



BTO Research Report No. 229

**Review of the Status of Introduced
Non-Native Waterbird Species
in the Agreement Area of the
African-Eurasian Waterbird Agreement
Research Contract CR0219**

Authors

M.J. Blair, H. McKay, A.J. Musgrove & M.M. Rehfisch

Report of work carried out by the British Trust for Ornithology under contract to
the Department of Environment, Transport and the Regions

February 2000

© British Trust for Ornithology

British Trust for Ornithology, The Nunnery, Thetford, Norfolk IP24 2PU
Registered Charity No. 216652

CONTACT NAMES AND ADDRESSES

British Trust for Ornithology

The Nunnery
Thetford
Norfolk
IP24 2PU

Contacts: Dr Mark Rehfisch, Head of Wetland & Coastal Ecology Unit (Scientific Matters)
Mr Michael Blair, Introduced Waterbirds Project Officer
Dr Andrew Musgrove, WeBS Low Tide Counts Organiser
Dr Nigel Clark, Head of Projects (Contractual Matters)

Tel: 01842 750050
Fax: 01842 750030
E-mail: m.rehfisch@bto.org; mike.blair@bto.org; andy.musgrove@bto.org; n.clark@bto.org

Central Science Laboratory

Sand Hutton
York
YO41 1LZ

Contact: Dr Helen McKay, Wildlife Management and Conservation Team (CEP6)
Tel: 01904 462060
Fax: 01904 462111
E-mail: h.mckay@csl.gov.uk

CONTENTS

	Page No.
List of Tables	3
List of Appendices	5
1. EXECUTIVE SUMMARY	7
2. INTRODUCTION	9
3. AIMS AND OBJECTIVES	11
3.1 Key Objectives of the Contract	11
3.2 Major Areas of Work	11
4. PROJECT CONCEPTS AND IMPLEMENTATION	13
4.1 Project Structure	13
4.2 Lack of Information on Introduced Waterbirds in the Literature	13
4.3 Changes to Project Documentation	13
4.4 Project Implementation, Information Services and Questionnaire Design	14
5. DATABASE	15
5.1 AEWA Database and Contents	15
5.2 Data Quality	16
5.2.1 Lack of detailed knowledge of introduced species	16
5.2.2 Quality of responses	16
5.2.3 Inadequate responses	16
6. SPECIES ACCOUNTS AND GLOSSARY OF LITERATURE	17
6.1 Full Species Accounts	17
6.1.1 Sacred Ibis <i>Threskiornis aethiopicus</i>	18
6.1.2 Greater (European Flamingo) <i>Phoenicopterus ruber</i>	19
6.1.3 Chilean Flamingo <i>Phoenicopterus chilensis</i>	21
6.1.4 Mute Swan <i>Cygnus olor</i>	22
6.1.5 Black Swan <i>Cygnus atratus</i>	25
6.1.6 Greylag Goose <i>Anser anser</i> (incorporating Feral/hybrids)	28
6.1.7 Bar-headed Goose <i>Anser indicus</i>	30
6.1.8 Canada Goose <i>Branta canadensis</i>	32
6.1.9 Barnacle Goose <i>Branta leucopsis</i>	36
6.1.10 Egyptian Goose <i>Alopochen aegyptiacus</i>	38
6.1.11 Ruddy Shelduck <i>Tadorna ferruginea</i>	40
6.1.12 Muscovy Duck <i>Cairina moschata</i> (forma domestica only)	42
6.1.13 Mandarin Aix <i>galericulata</i>	45
6.1.14 Mallard <i>Anas platyrhynchos</i> (incorporating Feral/hybrids)	48
6.1.15 Red-crested Pochard <i>Netta rufina</i>	52
6.1.16 Ruddy Duck <i>Oxyura jamaicensis</i>	53
6.2 Species which have Escaped and Bred or Survived at Least One Year in the Wild	56

6.3	The Compilation of an International List of References on Invasive and Introduced Organisms	75
7.	INTRODUCED WATERBIRDS: GOVERNMENTAL AND NGO PERCEPTIONS ...	77
7.1	Population Estimates	77
7.2	Factors Affecting the Presence and Spread of Introduced Waterbird Species	77
7.3	The Threat Posed by Introduced Waterbird Species to Indigenous Waterbird Species .	78
7.4	Governmental Responses to Introduced Waterbirds	78
7.4.1	Africa	78
7.4.2	America	80
7.4.3	Asia	80
7.4.4	Asia Minor and the Middle East	80
7.4.5	Europe	81
8.	GAPS IN COVERAGE IN THE AEW A AREA	87
8.1	Africa	88
8.2	America	89
8.3	Asia	89
8.4	Asia Minor and the Middle East	89
8.5	Europe	90
8.6	Collecting the Missing Data	90
8.7	Updating the Database	91
9.	STATUS OF INTRODUCED WATERBIRDS IN THE AEW A AREA AND THEIR EFFECT ON NATIVE WATERBIRDS - PROJECT CONCLUSIONS AND RECOMMENDATIONS	93
9.1	Conclusions	93
9.1.1	Literature	93
9.1.2	Project findings	93
9.1.3	An assessment of introduced waterbirds as potential threats to native waterbird species	94
9.1.4	Trends	97
9.1.5	Contradictory responses	98
9.1.6	Hunting releases	98
9.1.7	Which introductions are the greatest threat to migratory waterbirds?	99
9.1.8	Usefulness of the data obtained by the project	99
9.1.9	Improvement of data quality	99
9.1.10	The need for a method of assessing the risk captive waterbird species may present to indigenous waterbird species	99
9.1.11	The advantages of reducing escape rates	99
9.1.12	National conservative legislation and control measures for introduced waterbird species	100
9.2	Recommendations	100
	Acknowledgements	103
	References	107
	Appendices	109

LIST OF TABLES

	Page No.
Table 1	Summary of Range States legislation dealing with introduced waterbird species 86
Table 2	The AEWA status in Africa 88
Table 3	The AEWA status in Asia Minor and the Middle East 89
Table 4	The AEWA status in Europe 90

LIST OF APPENDICES

	Page No.
Appendix 1	Questionnaire Response Status of AEWA States 109
Appendix 2	Summary Breakdown by Continental Region and Range States of the Introduced Waterbird Species Reported by Respondents 113
Appendix 3	BOU Definitions of Sub-Categories of Non-native Birds. 117
Appendix 4	Questionnaires Used in Project 119
Appendix 4.1	General Questionnaire 120
Appendix 4.2	Detailed Questionnaire 123
Appendix 4.3	General Questionnaire in French 126
Appendix 5	Introduced Waterbird Species Records Omitted from the Report 129

1. EXECUTIVE SUMMARY

Introduction

The African-Eurasian Migratory Waterbird Agreement (AEWA) aims to put in place sound, agreed conservation strategies for migratory waterbirds over their complete life-cycle. This report is produced as part of the United Kingdom Government's contribution to the AEWA.

Aims and objectives

This report i) assesses the status of introduced and non-native waterbird species within the agreement area of the AEWA, and ii) assesses the extent to which these introduced species may negatively affect native species.

To fulfill the above it was necessary to collect information a) on the range and populations of non-native waterbird species and sub-species within the AEWA Range States (**Section 6**), b) on the measures taken by the Parties to avoid the accidental escape of non-native captive birds (**Section 7**), and c) on the measures taken by the Parties to ensure that non-native species of waterbirds, or their hybrids, which have already been introduced to the wild within their territory do not spread in a manner potentially hazardous to indigenous species (**Section 7**).

Project implementation

There is little information in the literature about introduced waterbirds because they have been viewed as of secondary importance. The references that exist are often narrow in outlook, concentrate on specialist subjects (such as hybridization or disease pathology of captive-reared species), are outdated or deal with very small samples.

Much of the information presented by this report about the numbers of, and legislation relating to, introduced species was collated from the 77 responses received to questionnaires sent to all Range States.

The questionnaire has sought and obtained information for each country on the identity of each introduced species, its location, habitat and history, whether it exhibited sedentary or migratory behaviour, its breeding and population status, hybridization evidence, disease evidence, habitat changes, escape recruitment, and threat to other waterbird species. In addition, the questionnaire sought information on national conservation measures and legislation, their effectiveness, and on countermeasures or legislation on introduced species. The presence of the waterbird trade, collections of live waterbirds and free-flying stock was also assessed.

Database

All of the information received from the questionnaires up to 1 August 1999 has been input into a database ready for future interrogation. This database could be updated at regular intervals to provide a useful source of information on the status of introduced waterbirds within the AEWA area.

Species accounts

As yet, 111 introduced waterbird species (and two hybrid populations) have been recorded as regular escapes and some 50 more have been noted as isolated records. From the responding countries it is clear that the number of introduced species in each country is very variable. The numbers ranged from 0-24 species in Africa, 0 in America, 0 in Asia, 0-25 species in Asia Minor and the Middle East and 0-79 species in Europe.

It is apparent that even in countries with many observers, little is known about the status of introduced waterbirds, mostly because of a lack of agreed methods of reporting them. Record-based population estimates are therefore almost certainly underestimates in most cases. Distributions are usually poorly known. Almost nothing is known for most introduced waterbird species of their behaviour and biology in their adopted environment. Therefore, the data collected from the questionnaires are necessarily fragmentary, although the scale of the exercise showed that, for the more numerous of the introduced species, patterns of spread were apparent. From the questionnaire respondents, there is clear evidence of an increase in the number of introduced waterbird species recorded, of increasing occurrence of breeding and of increasing populations of some species.

Assuming that the above trends continue, forecasts (with broad caveats) have been made for 16 introduced waterbird species which are thought to pose a particular threat to native waterbird species in the AEWA area. Less detailed species accounts have been written for a further 95 introduced waterbird species which are considered to pose less of a threat to native species.

Governmental responses to introduced waterbirds, including existing legislation

The legislation in the AEWA area countries varies from complete and apparently effective to non-existent. Some countries, such as Botswana, which have no introduced species, have planned sound, comprehensive legislative countermeasures. Controls are planned on importation, keeping birds in captivity and release into the wild. Some countries, which have introduced much legislation can find it difficult to legally implement any countermeasures. Other countries have legislation in place, but it is inadequately implemented. AEWA seems ideal for raising the profile of the problems caused by introduced species and co-ordinating efforts to deal with the difficulties.

Gaps in coverage in the AEWA area

Not all countries responded to the questionnaire. This report has estimated the likely number of introduced species in each of the non-responding countries based on a variety of parameters. This ranged from 0-4 species in Africa, 0-8 species in Asia Minor and the Middle East and 0-10 species in Europe. The database ought to be updated as more data become available.

Conclusion

This summarises the report findings and makes a suite of recommendations based on the information gathered from both the questionnaires and the literature.

2. INTRODUCTION

The subject of invasive and introduced organisms has traditionally been one of limited academic interest. Where native species have declined as a consequence of introductions, sometimes to extinction, these events have been of more note, but have mainly carried little economic or political weight. One early exception was the recognition in the USA that the **House Sparrow** *Passer domesticus* was not only a pest which caused damage to stored and standing grain but that it also had adverse effects on 70 native bird species (Lever 1987). As a consequence the Lacey Act of 1900 prohibited the further importation of exotic fauna into the USA. The scale and the pace of change wrought by introduced and invasive organisms are now such that serious economic effects are becoming commonplace, and moral concern over species' extinction through ignorance and carelessness is now a prominent feature of the political agenda and of informed public opinion. For example, the zebra mussel *Dreissena polymorpha*, which was accidentally introduced to the American Great Lakes in ships' ballast, now blocks filters in power plant cooling systems at a cost of over \$300 million (Mackenzie 1999). In Europe, the North American mink *Mustela vison* has escaped and established itself in many countries, threatening several indigenous mammals and numerous seabird colonies (Lever 1994; Craik 1995, 1997).

There is, therefore, real concern that, in the case of introduced waterbirds, indigenous waterbirds may be at risk, mostly through competitive exclusion and hybridization. The African-Eurasian Migratory Waterbird Agreement (AEWA) defines waterbirds as those species which are ecologically dependent on wetlands for at least part of their annual cycle, *i.e.* divers, grebes, herons, storks, ibises, spoonbills, flamingos, wildfowl and waders. Of principal concern to the AEWA are those waterbirds whose range lies at least partly within the AEWA area, which comprises over 120 Range States and encompasses the migratory routes of almost all the waterbird species within it.

The AEWA aims to put in place sound, agreed conservation strategies for migratory waterbirds over their complete life-cycle. This project, on the status and effects of introduced waterbird species on native waterbird species within the AEWA area, is part of the British Government's commitment to the AEWA.

Report Structure

The aims and objectives of the project are described in **Section 3**. **Section 4** explains why the lack of broadly-based literature required that most of the information needed by this project be gathered by questionnaires sent to relevant organisations and governmental bodies. A database was set up to hold all of the information acquired from the questionnaires, and in **Section 5** the database structure is summarized.

The number of species reported or estimated in the AEWA range states are tabulated in **Appendix 1**. **Appendix 2** lists those Range States for which introduced waterbird species were reported by respondents. **Appendix 3** contains the British Ornithologists' Union definitions of subcategories of non-native birds, which form the basis of the very first formal listing method for introduced bird species. **Appendix 4** contains the questionnaires used in the project. **Appendix 5** lists the introduced waterbird species omitted from the report, the total of 50 giving an additional perspective to the scale of their occurrence.

3. AIMS AND OBJECTIVES

3.1 Key Objectives of the Contract

The first key objective of the contract was to assess the status of introduced and non-native waterbird species within the AEWA area.

The second key objective was to assess the extent to which these non-native waterbird species could negatively affect native species.

For the purposes of this report, the terms “introduced” and “non-native” are interchangeable and are considered to include ‘naturalized introductions’, ‘naturalized re-establishment’ ‘naturalized feral’ and ‘vagrant naturalized species’ (**Appendix 2**).

3.2 Major Areas of Work

To fulfil the key objectives, four major areas of work were required:

- i. To identify the current status of introduced waterbird species in each AEWA Range State (**Section 6**).
- ii. To assess the potential for population increase and range expansion of introduced waterbird species within and beyond each AEWA Range State (**Section 6**).
- iii. To determine the likelihood of interactions between introduced and indigenous waterbird species (**Section 6**).
- iv. To describe and evaluate the effectiveness of measures taken by parties to the AEWA to:
 - (a) Avoid the accidental introduction of non-native waterbird species (**Section 7**).
 - (b) Ensure that any introduced waterbird species or hybrids will not increase in a manner which will be potentially hazardous to indigenous waterbird species (**Section 7**).

4. PROJECT CONCEPTS AND IMPLEMENTATION

There is ample evidence to show that introduced fauna can adversely affect native fauna, and even sometimes cause their extinction. Island forms are particularly vulnerable (Lever 1994). There is also evidence that introduced bird species have in many cases seriously affected native bird species (Lever 1987). In the case of waterbirds, particularly closely-related wildfowl species, several native species are under threat from introductions, notably through hybridization (Marchant & Higgins 1990). The perception within the AEWA was that both the scale and rate of waterbird introductions, whether deliberate or unintentional, are increasing, making it more likely that viable populations could become established and pose threats to indigenous species. This project aimed to quantify this perception.

4.1 Project Structure

It was originally assumed that there would be sufficient data in the literature to assess the presence and impact of introduced waterbirds in Western Europe, but this did not prove to be the case. As expected, the literature for most non-European countries was incomplete. It was therefore decided to acquire the bulk of the information about the status and effects of introduced waterbird species from questionnaires sent out to relevant government organizations and to individuals with a broad knowledge of a nation's avifauna. However, even a combined literature search and analysis of questionnaire responses is unlikely to be comprehensive.

4.2 Lack of Information on Introduced Waterbirds in the Literature

Although studies on the population dynamics, biology and behaviour of introduced waterbirds in an alien environment are crucial to our understanding of how well introduced species will thrive, such studies are rare in the literature (the Egyptian Goose *Alopochen aegyptiacus* (Lensink 1999) is a recent exception). Without such information about introduced waterbird species the need for, and implementation of, control policies may be based on unsound and flawed premises.

Until very recently, there was no approved method of reporting introduced birds in any country. For the UK, the British Ornithologists' Union (BOU) has recently introduced a new category in its list for introduced species, based on clear definitions as to the status and origin of non-native wild birds (**Appendix 3**). In The Netherlands and Switzerland, the need to report introduced species is now becoming generally accepted. In Germany the issue is being debated strongly, but the need for better information gathering has been recognized within academic biology.

The fragmented body of literature on introduced waterbirds is also heavily skewed toward studies of captive and farmed species or hunting-release stocks. The majority of studies are recent, and are often very specific to, for example, hybridization, translocation, small-scale surveys and histories (*e.g.* Gillespie 1985)

Additionally there remains a strong prejudice among birdwatchers and amateur ornithologists about escaped exotic species which are regarded as not being "real" birds. Even where wildfowl count forms feature introduced waterbird species, many counters fail to record them. Some coordinators will omit introduced species even if counters have recorded them. For example, a project to count the feral geese in Germany had to be postponed because many counters did not wish to participate in such a "worthless" exercise.

4.3 Changes to Project Documentation

Following the revision of the project assumptions, the design of the questionnaires was changed (**Appendix 4**) to encourage respondents to provide information about waterbird collections, conservation legislation and its effectiveness and whether they held positions of responsibility in conservation matters.

It was emphasised that even the most general information about introduced waterbirds could be useful, given the state of present knowledge. Respondents were also asked to give details of recent national references.

An examination of responses showed that the extent of information available to even the best-informed authorities was often very limited. The revised project assumptions therefore were found to be valid. It is clear that the status of introduced waterbird species and the effects that they may have on indigenous waterbird species are at best poorly known, often just informed speculation, and at worst not known at all. Conclusions reached and recommendations made in this Project Report are therefore based on imperfect knowledge.

4.4 Project Implementation, Information Sources and Questionnaire Design

Most information on the presence and numbers of species was obtained directly from ornithological researchers resident in each state. Similarly, details of national legislation and policies concerning the introduction and control of non-native waterbirds and migratory waterbird conservation could be identified by national conservation bodies or government departments. Lists of potential contacts were compiled by seeking the advice of members of international bodies, such as the European Bird Census Council, BirdLife International, the Wildfowl and Wetlands Trust, Wetlands International, IUCN, the African Bird Club and the Ornithological Society of the Middle East. The recommended contacts, in turn, suggested more contacts.

Additional potential contacts, especially in official positions, were identified from lists of delegates attending AEWA meetings. Furthermore, relevant conference attendance lists were scanned for further candidate contacts. For a number of countries, national contacts could not be identified, but instead, individuals who had worked on ornithological or conservation projects in these states were contacted. From over 120 states within the AEWA area, only one (Western Sahara) could not be covered from the list of potential contacts.

General (**Appendix 4.1**) or specialist (**Appendix 4.2**) questionnaires were distributed to our contacts. Questionnaires were designed after consultation with ornithologists at the BTO, CSL and elsewhere. Many recipients answered or forwarded the questionnaires to individuals better-placed to provide answers. Inevitably, some declined to participate either through excessive workload, absence or lack of knowledge; unfortunately, a fair number of such refusals were not received until late in the project. Where no response was received, reminders were sent. Some officials puzzlingly declined to provide any information at all "because there are no introduced birds". Government views of conservation legislation, tended to be more positive than conservation workers.

5. DATABASE

5.1 AEWA Database and Contents

The AEWA Introduced Waterbirds Species data are held on a *Microsoft Access 97* database. The database comprises five linked tables, two main inputting forms, representing the General and Detailed Questionnaires respectively (with one small subform common to both forms [**Species and Locations Table**] and different large subforms for both main form types [**Waterbird Status Table General** and **Waterbird Status Table Specialist** respectively]). A number of Access 97 Query- and Report formats were designed to assist in the production of this report. The structure of the database was derived from the design of the questionnaires (both general and specialist). The database tables and forms are constructed as follows:

The **Main Table** contains information from a respondent (a country occupies as many rows as entered responses from that country). The fields are:

- Form number. An internally-generated integer used principally to link tables.
- Country. The country name, selected from a drop-down "Combo Box" which is linked to the lookup table **Allcountry**.
- Contact details. Name, address, phone, fax, e-mail, data protection box (if ticked, name and address details were not included in the database).
- Conservation data. For responses to those questions not in the subforms, namely G1, G2, G5-12, G14, S1, S2, S5-10, S12 and S17.
- Part 3. A memo field in which expanded replies to the questions or separate narrative information could be entered.

The **Species & Locations Table** contains the information entered into the subform common to both inputting forms (a small table on page one of the questionnaires containing species-specific information). Its fields are:

- Form number. Links the table to the **Main Table**.
- Species. A number (based on the EURING number scheme) which links to the AEWA Number field in the lookup table **Allspecies**.
- Location. The location of a species within a country as stated on completed questionnaires by respondents.
- Description. The habitat type occupied by a species as stated on completed questionnaires by respondents.

The **Waterbird Status Table** contains the information entered into the appropriate large subform of both main inputting forms. It corresponds to the questions on the A3 page of the questionnaires, and relate to species-specific information. The **Waterbird Status Table** contains the following fields:

- Form number. Links the table to the **Main Table**.

- AEWA number. A number which links to the EURING Number field in the lookup table **Allspecies**.
- Year of information. The year to which the information from the questionnaires relates to. (Questions G16a and S14a).
- Questions G16b to G16s from the General Questionnaire and questions S14b to S14x from the Detailed Questionnaire..

The lookup table **Allcountry** simply contains a list of country (Range State) names to choose from.

The lookup table **Allspecies** contains a list of English waterbird species names, their scientific ("Latin") names, AEWA numbers (the EURING numbers where applicable, plus a few invented [but in taxonomic sequence] numbers for the non-European species not on the EURING list), BTO five-letter and two-letter codes.

5.2 Data Quality

There were a number of factors affecting data response quality:

5.2.1 Lack of detailed knowledge of introduced species

Information on distribution, numbers, biology and behaviour of introduced waterbirds species was normally lacking and almost always fragmentary. This was the most significant factor affecting data quality.

5.2.2 Quality of responses

The conflicting responses received arose because specialists and officials treated evidence in different ways, had genuinely different sources of information, or perhaps differed in their perception of how their response might reflect on them.

5.2.3 Inadequate responses

Those responses deemed as inadequate were followed up to improve the data quality. A reasoned response could be inadequate because the questionnaire had not been read or understood properly. Amended responses usually were easily obtained. Some intended responses were amended by the originators because having read the questionnaires thoroughly, they had increased their awareness of the potential problems of introduced waterbird species. A few respondents appeared to be complacent or lacking in knowledge of the subject area. Fortunately there usually was an alternative response covering the same country.

6. SPECIES ACCOUNTS AND GLOSSARY OF LITERATURE

Although those global overviews which cover a wide range of waterbird species provide a useful history of early introductions, they do not reflect recent changes (Long 1981; Lever 1987). Breeding or wintering bird atlases can give a partial picture of introduced species' distributions, but these mostly lack data on introduced species. From what can be discovered from publishers' marketing lists, there are no plans for an updated overview of introduced birds in the near future.

However, papers and reports are being published or are in preparation to address the imbalance of the literature on introduced waterbird species. In the United Kingdom, the establishment of the new formal reporting category "E" by the BOU Records Committee will be a major step in providing soundly-based data on introduced waterbird species, as can be seen from the 1997-98 Wetland Bird Survey report (Cranswick *et al.* 1999). The first comprehensive action plan for an introduced species (**Ruddy Duck** *Oxyura jamaicensis*) which poses a risk to an indigenous species (**White-headed Duck** *O. leucocephala*) has been compiled (Hughes *et al.* 1999); its list of references is more broadly-based than has been customary for a paper on an introduced species. An important report on the population dynamics of the introduced **Canada Goose** *Branta canadensis* (Kirby *et al.* 1998) has appeared as has the first comprehensive paper on the population dynamics, breeding biology and behaviour of **Egyptian Goose** *Alopochen aegyptiacus* in The Netherlands (Lensink 1999). A number of important studies will be published in the near future by the Neozoen group at the University of Rostock in northern Germany, some of which will deal with introduced waterbird species.

At present, there are between 0-1 introduced waterbird species in Asia and easternmost Europe, 0-25 species in Africa, the Middle East and Asia Minor, and 0-79 species in Europe and the Americas (**Appendix 1**). Because of the scale and increasing pace of introduction of waterbird species in the AEWA area, the information gathered by this project will be relevant for only a few years. There is a need to maintain a database of such information by regular updating both from the original sources of information and from other sources within the AEWA. Ongoing studies such as those mentioned above should not remain isolated if there is to be any real chance of coordinating control measures for introduced species. With updated information, the AEWA forum offers a chance of such coordination at an early stage. Furthermore, a database updated regularly would allow the a more broadly-based literature on introduced (waterbird) species to evolve.

Full species accounts are given for 16 introduced waterbird species which we consider are most likely to become threats to indigenous AEWA waterbirds, based on evidence from the literature and the questionnaire responses (**Section 6.1**).

The 113 summary species accounts cover 95 introduced waterbird species which do not appear to present a clear threat to any indigenous waterbird species in the AEWA area, based on the literature and our questionnaire responses (**Section 6.2**).

6.1 Full Species Accounts

In each account, the Range States in which the species has been recorded are grouped in alphabetical order of continental region, thus: Africa, America, Asia, Asia Minor & the Middle East, and Europe. Within each continental region, the Range States are listed alphabetically. Where a species has not been recorded as introduced within a continental region, that region is omitted from the species account. Population size estimates in the main are those provided by respondents; those from other sources are cited.

Except for the paragraph **Potential future trends**, the information cited comes mostly from respondents, that on the natural distribution from del Hoyo *et al.* (1992 & 1996), and some historical background from Lever (1987). For each species, the paragraph headed "Potential future trends" considers worst-case scenarios based on the fragmentary data collated for this project. In the next few years, broadly-based research like that cited above should provide more authoritative analyses and will probably whittle list of

species down to fewer than 16.

The following abbreviations appear in the Full Species Accounts; **bp** = breeding pairs and **asl** = above sea level.

6.1.1 Sacred Ibis *Threskiornis aethiopicus*

Status in its natural range

The present natural range of the **Sacred Ibis** comprises the African marshes, swamps, shallow wetlands and grasslands south of the Tropic of Cancer. It forages often in fields and general farmland. It is not known whether the only other known population survived the recent draining of the Iraq marshes. It was common enough in Egypt 3,000 years ago to be entombed in the millions as a species of religious significance, a fact emphasised by present-day waterbird collections. It is not globally threatened (del Hoyo *et al.* 1992 & 1996) in its natural range, partly because it is an adaptable species, able to thrive in environments away from water and marshes, even to the extent of near commensal behaviour with man.

Hybridization

It is not known to hybridize in the wild, and no information has been supplied about captive hybridization.

Introductions outside the AEWA area

No information has been obtained about introductions outside the AEWA area, although the species undoubtedly features in collections and zoos worldwide.

Occurrence in the AEWA area

ASIA MINOR & THE MIDDLE EAST

United Arab Emirates

Up to 10 pairs from a total of some 70 birds bred in at least two locations, Al Ain and Sir Bani Yas Island wetlands (Ain Al Fayda) between 1976 and 1991. Initially, the birds had roosted only around a private zoo and had fed at artificially-created shallow ponds. Subsequently, the population increased but slowly. Some birds may have arrived from the drained Iraqi marshes. The species' present status is unknown.

EUROPE

France

The species was introduced, either deliberately or accidentally (or by a combination of both) into the Brittany Atlantic coast at Golfe de Morbihan probably some time in the late 1970s or early 1980s. Initially, breeding began in occupied heronries, but as numbers grew, herons became the minority. For a period, breeding numbers seemed to stabilize around 40 bp, but a second colony was founded at Lac Grand Lieu, near Nantes and by 1993 the total population was estimated at 350 individuals, and in 1999 there were some 200 bp from over 1,000 individuals. New colonies are appearing from time to time. The birds feed in marshes and lake margins, and also exploit muddy areas of coast. The damp Atlantic climate somewhat unexpectedly has proved ideal for the species.

Italy

Since 1990, a small population has survived in north-west Italy. The species has been reported from five provinces and as probably breeding now in mixed heronries in two provinces most years (north-west and

north-east Italy). About 10 bp are thought to have produced a slow increase to a presently uncertain population size.

United Kingdom

The 30-odd records of the species in the UK are thought to be mainly of birds from the French colonies (J. Marchant *pers comm*).

Elsewhere

Undoubtedly, escaped birds have occurred, or have strayed into many other countries, but the fragmentary and partial nature of recording to date means that many sightings have never been reported formally (J. Marchant *pers comm*). That said, there are doubtless many sources with information where time has not permitted contact or whose identity has not been discovered in the course of this project.

Potential further trends

The **Sacred Ibis** will continue to increase in France, but any spread immediately south of the Loire is unlikely because the area is heavily shot over. It will probably establish colonies elsewhere in France and possibly breed in Britain, and probably attempt to do so in areas in Europe outside the 0° winter isotherm before the year 2015. It may become viewed as a pest locally if its foraging in fields damages winter wheat seedlings. Its dominance of local heronries will have increasing local effects on **Grey Heron** *Ardea cinerea*, **Little Egret** *Egretta garzetta* and **Night Heron** *Nycticorax nycticorax*. Its spread in Italy probably is more constrained by indiscriminate shooting than in France, but **Little Egret** has colonized areas near fishponds in Italy which are better protected than others, so an increase there can be expected.

6.1.2 Greater (European) Flamingo *Phoenicopterus ruber*

Status in its natural range

It breeds in scattered, often impermanent colonies at shallow saline or highly alkaline waterbodies, sometimes on sandbars and mudflats, and also on salt-pans. There are two subspecies, *ruber* occurring from Spain east to Turkey and Kazakhstan, southwards to much of Africa, and south-east to India and Sri Lanka, wintering usually somewhat either south of the northern breeding range in North Africa, Cyprus and Asia Minor, or moving irregularly to suitable wintering lakes or coastal lagoons, often where non-breeding birds over summer. The second subspecies, *roseus*, breeds from the Caribbean to the Galapagos. Exchange of adults between relatively distant colonies may be quite common, because the species dispenses widely. It is **Not Globally Threatened**.

Hybridization

In the wild, hybridization has probably occurred with **Lesser Flamingo** *P. (Phoeniconaias) minor* which occurs in the East African Rift Valley and further south, and which also wanders widely. Wild-living escapes have hybridized at Zwillbrocker Venn in Germany with escaped **Chilean Flamingo** *P. chilensis*, successfully raising young. Hybridization attempts with other flamingo species are common, although results have not been obtained for this report.

Introductions outside the AEWA area

Greater Flamingo is an extremely popular collection species all over the world, and if not pinioned, readily escapes. Individuals have turned up amongst flocks of other flamingo species in the New World. Most flamingo species can survive well as escapes, but breeding successfully may depend critically on it being able to meet its dietary needs.

Occurrence in the AEWa area

AFRICA

South Africa

It has been privately introduced (in the 1990s) at an artificial marshland created in a rather arid area as part of an eclectic species collection.

EUROPE

Germany

Since the 1980s, numbers of escaped or released **Chilean Flamingo** have bred at Zwillbrocker Venn, close to the Dutch border, and amongst them up to 6 bp of **Greater Flamingo** have been counted, an unknown proportion of which may be the American subspecies *roseus*). Breeding has been annual where weather conditions have permitted, occasional hybridization being known. An estimated 160 birds c. 10% **Greater Flamingo** have been counted in the mixed flock. Numbers probably are at least stable, but the role that escape recruitment plays in maintaining the population is unclear.

The Netherlands

Flamingos are encountered year-round, mostly **Chilean Flamingo**, and mostly from the German mixed colony. However, winter counts of mixed flocks over 300 strong in some years suggests that the European introduced population of both species is much larger than realised.

United Kingdom

There have been over 25 recent records of **Greater Flamingo**, mostly attributed to wanderers from the German colony. Pinioning may well be comprehensive for the species in British collections.

Elsewhere

Many escapes, especially of birds located further south in Europe have gone unrecorded because of the difficulty of separating them from natural vagrants from the birds breeding in the Mediterranean colonies. A deliberately-introduced *roseus* flock (1950s?) lasted for about 30 years in Hialeah, Florida, where a number are thought to have returned to the normal Caribbean range, which pattern is to be expected from isolated flamingo colonies such as that in Germany.

Potential future trends

Flamingos will always be attractive to the general public and so **Greater Flamingo** will continue to appear in collections. Its specialized feeding and breeding requirements make this species unlikely to have an effect on any indigenous species. Sightings of escapes will probably increase largely due to improvements in recording exotic species. The opinion of students of the German mixed flock (of c. 160 birds, perhaps 10% being **Greater Flamingo**) is that it will not increase greatly unless mass escapes occur, or there is a sudden influx of wild **Greater Flamingo**. They believe that captive conditions are now more secure. This colony (the **Greater Flamingo** component in particular because it is the less hardy species) is more vulnerable to unfavourable North German winter weather in the long term than are those in the warmer Mediterranean region. However, should the *roseus* birds disperse to breed in a small Mediterranean colony, a degree of subspecies blurring might occur. Should hybrid **Greater x Chilean Flamingos** wander similarly, the genetic circumstances could become complex. The birds in the German mixed colony therefore present a small degree of risk to small wild **Greater Flamingo** flocks.

6.1.3 Chilean Flamingo *Phoenicopterus chilensis*

Status in its natural range

This hardy South American species occurs on coastal mudflats, estuaries, lagoons and salt lakes up to 4,500 m above mean sea level (asl), and also on slightly saline lakes lacking fish, from central Peru south through the Andes to Tierra del Fuego and east to southern Brazil and Uruguay. It is **Not Globally Threatened**.

Hybridization

In the wild, hybridization is probably very occasional. Wild-living escaped individuals have hybridized with **Greater Flamingo** *P. ruber* at Zwillbrocker Venn in Germany, successfully raising broods.

Introductions outside the AEWA area

It is, and has long been, a popular collection species worldwide, and readily escapes when not pinioned.

Occurrence in the AEWA area

EUROPE

Austria

The few Austrian records have all been attributed to escaping birds from other countries, but the species does occur in Austrian collections.

France

Small numbers have been reported annually, mostly in the same locations, but confusion with **Greater Flamingo** which breeds in the South of France and wanders freely, is likely.

Germany

The mixed colony, founded in the early 1980s and near the Dutch border contains 10-20 bp amongst about 160 individuals, of which *c.* 90% are **Chilean Flamingo**. Weather conditions permitting, breeding is annual. The role escape recruitment plays in maintaining the colony is unknown, but numbers appear stable.

Iceland

Iceland's single record was of a regular summer migrant from UK.

Italy

It has been recorded in two provinces since 1989, some birds demonstrating strong winter site fidelity. These may be birds from the German colony.

The Netherlands

Sightings occur year-round, mostly attributable to wanderers from the German colony. Winter counts of mixed flocks (mostly comprising **Chilean Flamingo**) in the Dutch Delta and IJsselmeer have reached over 300 in total, suggesting that there are many other escapes otherwise unaccounted for.

United Kingdom

There are over 30 recent records, but certainly until recently it has been grossly under-reported. There are several cases of the same individual turning up in the same place at the same time of year, demonstrating site-fidelity (J. Marchant, *pers comm*). Some are known to have survived very severe winter conditions. One wintering bird migrated annually to Iceland for several years.

Elsewhere

There are a number of deliberately-released wild-living mixed-flamingo flocks in the USA, whose breeding status is uncertain.

Potential future trends

Should **Chilean Flamingo** become established in Europe in less marginal habitats and conditions that prevail at the German colony, then it would thrive when the colony nuclei became large enough, whether or not escape recruitment continued. It is the hardier of the two flamingo species in the colony. There seems to be a critical colony size at which the stimulus to breed is at its highest. The species does not present a threat to any other indigenous waterbird with the caveat that should numbers increase rapidly in **Greater Flamingo** breeding sites, the outcome of the competition is uncertain, but could be in favour of *chilensis*, if its relative success in Germany is representative of its performance in all suitable habitats.

6.1.4 Mute Swan *Cygnus olor*

Status in its natural range

Its habitat requirements of submergent vegetation to a depth of just over a metre in slow or standing waters are common as a result of human construction of dams, artificial lakes, weirs and gravel pits. Its distribution up to the 12th century was largely dependent on natural features with such characteristics and so was fragmented, but subsequently the proliferation of hydraulic schemes influenced by developing technology has allowed its range not only to become more coherent, but also to expand. Furthermore, in Britain and other European countries the **Mute Swan** became semi-domesticated after capture and was adopted widely as the property of the nobility. Consequently, its range was extended through the gift culture prevailing amongst the nobility, when a "Pair of Swans" would be installed in a moat or ornamental pond as a sign of loyalty, good intentions or patronage, or often as a marriage gift when noble families were linked.

In its present-day range, it and the other white swans are protected in nearly every European country. It remains an ornamental bird despite its wholly successful status in its present-day range which extends from the British Isles to central and north-east Europe east through Central Asia to eastern China. It continues to increase in numbers and range. In some locations it breeds not in the usual way as strongly-territorial pairs, but semi-colonially. It often assembles in large flocks at traditional locations. In South Africa, it is designated a REGULATED species (Shaw 1999 - **Section 9.1.11**). It is **Not Globally Threatened**.

Hybridization

In captivity, it has hybridized with three swan species and four goose species. In the wild, hybridization is known with **Whooper Swan *Cygnus cygnus***, both with wild birds and escaped or injured birds.

Introductions outside the AEWA area

During the era of colonialization, many attempts were made to introduce the **Mute Swan** as a symbol of the home country. Most failed, for reasons which now seem obvious, such as severe tropical conditions and lack of suitable submergent vegetation. It remains an attractive species to collectors and continues to feature in collections worldwide, including many in climatically unsuitable areas. Normally an aggressive

and highly-territorial species, it has been known to kill adults and young of other waterbird species, especially of geese, but it also benefits some indigenous species. In many cases duck and grebe species nest in very close proximity, benefitting in two ways; they gain additional protection from a formidable defender of territory against dangers, and they can consume submergent vegetation normally out of reach but dislodged by feeding swans.

Occurrence in the AEWA area

AFRICA

South Africa

For 25 years up to the 1980s, a population of up to 60 birds (escapes or their descendants) thrived at two locations, but declined to technical extinction (an unknown number were (re)captured for collections, the remainder not surviving). In 1996, escaped birds formed a small population at Marina da Gamba, Western Province.

Zimbabwe

A small introduced population seemingly thrived for several years up to 1989.

ASIA MINOR & THE MIDDLE EAST

United Arab Emirates

Up to four birds were present on Sir Bani Yas Island (probably brought into the private zoo) for a period in the 1980s.

EUROPE

Austria

The population of 140-320 bp originates partly from the original introduction programme of the 1890s and it is slowly increasing. A number of fishponds and artificial lakes which assisted the spread have suffered some degradation through trampling.

Croatia

The small but increasing population is believed to have arisen from the natural spread of stock introduced to Hungary. However, the Hungarians have not yet offered a view on the origin of their **Mute Swan** population.

Finland

It reached Finland initially by deliberate introductions (at Aaland in 1937), by the spread of birds naturally from Sweden, and as part of the natural range expansion from Germany and Poland in the 20th century. As in other countries, the effects on indigenous species are equivocal. Some are threatened and some benefit, depending on the location. **Great Crested Grebe** *Podiceps cristatus* and **Coot** *Fulica atra* will nest very close to **Mute Swan**. In winter, **Wigeon** *Anas penelope* seeks out swans to take advantage of dropped or uprooted edible vegetation. Hybrid **Mute x Whooper Swans** recorded in Finland originated in Sweden. The Finnish population officially is c. 2,000 bp, dropping to 1,500 birds in those winters which leave only the coastal waters unfrozen. However, one contributor noted that local counts in his area consistently exceeded the breeding and non-breeding numbers cited for his area in national censuses. Conversely, the national census coordinators have admitted that there is little survey interest amongst counters for the

species, and many broods are very mobile amongst the islands and bays of the Baltic archipelago. Furthermore, natural immigration from Sweden masks the extent to which the introduced birds succeed.

France

Despite a long-established and stable naturalized population, introductions continue, for reasons which, apart from ornamental birds on newly-created waterbodies, are difficult to fathom. In much of central and southern France, impermanent waterbodies are common, and these areas can be damaged by post-breeding **Mute Swan** families through eutrophication, over-exploitation and trampling as the waters evaporate. This presents an indirect threat to other waterbirds through temporary loss of food and perhaps permanent damage to the habitat. More important it adversely affects **Black Tern** *Chlidonias niger* colonies. In the national **Mute Swan** population of 7,000 individuals, there are 2,000 bp.

Germany

Twentieth-century introductions and re-establishment programmes have helped produce a continuously-distributed population, but the extent of the contribution has been masked by a natural range extension east- and southwards. Parkland has been extensively colonized by one means or another. Perhaps in excess of 4,000 bp now exist. It should be noted that, even from the fragmented 19th-century population, birds emigrated to countries to the south, east and west.

Greece

The small Greek population results from introductions, but when these began is uncertain.

Iceland

Between 1958 and 1977, Iceland had a small introduced breeding population of some 20 bp, near Reykjavik, but it is now extinct, probably due to a combination of adverse factors including vandalism.

Italy

The population has reached some 800 individuals, primarily since the 1970s, most living in northern Italy, but slowly spreading south. Its origin seemingly is a mixture of deliberate releases and natural immigration from stock introduced elsewhere.

Latvia

First introduced in 1935, the population was augmented by subsequent introductions and natural spread of other countries' introduced populations, numbers now reaching 500 bp and 4,000 individuals in winter.

Luxembourg

An introduction scheme before 1974 served as the basis for the present breeding population of a stable 12 to 20 bp. Winter migrants boost the figure to 150 individuals.

Switzerland

It was first introduced before 1895 and has gradually colonized all suitable waters. However, the breeding population of only 450-600 bp reflects the presence of many deep lakes with few shallow margins for suitably-protected breeding sites. In contrast, the winter population swells to around 4,000 individuals with the arrival of winter migrants. Up to midwinter, vegetation dislodged by floods and upstream rivers

is abundant. Later, artificial feeding at lakeside cities, towns and villages supplements the diminishing natural food supplies.

United Kingdom

In the 12th century, the **Mute Swan** became a royal bird. Individuals from the relatively small and scattered population were obtained and semi-domesticated for reasons of prestige and luxury food for the nobility. It rapidly became established throughout the UK in a series of establishment, re-establishment and introduction schemes. The 1990 population estimate is 25,750 birds (Stone *et al.* 1997). The substitution of lead angling weights by non-toxic alternatives has been followed by population increases where numbers had been low. Lost weights still claim victims, however. Some damage to crops has been recorded, through trampling seedlings during wet weather.

Elsewhere

Introductions have been a commonplace experience in many European and other countries. The species is now fully naturalized in Europe, but most introductions elsewhere have failed. Introduced populations (New England and the Great Lakes) have spread to much of the eastern USA. The small Japanese semi-feral population may have been augmented by vagrants from the highly-migratory mainland population. Other introduced populations exist in south-west Australia, New Zealand and western Canada.

Potential future trends

The **Mute Swan** will continue to thrive, but natural expansion will slow down as suitable habitat, food supply and breeding conditions become fully exploited within present limits. The continuing creation of gravel pits by the construction industries will allow a degree of population increase, as will the increase in urban wetlands. These conditions are rarely in evidence immediately beyond the present range. It will remain a popular collection species worldwide, but escapes are prominent and easily found if eradication is authorized. The species is a threat locally to geese in particular, but it is not omnipresent throughout their distribution. Smaller species can benefit by the **Mute Swan** dislodging edible vegetation out of their reach.

In France and probably elsewhere across central Europe, **Mute Swan** families aggregating at shallow impermanent waterbodies will probably have an increasing effect, through trampling nests and young, on **Black Tern** breeding colonies, and possibly on other river terns.

6.1.5 Black Swan *Cygnus atratus*

Status in its natural range

Its breeding range comprises large lakes, lagoons and billabongs with relatively shallow fresh or brackish permanent water in Australia and Tasmania. An introduced population thrives in New Zealand where it was once, and may again be regarded as an agricultural pest. Ever since its discovery by colonial explorers, it has been a much sought-after ornamental bird across the world. However, in the northern hemisphere, escaped pairs often seem to be dominated by the austral breeding cycle and many breeding attempts fail with the onset of winter. In South Africa, it is designated a REGULATED species. It is **Not Globally Threatened**.

Hybridization

It has hybridized in captivity with several swan and goose species, but there are few data on hybridization in the wild.

Introductions outside the AEWA area

The New Zealand introductions started probably in the 18th century and, by the early 20th century, the

population was so numerous, and reports of agricultural damage so frequent, that the species was subject to a hunting open season. The population quickly crashed but recovered once protection had been re-established and accepted. The species is now very numerous again, and forms aggressive, loose breeding flocks. Soon after it was discovered by European explorers, it rapidly lost its fear of man. In urban wetlands, parkland and farmland its tolerance of man makes it an easy target for hunters or vandals.

Occurrence in the AEWA area

AFRICA

South Africa

Escapes have been recorded occasionally occupying urban wetlands, but there is no record of breeding. Its conspicuous size and behaviour would make it easy to exterminate if it began to thrive in the wild and became perceived as a threat to indigenous waterbirds.

ASIA MINOR & MIDDLE EAST

United Arab Emirates

From 1991-92 at least, two free-flying individuals were in the vicinity of the private zoo on Sir Bani Yas Island, their history and fate being unknown.

EUROPE

Austria

It was first introduced in the 1950s in Vienna, and quickly a successful population built up. By the early 1990s it comprised perhaps 60 birds, mostly in the city or on adjacent rivers and parkland. In response to complaints from the public, the city authorities, after an acrimonious debate, finally authorized the culling of the flock.

Belgium

At least eight birds were known by 1990, 5 bp being recorded in 1994, but breeding has been irregular since.

Czech Republic

In the 1990s, up to five non-breeding individuals were recorded.

Germany

It has been present continuously since 1969, its numbers and breeding success fluctuating, in part due to the degree of severity of winter weather. The population size is between 50 to 200 individuals, but only five to 15 bp, nearly all associated with urban wetlands or parkland. The overall trend is stable.

Iceland

There have been two recent records, the origin of the birds being unknown.

Italy

Individuals have been recorded since 1979, the present breeding population reaching 5 bp in good years.

Those which breed in natural wetlands have had poor success because they breed in winter.

The Netherlands

It has had low breeding success since it was first recorded in 1978, 25 bp being the maximum in a good year. Overall, numbers and range seem to be increasing slowly, but how much this has to do with heavy escape recruitment in 1994 is uncertain. The growth of bankside, emergent and submergent vegetation in the huge network of drainage channels and canals has led to ideal conditions for many waterbird species, including **Black Swan**.

Portugal (Madeira)

In the 1980s, one was shot at sea, its origin being unknown. This is the only introduced waterbird recorded from the Madeiran archipelago.

Slovakia

There are several records from the early 1990s on the Danube which, as it leaves Austrian, territory forms the border between Slovakia and Austria (briefly), then Slovakia and Hungary. All are thought to be of birds which wandered from the now-extirpated flock in Vienna.

Switzerland

The species is encountered as an escape from time to time, usually on lakes near human habitation, some birds being thought to have originated outside the country.

Ukraine

In the 1990s, an unknown number were known to have been free-flying on a private estate.

United Kingdom

Ornamental birds have been present discontinuously since 1791, escapes breeding in the wild being recorded first in 1902, since when breeding in the wild has been intermittent. It remains a very popular collection species, and so a large source of potential escapes remains.

Elsewhere

It is a popular collection species in the USA and Canada, where escapes seem not to be able to thrive for long in the wild. A small number birds dependent on supplementary feeding may still exist in Japan.

Other aspects

As a captive breeder, it seems that supply can match demand, which is generally for solitary pairs.

Potential future trends

The **Black Swan** will probably continue to escape throughout the world, probably in increasing numbers, but nowhere outside the southern hemisphere has it yet shown any ability to become truly self-sustaining in the wild. Wild-living birds, largely locked into an austral breeding cycle, have remained dependent on an element of public feeding. However, in New Zealand, the breeding rate seems dependent on groups reaching a certain size, so should that occur amongst introduced populations, and the grip of the austral breeding cycle is loosened, the **Black Swan** probably would form fully self-sustaining populations in the

near future. It would probably displace many smaller waterbirds. At present it is no threat to any indigenous species, nor, outside the southern hemisphere, does it present any kind of economic threat to crops. The South African assessment that it would be easy to extirpate, should that be required, remains accurate.

6.1.6 Greylag Goose *Anser anser*
(incorporating **Feral/hybrid Greylag Goose** *Anser anser forma domestica*)

Status in its natural range

The **Greylag Goose** is the main ancestor of the white domestic farmyard goose, but the history of domestication is strewn with deliberate hybridization attempts by farmers between domestic stock and many other kinds of geese, and quite often with other *Anatidae* species, because the biological and behavioural barriers between *Anatidae* seem less effective than in most other bird families. Injured or captured **Greylag** have long been added to domestic flocks, the offspring mostly attaining a mixed plumage. Undoubtedly, gene-flow has not been all one-way, because anecdotal and narrative evidence from as far back as the 10th century tell of domestic geese disappearing when the wild geese leave on spring migration.

That said, the **Greylag Goose** has a modern range not too different from the distant past, the recovery being assisted by establishment and re-establishment programmes throughout Europe and the change to less indiscriminate hunting. The nominate *anser*, partially migratory, occurs from western Europe through to Fennoscandia, the Baltic countries south to the edge of the Mediterranean climate zone. East and north of this range the fully-migratory *rubirostris* occurs. This adaptable goose occupies a wide variety of habitats associated with water in open country, usually where there is ample fringing vegetation and nearby grasslands. It winters on marshes, grasslands, farmland and coastal lagoons. In South Africa, it is designated a PROHIBITED species. It is **Not Globally Threatened**.

Hybridization

It has hybridized in captivity with 23 *Anatidae* species and with domestic geese. In the wild, hybridization as an isolated event has often been recorded, but since the 1970s, hybridization in the wild with other escaped geese and with **Feral/hybrid Greylag Geese** has helped produce perhaps 18,000 hybrids (mostly of domestic/wild goose appearance) in The Netherlands and Germany.

Introductions outside the AEWA area

Acclimatization societies in the 18th and 19th centuries made many attempts to introduce goose species, both as memories of their native land for colonists and as a farmed food source. However, it was the **Feral/hybrid Greylag** or white domestic goose which was often taken by colonists themselves.

Occurrence in the AEWA area

ASIA MINOR & THE MIDDLE EAST

United Arab Emirates

A pair was introduced in the 1980s with unknown effect.

EUROPE

Austria

The natural breeding population of 140-320 bp (1985-95) has been augmented by the introduction of *c.* 30 bp mostly into eastern Austria. Wintering populations are large, exceeding 1,200 individuals.

Finland

A small number of introductions have occurred, but these have been lost in the background of natural expansion of the already abundant natural population.

France

Natural range increases have taken place, but introductions (including some of *rubirostris*) in the 1990s by hunting interests have been quite common.

Germany

The extensive German populations, perhaps 10,000 individuals, has arisen from natural range expansion from small core areas, introductions and re-establishments since the 1950s. Hybridization has become common between **Feral/hybrid Greylag**/domestic geese, producing a large (3,500-9,500) population whose status is poorly known. Counters on survey work have expressed great reluctance to count hybrids because they are not "real birds". There is also often-noted hybridization with other naturalized or introduced geese, such as sedentary **White-fronted Goose** *A. albifrons*, **Bar-headed Goose** *A. indicus*, **Swan Goose** *A. cygnoides*, **Barnacle Goose** *Branta leucopsis*, **Canada Goose** *B. canadensis*, over 1,500 examples known since the 1970s, and **Egyptian Goose** *Alopochen aegyptiacus*, but hybrid fertility success mostly is unknown. A phenomenon increasingly observed but not yet quantified is the tendency of resident **Greylag** or **Feral/hybrid Greylag Geese** to depart on migration with departing wintering flocks. It is strongly suspected that some return with the winter flocks, but without ringing or tagging, proof is lacking.

Great Britain (excludes Northern Ireland)

It has been introduced or re-established frequently from the Middle Ages into many parts of Britain, the present population standing at around 17,000 birds breeding in over 450 locations, but the wintering numbers exceed 100,000, including many *rubirostris*, which strangely has also featured in introductions. Introductions, presumably through hunting interests, continue.

Ireland (including Northern Ireland)

The first introductions, in the north, date from the 1730s and have proceeded generally on a small scale and irregularly ever since. Some 975 (Browne & O'Halloran 1997) birds are associated with 12 main breeding sites, the wintering numbers reaching 4,000.

Switzerland

Several small populations of feral-living or commensal **Greylag** exist on some Swiss lakes, the numbers and range increasing slowly.

Lithuania

In the 1970s, a small-scale introduction, initially captive failed after a few years, just as natural expansion into Lithuania occurred from natural and introduced populations elsewhere. The Lithuanian population, over 1,000 bp, is now well-established.

The Netherlands

The Dutch natural **Greylag** population is not regarded as problematical, and introductions, if they have occurred, have been on a small scale. However, it is clear that considerable hybridization has occurred to produce between 4,000 and 10,000 feral domestic or **Feral/hybrid Greylag Geese** whose numbers seemingly are increasing.

Ukraine

For decades, introductions have been carried out at the Ascania-Nova hybridization research facility (now classed as a reserve). It is believed that significant numbers still breed in the area, but the fate of any hybrids is unknown.

Elsewhere

Many countries have large stocks of domestic geese as goose-farming has become commercialized, but most are unaware of the potential problem as now found in The Netherlands and Germany of escapes breeding ferally with great success.

Potential future trends

Greylag Goose and **Feral/hybrid Greylag Goose** will continue to thrive, especially in view of the way that sedentary stock is adapting to near commensal life in urban wetlands and gravel pits much like **Canada Goose** has done. Although these birds have largely lived in harmony and in reasonably close association, hybridizing at times, conflict between **Greylag** and **Canada Geese** is likely to increase as competition for breeding habitat becomes keener, even though their relative breeding cycles are normally only partly coincident. Furthermore, the increasing hybrid flocks in The Netherlands, Germany and elsewhere will become a serious issue. A side-effect may be the reduced tolerance by both species of smaller waterbirds, which may be a local effect, but experienced in many areas. Eutrophication of ponds may become an issue. If the rate of hybrids joining migrating *rubirostris* flocks increases, the wild birds face some genetic risk.

6.1.7 Bar-headed Goose *Anser indicus*

Status in its natural range

This extraordinarily hardy species breeds on the highland plateau wetlands of Central Asia, Mongolia and China at 4,000 to 5,000 m asl, migrates south over the Himalayas to winter in lowland swamps, lakes and rivers of India and South-east Asia.

Hybridization

It has hybridized in captivity with eight *Anatidae* species, and as an escape with feral geese, resident **Greylag Goose** *A. anser* (to the second hybrid generation in Germany) and with other wild-living introductions, particularly **Canada Goose** *Branta canadensis*, not uncommon events in Germany, and possibly UK. In South Africa, it is designated a REGULATED species. It is **Not Globally Threatened**.

Introductions outside the AEWA area

It is a popular collection species, breeding readily in captivity, and so escapes are much more widespread and frequent worldwide than recorded. The winter movements of introduced birds are not known. A sizeable proportion probably is sedentary if unfrozen water persists winter through.

Occurrence in the AEWa area

EUROPE

Austria

Occasional wanderers have been recorded, their origin claimed as non-Austrian.

Belgium

Around five individuals have been recorded, but its breeding status is unknown.

Iceland

There have been four records up to 1997. Lake Myvatn resembles its native habitat (apart from altitude) closely enough for a close watch to be kept.

Czech Republic

Up to five individuals have been recorded in the 1990s, and breeding has been suspected.

Finland

It has been recorded since 1982, with occasional breeding. At present up to 2 bp succeed in good years from a population of *c.* 25 birds.

Germany

An under-recorded species, it has been known as an escape since 1968 in Schleswig-Holstein. An irregular breeder, there nevertheless may be five to 10 bp most years, in a total population thought to number 100-200 birds, of which 50-80 are in Schleswig-Holstein. Numbers and range are probably increasing slowly. Hybridization attempts in the wild are not uncommon.

Italy

First recorded in 1969, 10 groups have existed in 10 provinces. Breeding has occurred in three provinces. One winter record was of a bird from Germany where it may have attempted to breed.

The Netherlands

Since the first record in 1973, *c.* 11 bp from an unknown total are likely in a good year. It continues to increase slowly on the floodplains and marshes.

Romania

Its status is uncertain, vagrancy from other countries being suspected, but some may now be resident, at least for part of the year.

Sweden

Up to 16 scattered individuals have been recorded in any one year, but breeding status is uncertain.

Switzerland

There are several scattered records (mostly in the 1990s), but none of breeding.

Ukraine

For several decades, it has existed, breeding occasionally on the Ascania-Nova reserve, once the location of extensive hybridization experiments with plants, birds and animals..

United Kingdom

Recent estimates suggest that at least 5 bp succeed most years from over 100 birds in c. 30 locations, numbers and range having increased slowly since the 1960s.

Elsewhere

This highly-popular collection species is under-recorded as an escape in many parts of the world.

Other aspects

Some collections now no longer stock **Bar-headed Goose** because it forms aggressive flocks which interfere with other species' breeding, probably mainly because overall bird density is so artificially high. It also tends to attempt to mate with many other species. It breeds readily in captivity, which may be another disincentive to keep it. Broods do not sell well because demand for new stock is low.

Potential future trends

Its lack of success as an escape in the wild so far is puzzling. It is very adaptable and hardy and there is a huge captive population which suffers a high escape rate. Furthermore, it breeds readily in captivity. It could be that generations of captive breeding have made it less fit for survival in the wild. However, it may be that circumstances for escapes have never been quite suited to their needs. The reports of hybridization in the wild may reflect a lack of opportunity with its own species, but possibly more that such hybridization seems to be associated with the existence of a goose flock or the semi-colonial status of breeders. It is predicted that this species, if it can assemble several flocks or semi-colonies large enough to stimulate breeding behaviour, then **Bar-headed Goose** will begin to emulate **Canada Goose** in Europe. As an aggressive, semi-colonial and fiercely-territorial species, it will likely present a threat to other, mostly smaller waterbirds which breed in marshy habitat.

6.1.8 Canada Goose *Branta canadensis*

Status in its natural range

The natural range of the Canada Goose is confined to the Nearctic, comprising the Aleutians, Alaska, the whole of Canada and much of northernmost USA. Up to 11 subspecies are recognized, but extensive intergrading zones exist. All North American populations are migratory, the wintering grounds comprising southern USA. The species is widely hunted (an annual permitted bag of 500,000), although some restrictions are applied to threatened subspecies. Subspecies identity, already difficult and contentious in some cases, is further confused by the existence of a growing sedentary introduced population in parts of the USA. There is evidence of wild individuals joining such sedentary populations. The **Canada Goose** can breed anywhere in the temperate zone that has suitable feeding within a reasonable distance of open water. It is remarkably adaptable to human settlement and quickly learns the safe limits of any locations. It establishes a strong pair-bond and defends its breeding territory vigorously. It is semi-colonial and gregarious, the social structure being dominated by the larger families. In South Africa, it is designated as a PROHIBITED species. It is **Not Globally Threatened**.

Hybridization

In captivity, the **Canada Goose** has hybridized with 16 *Anatidae* species. Its semi-colonial nature in free-flying wild-living populations does not prevent fairly frequent hybridization, often with other feral goose species. Also of concern, is the extent of hybridization between subspecies within introduced populations.

Introductions outside the AEWA area

The large (40,000+?) New Zealand **Canada Goose** population is seen by farmers as being destructive of crops to an extent which does not occur in Europe, possibly because the species in New Zealand does not display such strongly commensal behaviour. The extent of crop damage may be higher than in Europe because the quantity of suitable plant growth near New Zealand rivers is insufficient to maintain these numbers.

Uncontrolled introductions by hunters continue in Finland, Norway, Germany, Poland, and more sporadically in the Baltic States and western Russia.

Occurrence in the AEWA area

The **Canada Goose** was introduced to England in the 17th century and to Sweden in the 1930s. The populations in continental Europe are thought to have arisen as a result of introductions, releases from overstocked collections, escapes and individuals which have not returned to their Swedish, and possibly British breeding grounds. These introduced birds are thought to belong mostly to the subspecies *canadensis*, but it is likely that significant numbers of other subspecies were introduced.

Austria

Reported since 1979, it now has an increasing population, mostly at reservoirs, of c. 50 individuals from which 2 to 5 bp succeed annually.

Belgium

Since the 1970s, the population has increased to over 300 bp, nesting in a range of habitat types generally in wetlands. Nearly 2,000 birds appear in winter counts. Introductions, mostly for hunting, continue. There are several records of hybridization with resident feral **Barnacle Goose** *B. leucopsis*, **White-fronted Goose** *Anser albifrons*, and **Mallard** *Anas platyrhynchos*.

Czech Republic

Only five individuals have yet been recorded, without any evidence of breeding.

Finland

Since 1967 when it was introduced at Porvoo, then at 30 other locations, the population has grown to around 3,500 bp, and continues to increase, which has persuaded the Finnish authorities to set a game bag total each year (over 1,000 are shot, but reporting is poorly enforced) in an attempt to stop that trend. Finnish birds winter mostly in western Europe. Scaring by gunshot is also allowed year-round.

France

Its core populations in France, in areas of northern France where hunting is infrequent or controlled, comprise 200 bp and over 350 other individuals. The increasing numbers are founding new colonies. There is also a constant, but ill-coordinated series of introductions as a quarry species in areas of high-intensity hunting where control is sufficiently lacking effectively to wipe out the released stock. Both activities date

from the 1970s. Several hundred birds arrive to overwinter amongst the resident stock, mostly from Fennoscandia, but some claimed to be from Britain, although no British ring numbers have been quoted since 1992. Apart from hunting, the species is fully protected.

Germany

Recorded since the early 1900s and breeding since the 1950s, **Canada Goose** is not yet regularly monitored in Germany, although the University of Rostock has instituted a discipline of studying and monitoring introduced organisms, including birds. An upper estimate of the population is 1,000 bp, widely scattered, amongst perhaps 3,000 other individuals. The Schleswig-Holstein population alone is 100 bp plus 400 individuals and, post-breeding, 300 juveniles. The trends are that numbers and range are increasing. Much hybridization with other introduced or restocked geese has been observed, some 500 instances with **Greylag Goose** *Anser anser* alone. Ill-coordinated introductions as a quarry species continue irregularly. Up to 30,000 birds winter in Germany, comprised mostly of Fennoscandian migrants.

Great Britain (excluding Northern Ireland)

The present British population (of 20,000 bp, c. 80,000 birds, post-breeding) is largely sedentary and associated with parks and other areas of water-based human activities. Near colonies or winter assemblies, ground erosion and compaction occur, and excess droppings lead to soil and water contamination, probably creating an increased human health hazard. Certainly the droppings affect soil composition locally. There is concern that the sheer size of the population will have adverse effects on indigenous waterbirds, but studies so far have been limited in scope, and equivocal in result; there are some adverse effects such as killing or driving off smaller waterbirds, and some benefits, such as providing early warning to smaller nesting waterbirds of intruders, and uprooting deep submergent vegetation on which attendant smaller dabbling ducks can feed. A proportion of the British population has established a moult migration to the Beaulieu Firth in northern Scotland. Releases occurred in the 1980s of some of the small subspecies, but officially only of 40 birds. At almost all collections, the birds on view are wild-living, and have settled freely. In Britain, **Canada Goose** nesting behaviour is usually semi-colonial in nature, but isolated pairs or groups of two or three pairs are common.

Ireland (including Northern Ireland)

Introduced first in the early 1800s, it has now spread south into Eire. Most of the breeding sites (from a total of 23) are in Northern Ireland. The increases in range and numbers are slower than for Great Britain, perhaps because the species is hunted more often and is less associated with urban wetlands and parkland. Introductions seemingly continue for hunting purposes. Over 530 of the 970 birds counted (Browne & O'Halloran 1997) occur on only eight sites. Over 25 hybrids with **Greylag Goose** *Anser anser* have been counted.

Italy

It has been recorded almost annually since 1969, mostly as a vagrant from other countries, but there is now a small stable group of c. 10 birds from which 1 bp regularly succeeds. There has been a ringing recovery from Sweden, where the bird may have attempted to breed.

Latvia

Not infrequently wanderers from other countries visit Latvia, but only one failed breeding attempt is known. The Latvian hunting association hopes that the species will become a breeder, but they have no current plans to introduce it.

The Netherlands

Since the first record in 1951, the species has bred more or less continuously to reach what is almost certainly an underestimated 140 bp in 1999; in winter at least 1,800 birds appear, mostly from Fennoscandian populations. It breeds on grassland, amongst bankside vegetation and in marshes.

Norway

112 birds were released in 1936, but the population failed to become self-sustaining until later releases were made, the birds breeding beside lakes, in bogs and on grassy plains. Now c. 2,000 bp in a population which exceeds 10,000 birds have persuaded the Norwegian authorities to allow a declared hunting season to help prevent further increase. The species winters on unfrozen coastal waters or on the north European plain from France to Germany. Introductions are forbidden.

Russia (European)

Officially, there is only one record of a natural vagrant and one breeding record at Lake Ladoga, but visiting birders have noted sightings between Estonia and St Petersburg and others at Lake Ladoga. There have been several attempts to introduce it as a quarry species in locations believed to be north and south of Belarus, but all such introductions are believed to have become extinct through unregulated overhunting. In the early 1990s, some Russian biologists had heard of persistent attempts by hunters to introduce the species east of Lake Ladoga, but no other information is forthcoming. The areas concerned are so vast and so thinly-populated that **Canada Goose** populations could still exist. Almost certainly, introduction attempts will continue. The species is easy and cheap to obtain.

Sweden

A failed introduction scheme in 1930 was followed by successes up until 1987. Numbers and distribution are not well known, but the population is estimated at c. 5,000 bp from a 50,000 total population (at lakes, marshes bays and plains), which is increasing. Some conflict with **Mute Swan** has been recorded, the latter being intimidated by the presence of large numbers of **Canada Goose** into leaving the area of a nest site as soon as the fledglings have hatched. Some hybridization with **Greylag Goose** has occurred. The extent of ice-cover determines whether the wintering sites are mostly on the Swedish coast or on the north European plain,

Switzerland

Up to five individuals have been reported most years since 1989, usually in association with man, but apparently not breeding.

Ukraine

For several decades, it has been free-flying and reportedly breeding on the Ascania-Nova reserve, a former hybridization research station. How many birds there were is not known. It is believed that some still remain, but whether they are migratory or sedentary and artificially sustained during winter is not known.

Other aspects

Studies in several countries confirm that the effects on other waterbirds are mixed. Undoubtedly the species is very aggressive to other waterbirds of its own size or smaller during incubation and when the goslings are small. It has been known to kill adult and young ducks, **Moorhen** *Gallinula chloropus* and **Coot**, *Fulica atra* and it is likely that its aggressive behaviour denies territory to smaller waterfowl seeking it. Furthermore, sizeable aggregations of breeding **Canada Goose** virtually prevent other waterbirds utilizing a large potential breeding area. Conversely, where it feeds on submergent vegetation beyond the

reach of dabbling ducks, it is often followed by smaller waterbirds which steal some of the floating uprooted plants. The **Canada Goose** itself, when nesting in isolated pairs, is liable to have its young killed by **Mute Swan** *Cygnus olor*, which is more hostile to goose neighbours than to ducks.

However, the concern in Europe is that the sheer size of the expanding **Canada Goose** populations is not only affecting indigenous waterbirds, it is also liable to have deleterious effect on wintering areas used by migrant waterbirds, through water enrichment (eutrophication) changing the balance of plant and invertebrate communities.

Potential future trends

The numbers of **Canada Goose** are already very large in Europe, and soon open hunting seasons will probably be introduced in many countries. Research will probably show significant economic and amenity damage being caused locally, and some degree of health risk may will be quantified. However, governments may lack the political will to take any concerted action against a bird seen by the general public as "handsome" and thus qualifying for protection. Consequently, public approval of action against other species subsequently identified as threats of one kind or another could become very more difficult to obtain. The **Canada Goose** may become a breeding bird across lower central Europe. The Russians and perhaps the Belarussians and Ukrainians may by 2010 establish successful introduced populations which could spread east over the following 20 years to occupy habitat near-identical to that found in its normal range. Migrant populations may then winter on the Caspian and Black Seas, perhaps putting pressure on the **Red-breasted Goose** on its wintering grounds. The eutrophication of shallow waterbodies by large numbers of **Canada Geese** could become an issue.

6.1.9 Barnacle Goose *Branta leucopsis*

Status in its natural range

Its natural range is disjunct, comprising Greenland, Svalbard and Novaya Zemlya, and it nests only on crags and rocky outcrops in arctic tundra near waterbodies. The species winters on coastal lowland meadows and grassland in northern Europe. Hardy it certainly is, but in light of its very narrow breeding habitat requirements, it has proved surprisingly adaptable. In South Africa it is designated a REGULATED species. It is **Not Globally Threatened**.

Hybridization

It has hybridized in captivity with 10 species of *Anatidae* and wild-living feral birds have hybridized with several (mostly introduced) goose species.

Introductions outside the AEWA area

It has always been a popular collection species and is kept in captivity all of the northern hemisphere. Deliberate introductions have been comparatively few. However, escapes and releases have proved surprisingly adaptable, breeding occurring reasonably freely in habitats totally unlike that used in the natural breeding range.

Occurrence in the AEWA area

Austria

The first record was in 1981, but a small breeding population (1 to 3 bp) seems to have become established since 1997, there being *c.* 15 birds recorded altogether. The use of gravel pits or bankside river vegetation is more typical of lowland geese.

Belgium

The first records of escapes were noted from 1983 onwards, but now there are at least 50 bp and 200 other birds, probably many more, occupying grassland, waterbody shores, parkland and coastal wetlands. These numbers have caused problems with analyses of winter counts of numerous migrant **Barnacle Goose**. Resident birds are more regularly productive, unlike the wild Arctic breeders which succeed once every four years or so in successfully fledging a brood. The Belgians and others involved in studies of this species are concerned that winter counts are no longer reliable indicators in poor breeding years of the productivity of arctic breeding birds. The option of yearly (successful breeding years cannot be predicted) arctic expeditions to obtain these data is impractical from the cost aspect. Successful hybridization has been recorded with **Canada Goose** *B. canadensis*, **White-fronted Goose** *Anser albifrons* (naturalized birds) and **Mallard** *Anas platyrhynchos*.

Finland

The very slow increase from 1980 to some 32 bp in 1998, which shows clear signs of increasing, follows a pattern seen elsewhere in Europe.

Germany

Despite conflicting opinions about this poorly-surveyed introduced species, the best current assessment (from the University of Rostock) is of 20 to 50 bp from c. 500 individuals, a number supported from the totals for Schleswig-Holstein of 25 bp and a minimum of 50 other birds. Some of these birds may have come from a small established group on Gotland. There is some evidence of releases, probably disposing of collection overstocks. The trends indicate a general increase. Several (most?) records are for birds in urban wetlands or on lakes. Some hybridization with **Greylag Goose** has been recorded.

The Netherlands

From a late first escape record of 1987, over 80 bp plus 300 individuals are resident. The Dutch experience the same problem as the Belgians with their winter counts aimed at calculating breeding productivity. They are also unsure of the extent of any transfer of individuals between migrant and resident populations.

Norway

Strangely, despite ample, seemingly ideal breeding habitat, and despite near-continuous records of escapes from the 1940s, there were only 35 bp recorded in 1998.

Switzerland

There are scattered records of individuals, but no hint of a breeding record in a country which possesses ample typical breeding habitat amid alpine tundra, albeit at high altitude. All so far have been found in slow still waters.

United Kingdom

The recorded number of only 30 bp at 17 locations (ponds, pools, gravel pits, invasively at waterbird collections) from over 900 resident birds at over 90 locations is certainly an underestimate, the first records referring to the 1980s when numbers probably were already in high double figures. Some 39,000 birds wild arrive to winter in UK. There have been no detailed counts of wild or feral birds since 1991 (Stone *et al.* 1997).

Potential future trends

The slow increases seen of naturalized **Barnacle Goose** populations will probably continue until a critical population size and density are reached (Green 1997), perhaps by 2015, allowing numbers to increase at a faster rate. Such an increase occurred with **Canada Goose** *B. canadensis*. The species may spread to other countries. It is unlikely to present a direct threat to other waterbirds, except locally close to a colony. It may develop into a pest species and will probably also be identified as contributing to the eutrophication of small waterbodies, thus indirectly affecting other waterbirds..

6.1.10 Egyptian Goose *Alopochen aegyptiacus*

Status in its natural range

The Egyptian Goose occurs in Africa generally south of the Tropic of Cancer in or near open country wetlands, meadows and grasslands and also in the Ethiopian highlands, avoiding only densely-wooded country. It has become scarce in the northern Nile valley, but has enormously increased in southern Africa where extensive irrigation schemes have provided ideal habitat close to arable crops which it grazes, becoming a pest. Until the early 18th century it was an established European breeding bird in the Danube valley from southern Hungary downstream through Vojvodina to Romania. It is gregarious except when nesting, which occurs in trees, on the ground in concealment, and in cavities. In South Africa it is designated as a REGULATED species where its origin is legitimate (from South African populations), but as a PROHIBITED species where its origin lies outside the country. It is **Not Globally Threatened**.

Hybridization

The Egyptian Goose has hybridized in captivity with four species of *Anser*, three species of *Branta*, two species of *Chloephaga*, **Muscovy Duck** *Cairina moschata*, **Maned Goose** *Chenonetta jubata*, **Abyssinian Blue-winged Goose** *Cyanochen cyanopterus*, **Orinoco Goose** *Neochen jubata*, **Spur-winged Goose** *Plectropus gambensis*, three species of *Tadorna*, **Mallard** *Anas platyrhynchos*, and has hybridized in the wild with **African Shelduck** *Tadorna cana*, the fertility of the offspring being unknown.

Introductions outside the AEWA area

The **Egyptian Goose** was introduced, probably in the late 18th century, to eastern England as a parkland ornament and has slowly spread within East Anglia, and slightly beyond. The Netherlands population is probably a mixture of deliberate introductions and escapes and deliberate disposal of excess stock from collections, where it breeds readily. The populations in Belgium, north-east France and now north-west Germany probably arise from the spread of the rapidly-increasing Dutch feral stock. In Europe, the species has shown a preference for managed aquatic and riparian habitats. Where there is no naturalized population, it is a popular wildfowl species in collections.

Occurrence in the AEWA area

The natural-range population in Africa is overall not under threat except in the Nile Valley. In places in southern Africa, the species has become a pest of arable crops. Elsewhere, it is an introduced species.

ASIA MINOR & THE MIDDLE EAST

Israel

Wild-living birds have been seen near zoological centres and at fishponds from 1994 onwards. Breeding is suspected.

United Arab Emirates

A slowly increasing population (maximum count 50 bp from 300 individuals) existed from 1976-1991 in at least three locations, Al Ain, Abu Al Abyad Island and Sir Bani Yas Island wetlands (Ain Al Fayda and islands) and may still be present in good numbers. It occupies fish ponds, drainage pits and tidal mudflats.

EUROPE

Austria

The few records have been assigned to wanderers from elsewhere.

Belgium

There are at least 150 bp now in Belgium (only 10 bp of which are in Wallonia), where the extent of drainage channel habitat is much less than in The Netherlands. Some 630 individuals (excluding Wallonia) have been counted. Although riverine valley habitat is reasonably common, flooded gravel pits probably comprise the potential breeding areas. It was first recorded in the 1980s.

France

It is classed as a rare breeder.

Germany

From 200 to 400 bp now exist in Germany, from a total of 1,000 to 3,000 individuals, but thinly spread over six Länder, which suggests that releases or escapes have occurred since the first birds crossed the Dutch border in the 1950s into Nordrhein-Westfalen, where the core population comprises perhaps 150 bp. It seems only a matter of time before pairs reach southern Germany and the upper Danube, which from Ulm eastwards has extensive patches of suitable habitat all the way to the original European range of the species.

Great Britain

The latest estimate is that there are about 300 bp from a total of 950 adults in southern England, mainly in East Anglia. Spread has been slow, and to the south and south-west. It is curious that there has been little spread to the fens which superficially resemble The Netherlands, where the population has expanded much more rapidly. The reason may lie in the overall climatic limits, especially in spring and summer, where The Netherlands is on average 2°C warmer. Another reason given for the slow spread is the extent of nest-site competition provided by other introduced geese, such as Greylag *Anser anser* and Canada Goose *Branta canadensis*.

Italy

Wintering birds are known from five provinces, the first record being in 1989. These birds are believed to originate from populations in countries to the north. If the species has developed migration as a survival strategy in Europe, then the potential for further expansion is increased.

The Netherlands

Perhaps 1,400 bp form the basis of the rapidly-expanding Dutch population, which has found the vast network of drainage channels (used to enclose livestock instead of fences and walls) much to its liking. Many of these channels have become bordered with tree and bush stands. The total number is thought to exceed 6,000 individuals, the maximum count in winter. The Dutch are debating control measures because

of the species rapid spread which has already produced populations in neighbouring countries.

Romania

There are a few records, possibly only of singletons, but with low coverage and ample ideal habitat, it would scarcely be surprising if it has not already recolonized part of its original European range.

Sweden

The two records are believed to be a considerable underestimate, although breeding as yet probably has not occurred.

Switzerland

In the 1990s, two to seven birds have been recorded yearly. Breeding attempts are suspected.

Other aspects

Where the **Egyptian Goose** is breeding free of competition from other introduced geese, it shares the habitat preferences of **Mallard** and **Coot** *Fulica atra*. The extent to which these species are tolerated is not well known.

The **Egyptian Goose** is an attractive bird to the general public and so control measures may face adverse public opinion. Consequently, if any control programme were to include attempts to reintroduce the species to its former European range, then public opinion might be easier to sway. After all, the species is largely sedentary and may well not seek to return to locations from which it had been removed.

Potential future trends

The **Egyptian Goose** will probably to spread, particularly in Germany and France by 2015 and numbers will probably exceed 20,000. If populations become established in Switzerland, Austria and Hungary, say by 2010, the apparently migrant wintering Italian population could increase quickly, improving the survival rate. The chances of a spread to its former natural range along the Danube and into the side-valleys south of Hungary is therefore likely. It will probably present no discernible risk to other waterbirds except perhaps where it and other waterfowl have lost their fear of man, when it would dominate all smaller species..

6.1.11 Ruddy Shelduck *Tadorna ferruginea*

Status in its natural range

Its natural range stretches from south-east Europe eastward beyond Lake Baikal to Mongolia, and south and east from Turkey to Iran, north-west Africa and the Ethiopian Highlands, occupying largely brackish waters in open country or in open forest at altitude. It is primarily a hole-nester. The impermanent nature of much of its preferred waterbodies has made this species erratic in distribution, and low site-fidelity enables it to move rapidly when drought strikes. Like other shelducks, it sometimes nests remote from any standing water. In Europe and in Asia Minor, habitat loss through urbanization of coastal brackish waters and more intensive farming of marginal grassland has reduced population size and density. Across much of the Central Asian steppes reductions have occurred, probably on a lesser scale. In South Africa, it is designated as a PROHIBITED species. Despite its decline, the species remains **Not Globally Threatened**.

Hybridization

Both in captivity and as an escape in Switzerland it has hybridized successfully with **South African**

Shelduck *T. cana*. It has also hybridized as an escape with (introduced?) **Shelduck** *T. tadorna* in Austria. It has hybridized in captivity with only one other duck species. **Mallard** *Anas platyrhynchos*, producing fertile offspring.

Introductions outside the AEWA area

It is a large and striking bird, its orange-hued plumage making it a very attractive species in collections. It has proved adaptable and hardy as an inveterate escaper, surviving to breed in conditions not encountered in its natural range.

Occurrence in the AEWA area

ASIA MINOR & THE MIDDLE EAST

Israel

Since 1994 a number of birds likely of captive origin, have frequented artificial waters near Tel-Aviv Zoological gardens, breeding having occurred probably on at least one occasion.

United Arab Emirates

The recorded presence of only one bird in the 1990s is very probably indicative of other unrecorded individuals, given the popularity of species of striking appearance to collectors in this part of the world.

EUROPE

Austria

Those recorded (on the River Inn) are thought mostly to have wandered from other countries, but at least one hybrid brood (with **Shelduck** *T. tadorna*, itself possibly an introduction) has been noted.

Belarus

The first breeding record in 1997, thought to involve escapes, may be an underestimate, given the lack of coverage of the country. Exotic waterbirds are known at Grodno and Minsk zoos.

Belgium

Present since the 1980s, the species has reached a maximum of *c.* 20 individuals but has declined to perhaps eight at present. Occasional breeding may have occurred.

Czech Republic

There have been intermittent records since the 1950s, but there seems now to be a small stable number, possibly sustained by intermittent escapes, in the vicinity of Prague Zoo, although there is no evidence that breeding has occurred.

France

Some 20 to 30 individuals are known, the first record coming from the 1980s, and breeding has occurred. Escape recruitment probably remains essential to maintain numbers.

Germany

Records of escapes date from the 1950s, with nowadays 8-10 bp most years, a slight increase in numbers and range being likely. Schleswig-Holstein has 1-3 bp from a population some 15 strong.

The Netherlands

Seven to 10 bp (most years) occupy marshes and small waterbodies, but the breeding population may well be higher, given that winter counts have noted up to 150 birds in the Dutch Delta, which flock is possibly the origin of some UK sightings.

Poland

From 1981 to 1990, Wroclaw Zoo released captive-bred broods, which formed a small population from which at least 1 bp was successful from 1988-1990. The species probably no longer exists in that area, although some may have migrated successfully to settle elsewhere.

Switzerland

The presence of fragmented areas of montane open forest, small in area in comparison with the dense forestry plantations, may just explain why Switzerland, where the species first was recorded as breeding in 1989, holds 50 to 80 birds in total, and produces 2-6 bp annually. On at least one occasion, hybridization has occurred with **South African Shelduck** *T. cana*. Some aggressive behaviour has been noted.

Ukraine

It is known from the area of the Ascania-Nova Reserve (formerly a hybridization research facility) over several decades. These are thought to have been of captive origin and have probably bred on several occasions.

United Kingdom

There have been over 100 records since the 1950s and occasional breeding involving 1-2 bp.

Elsewhere

The species certainly occurs in collections in the USA, but its status as an escape there is unknown. The provenance of any bird in the wild in Europe, especially to the east, cannot be known absolutely, but the European total number of bp among escapes is significant in conservation terms, especially where the wild population has dwindled in Greece and on the Black Sea. Across Europe, the species can sometimes be found in waterways and parks in urban centres amongst the town ducks of unknown descent and origin.

Potential future trends

Given its popularity as a collection species, even among "garden-pond" collectors, there seems no reason why the **Ruddy Shelduck** escape rate should not continue to increase, Provided captive rearing has not robbed it of its migratory instinct, it should be able to employ a strategy of selective migration to avoid persistent harsh weather in winter. Captive breeding may also have produced the increasing tolerance of man observed among escapes. Given these factors, there is a reasonable chance that the species will establish itself in the wild in Europe by 2015. Except locally, it does not present a threat to indigenous waterbirds, but this may not be the case if there is a population explosion. Competition for nest-holes could then affect other species.

6.1.12 Muscovy Duck *Cairina moschata forma domestica*

Status in its natural range

Its natural range extends from southernmost Mexico south to eastern Peru and northern Uruguay where it inhabits mostly well-wooded tropical lowlands usually where there is standing water with ample shoreline and overhanging cover. In some places it prefers coastal lagoons and marshes. The species was

domesticated long before the Americas were known to Europeans, and as is common amongst many birds reared through captive generations, the semi-domestic variety (*forma domestica*) is predominantly white. The rate at which this occurred was probably hastened by the predisposition of the wild birds, usually mainly dark blackish-brown, to develop an increasing amount of white in the wings with age.

It is entirely possible that domesticated Muscovy Ducks were the first New World birds to be introduced to Europe, possibly by the early 16th century. Since that time, they have been introduced and raised as poultry in the majority of countries. Feral individuals, groups, and colonies have appeared in many places, but are usually ignored by biologists and birdwatchers, perhaps in part because they are often to be found in urban surroundings, or at least are close to habitation. This behaviour also renders them vulnerable to those who wish to add birds to their stock, to poachers, or at least to the hungry poor. Nevertheless, there is reason to believe that some feral groups are longstanding, for the species is adaptable and hardy, despite its tropical origin. The range and population size of the wild stock is declining, partly due to overhunting, improved access to remote areas, and capture for sale to farms as breeding stock. In South Africa it is designated as a REGULATED species. It is **Not Globally Endangered**.

Hybridization

In captivity it has hybridized with 14 *Anatidae* species. Farmyard and escaped birds have certainly hybridized with a number of goose and duck species.

Introductions outside the AEWA area

There seems to have been little or no work done anywhere to research the numbers, biology and breeding success of feral **Muscovy Duck**. It is possible that the semi-domesticated variety is the most widespread introduced waterbird species in the world. The relative paucity of records below simply reflects the lack of information or its assessment by many respondents as "only" a farmyard duck not qualifying as an introduced species.

Occurrence in the AEWA area

AFRICA

Madagascar

The species was known in the 1890s, and has become widespread, partly as a food species even the poorest farmers could afford. Many live feral, or at least in only loose association with man. Hybridization with white domestic ducks or **Feral/hybrid Mallard types** *Anas platyrhynchos forma domestica* is not uncommon. The fear is that **Muscovy Duck** and **Mallard** have hybridized or shortly will hybridize with the rare endemic **Meller's Duck** *A. melleri*.

Mauritania

Feral birds have been present for several decades, but whether this represents a high escape rate or successful feral breeding is not known.

Senegal

A small number are thought to exist in a feral state, at least for short periods, but whether the species hybridizes feral with domestic ducks is not known.

South Africa

Small numbers are thought to live feral, but there are no data. The species' history in the country is uncertain. It is thought to be increasing slowly and to have hybridized in the wild with **Egyptian Goose**

Alopochen aegyptiacus, but with poor success.

EUROPE

Austria

It was first noticed around 1979. The present estimate is of 14-20 bp from >100 individuals.

Germany

From what records there are, and those largely from urban habitats, the population breeding in the wild varies from 1-10 bp out of 50-100 individuals. However, only in Schleswig-Holstein have regular records been kept, and even there patchily.

The Netherlands

The species was known to have lived in the wild before 1992. It is thought the present breeding population is probably in excess of the 10 bp recorded. Trends are not known.

Portugal (Azores)

Quite common as a farmyard duck, it is thought to live ferally on occasion.

Switzerland

Scattered individuals are known, but any breeding has been assumed to be amongst farmyard birds.

United Kingdom

Known since the early 1980s at least, a colony existed for some 15 years near Ely, about 50 strong at its maximum. This population was studied in some detail by ornithologists. In 1999, the species' distribution was widespread, but most birds could be found in north-east, east-central and south-east England, on shallow lakes, drainage channels and reservoirs. The breeding population comprised 15 bp from c. 130 (summer locations) and >100 (winter locations) birds. It is probably greatly under-recorded.

Elsewhere

The **Muscovy Duck** occurs almost everywhere, but is seemingly invisible during wildfowl counts!

Potential future trends

The widespread attitude entrenched amongst biologists, ornithologists, birdwatchers and officials seems to be that the **Muscovy Duck** will never be a problem because escapes of *forma domestica* cannot survive long in the wild. This may very well be correct in most cases, but evidence is lacking. This species' existence in the wild should be subject to counts and records. It is possible that in the AEWA area, the numbers living ferally is in five figures, but unless its biology and behaviour become better known, then it may emerge unexpectedly as a pest species in places by 2015. It can be very aggressive, its large size enabling it to dominate other ducks. Its compact bulk makes it appear formidable even to geese. In places it could be a threat to some duck species through its dominance and even through hybridization, although isolated individuals are probably harmless.

6.1.13 Mandarin *Aix galericulata*

Status in its natural range

Its natural range lies mainly in north-east China, a very much smaller breeding population being found in Japan, where large wintering populations gather. There are no subspecies. It is secretive when breeding, preferring pools, lakes, rivers, marshes and swamps where there is extensive fringing and overhanging vegetation and forest. Its status is given as **Insufficiently Known** for a population which was thought to have declined to around the numbers of introduced and captive populations in Europe, between 12,000 and 20,000 birds. The 1996 discovery of over 60,000 birds in remote parts of China has not changed this categorization, because nearly all the newly-discovered populations lie in areas where there is rapid forest-clearance or which will be flooded by vast dam projects.

Hybridization

In captivity, it has hybridized with four duck species. In the United Kingdom it is thought to be dominant over the introduced closely-related **Wood Duck** *A. sponsa*, but hybridization attempts have seldom been recorded.

Introductions outside the AEWA area

This extremely attractive species is probably the most popular single exotic species purchased by "garden pond" collectors all over the world. Consequently, juveniles are frequently "set free" because there is no room for them. Furthermore, it is quite difficult to sell excess stock privately because the market is geared to first-time buyers who have no means of knowing any other sources than those advertised. Many of the larger collections not only no longer purchase **Mandarin**, they no longer stock them, because they invade the occupied artificial nest-boxes to destroy and sometimes eat the eggs of species much more valuable to breeders. It is likely that most large collections in the UK, The Netherlands and Germany, if they possess **Mandarin**, have obtained them by natural invasion from feral sources. In South Africa it is designated as a REGULATED species.

Occurrence in the AEWA area

AFRICA

South Africa

There are records of occasional escapes, the first being from 1983.

EUROPE

Austria

Present since 1981 at least, by 1999 it had increased in numbers to reach 10-20 bp and 50 other individuals.

Belgium

Estimates are contradictory. The first record probably predates 1987. However, a national estimate provided of perhaps 10 scattered birds whose breeding status is uncertain does not match a second estimate of a stable 15 bp from the Brussels area alone.

Czech Republic

It has been reported irregularly since the early 1990s, but breeding remains unproven.

France

The earliest confirmed record of an escape is 1977, but the present population is poorly known. One public garden alone has *c.* 30 free-flying birds, which does not align with the national estimate of 40-45 birds from which *c.* 10 bp succeed.

Germany

The first records date from 1968. Most subsequent records refer to the Berlin population of over 100 birds in a probably self-sustaining association based mainly in parkland. New estimates from the University of Rostock suggest that not only are numbers increasing in Berlin, but that between 100 and 200 bp breed most years from a total of 500-1,500 birds. The declining Schleswig-Holstein population comprises 20-40 birds, but it is conceivable that wild-bred generations are finding the huge areas of potentially suitable habitat between Berlin and the Polish border much more to their liking (Klaus Witt *pers. comm.*). Here, as in the United Kingdom, in spring and summer aquatic vertebrates are available and in autumn and winter, acorns, chestnuts and beechmast. Many waterbodies have thickly-wooded islands or dense plantation or forest overhanging the water. Severe winters would demand that a migration strategy be re-established, something largely lost amongst populations of urban lakes and streams.

Iceland

Up to 1997 there had been six records of unknown origin.

Italy

First recorded in the 1940s, it has been noted since then in 12 provinces, the present population being at least 10 birds. It shows preference for coastal lagoons and is thought to be mostly a winter visitor.

Luxembourg

Around 12 birds are known to be present in spring in good habitat. Breeding has probably occurred.

The Netherlands

Known from 1964, the species now has an increasing population of around 80 bp.

Portugal (Azores)

Free-flying birds probably exist, although survival in the wild is probably difficult because there are few suitable waterbodies. A commercial plant-seller is currently doing good business selling ornamental pairs.

Romania

There are a number of records, at present attributed to wanderers from Hungary, but the Hungarians believe that there have been no escapes. The Ukraine (see below) is another possible source. Breeding has not been recorded, but coverage is very low.

Russia

So far, the only records are of birds designated as vagrants.

Sweden

Since 1992 there have been 23 records, but no proof of breeding.

Switzerland

The first record dates from 1969. The population of 10-15 bp from c. 100 individuals is thought to be increasing.

Ukraine

Whether the small population, known to have been at the Ascania-Nova reserve for perhaps 20 years, bred successfully is not known. There are recent unofficial reports of sightings in the north of the country.

United Kingdom

The first introduced birds date from 1745, but regular breeding in the wild has probably occurred only from around 1866. Like in many parts of Europe, the species is associated with parkland, but much of this is private property. The latest (1987) estimate is of a population of up to 7,000 birds, but there have been no surveys since (Stone *et al.* 1997). It is possible that, given the species' secretive nature, such a figure may have increased. It is believed to be largely sedentary.

Elsewhere

There are simply no figures, but this extremely popular collection bird probably has small introduced populations almost everywhere its habitat requirements can be met. The present status of a feral population in northern California is not known.

Other aspects

The introduced population in the United Kingdom is more successful than that of the introduced **Wood Duck** for a number of reasons. In the wild, **Mandarin** in China breed in generally colder conditions (up to 60°N) than the **Wood Duck** from the south-eastern USA. The **Wood Duck** nests earlier, but the cold UK early spring weather has a much greater affect on hatching and fledging success both directly, and indirectly through reducing food availability. **Wood Duck** is also subordinate to **Mandarin** and so loses out in direct competition for nest-holes.

Potential future trends

Only through detailed surveys of the **Mandarin's** present European range would clear trends be forthcoming. One thing is certain; recent fragmentary information suggests that numbers living and breeding in the wild in Europe are much higher than thought. Ringing would prove if, as suspected, an element of this scattered population has redeveloped a migratory strategy. Winter counts in central-southern Europe which have noted this species' presence (most wildfowl winter counts refer to open waters or mudflats) where it has been absent in summer. By 2010 a truly vigorous and self-sustaining population may become evident in several new locations in Europe. A constraint will always be the availability of nest-holes. At present, the species is believed not to present any risk to indigenous waterbirds, but this is in the absence of detailed studies of this secretive bird during the breeding season. Certainly some of the anecdotal observations of behaviour in collections give rise to a sense of unease. (It commonly destroys eggs and nests of other species using nestboxes or holes).

6.1.14 Mallard *Anas platyrhynchos*
(**Feral/hybrid Mallard type** *Anas platyrhynchos forma domestica*)

Status in its natural range

There are from four to seven subspecies, for **Mallard** taxonomy is complex and debated, some forms being granted full species status by some authorities. Its natural range is vast, stretching south from the Holarctic taiga to the southern limit of the Mediterranean and continental climate zones, encompassing Europe and much of northern North America and Asia. The **Mallard** is a partial migrant in parts of its range, and is perhaps the best-known wild duck to the general public. Most of the domestic ducks encountered in the **Mallard's** range, and many beyond, share a common ancestry with it. The **Mallard** is exceptionally adaptable and vigorous, which partly explains the rapidity with which it became domesticated.

It can thrive in almost any kind of wetland with shallow water, whether fresh, brackish or saline, where there is sufficient cover to conceal the nest. It will use tiny ponds and ditches and even dense shrubbery in urban centres, but it also can be found in remote large riverine and wetland areas. The species is usually gregarious, and occasionally semi-colonial, but in most populations there is an excess of males. In South Africa it is designated as a PROHIBITED species. It is **Not Globally Threatened**, but some subspecies are in decline.

Hybridization

A consequence of excess males is that the incidence of pairings with other waterfowl species in the wild is quite high and, in captivity, common. Hybrid offspring are produced surprisingly often, but mostly are infertile or of low fertility. The history of duck domestication is strewn with countless examples of **Mallard** hybridizing with other duck species. However, as is quite common when wild species are captive-bred through several generations into domestic forms, the plumage colours disappear. Despite this history, farmyard ducks frequently escape to associate, breed and sometimes migrate with wild ducks, although their white appearance must make them more vulnerable to predators. The commonest consequence of such hybridization is that urban areas in particular contain many birds whose plumage is a mixture of white patches and **Mallard** features. It must be emphasised very strongly that the genetic makeup of these ducks is very variable, because many species and hybrids entered the lineage through the centuries, earning them the sobriquet of "Muddy Ducks". The description used in this project, "**Feral/hybrid Mallard type** *Anas platyrhynchos forma domestica*" recognises this varied ancestry, which probably differs for each such population throughout the world. The existence of such birds across much of the world poses a major threat to some duck species.

The experience of wildfowl collections is that **Mallard** hybridizes frequently, and often with the most unlikely species, which demonstrates that waterfowl speciation is less physiologically based than for many other bird families; amongst wild populations, behaviour, geographical isolation, habitat choice and availability seemingly are the ruling factors.

In captivity, the Mallard has hybridized with two species of *Anser*, (**Cackling**) **Canada Goose** *Branta canadensis minima*, **Egyptian Goose** *Alopochen aegyptiacus*, two species of *Cairina*, two species of *Netta*, three species of *Tadorna*, two species of *Aix*, 23 species of *Anas*, six species of *Aythya*, **Eider** *Somateria mollissima*, two species of *Mergus*, **Domestic Guinea fowl** *Numida meleagris*, **Domestic Fowl** *Gallus domesticus* (Shaw 1999).

In the wild, the males being invasive and aggressive, it has hybridized frequently with other ducks. Where fertile offspring result, the male aggressiveness seems to persist through the generations, maintaining the pressure on the species with which the **Mallard** hybridized. In the case of introductions within the AEWA area, but beyond its normal range, it has hybridized with the southern **African Yellow-billed Duck** *A. undulata* and produced fertile offspring.

Introductions outside the AEWA area

The **Mallard** has been introduced in many places for aesthetic reasons; it reminded settlers of home, or it was an attractive species which easily established a near commensal relationship, and so generally could be relied upon to remain nearby. It has also been introduced, along with domestic ducks of **Mallard** ancestry to provide eggs and meat. **Mallard** introductions have been carried out on a huge scale in western Europe and the USA by hunting organizations, not often within the species' natural range. Its introduction in Australia and New Zealand has been disastrous for indigenous duck species.

Occurrence in the AEWA Area

Little information is available about the scale of **Mallard** introductions by hunting interests. Many countries within the **Mallard's** natural range do not treat such releases as introductions. There are few studies into the effects of these introductions on wild populations.

Most countries have no information on any aspect of **Feral/hybrid Mallard type** and so not even totals can be guessed at. Consequently, very few countries have reported or recorded **Mallard** or **Feral/hybrid Mallard type** where their presence should have been treated as introductions. Seven countries recorded the former, six the latter, but only two of these recorded both!

AFRICA

Madagascar

It is believed that in the 1890s and probably in later decades, **Mallard** introductions were made by colonists. Certainly large numbers of **Muscovy Duck** *Cairina moschata forma domestica* and domestic ducks of **Mallard** and probably of **Feral/hybrid Mallard type** were introduced and bred successfully on a large scale. It is likely that there is a shifting mixed population of feral and semi-feral birds. There is concern that hybridization with the **RARE** native **Meller's Duck** *A. melleri* will occur at Lake Alaotra, which is large and not fully surveyed. At the 10 sites counted biannually as part of the African Waterbird Census, no evidence of hybridization has been recorded, but nonetheless it is suspected.

Mali

In the 1990s, a shifting population of feral or semi-feral domestic or **Feral/hybrid Mallard type** ducks has been noted, its size fluctuating.

Namibia

Since 1996 up to 10 bp of **Feral/hybrid Mallard type** have occupied the Oanob artificial water storage dam in the semi-desert of central Namibia. No interaction with native species has been observed. The few **Mallard** recorded may have been of natural origin.

Seychelles

Domestic ducks have been recorded in a semi-feral state on a few occasions. The few **Mallard** records are treated as natural vagrants.

South Africa

In South Africa a **Mallard** population has grown from the original escapes (probably before 1979) to perhaps as many as 1,000 bp in a number of locations. Up to 200 bp of **Feral/hybrid Mallard type** have been recorded (to at least the third generation), and some hybrid **Mallard** x **African Yellow-billed Duck** are known. Control action has been taken in some cases. Where feral domestic and **Feral/hybrid Mallard type** ducks were in small numbers and suitable habitat was scarce, shooting is believed to have

been effective. Where birds of whatever ancestry occupied less accessible and more abundant habitat, the use of chloral hydrate on baits has appeared effective, other affected species being released after recovering fully. As a consequence, numbers have declined to extinction, particularly on the Orange River Mouth Ramsar site. Partly because of the serious threat which **Mallard** presents to indigenous wildfowl, the Cape Conservation group in South Africa has collated much information on waterfowl hybridization in the wild and in captivity, with a view to introduce a species-based categorization system of non-indigenous waterfowl (See **Section 9**).

ASIA

Uzbekistan

From 1980 to 1989, there was an introduced population of **Mallard** in Uzbekistan, initially 500 (1980) being imported from Russia (the Moscow Region) and 250 (1981) from Ukraine (the Odessa Region). All the introductions made at one location, the Rassvelt Hunt Farm, to build up a hunting stock, from which introductions subsequently were made to other parts of Uzbekistan. Although the introductions seemingly succeeded, all the releases were over-hunted to extinction. A few bp may remain. The natural population comprises c. 1,000 bp widely scattered across the country, but in autumn 400,000 migrants appear, some 60,000 remaining to overwinter most years. The releases had no effect on indigenous species. Since January 1998, the import of wild animals into Uzbekistan has been illegal. Tashkent Zoo holds the only known non-native waterbird collection in the country.

ASIA MINOR & THE MIDDLE EAST

Saudi Arabia

A number of **Mallard** occupying ponds at a sewage farm near Riyadh since 1995 are thought to come from captive stock.

United Arab Emirates

The species was first recorded as an import in 1981. At one time the free-flying population of **Mallard** was quite numerous, but has declined. It is likely that many simply flew away, because now there is a stable pinioned population comprising the majority of the total of 20 bp and 100 other individuals. The three main locations are Al Ain, Abu Al Abyad Island and Sir Bani Yas Island wetlands. Pinioning is an uncommon practice in the UAE.

EUROPE

Andorra

Some four individuals were introduced as ornamental waterbirds. The country has no wetlands, only a few mountain lakes and streams, and one small reservoir.

Austria

Since the 19th century, feral domestic or **Feral/hybrid Mallard type** ducks have been commonly encountered, especially in urban wetlands, the hybrid form also occurring often in waterfowl concentrations.

Great Britain (excludes Northern Ireland)

Most years, up to 400,000 birds are released for shooting, the natural population being estimated (with difficulty) at 100,000 bp (Stone *et al.* 1997) and 500,000 individuals post-breeding.

Ireland (including Northern Ireland)

Some 4,000 birds are released yearly for hunting. The natural population is *c.* 17,000 birds.

Ukraine

Almost certainly **Mallard** featured heavily over several decades in the large-scale hybridization experiments carried out at the Ascania-Nova facility before the collapse of the Soviet system. Ascania-Nova is now officially a reserve. The origins of any duck hybrids in the Ukraine are difficult to discern.

Elsewhere

Despite being hunted intensively, the **Mallard** remains unthreatened in its core range, but a number of subspecies or very closely related species are under threat through habitat loss, in Mexico (*A.p. (A.?) diazi*), south-eastern United States (*A.p. fulvigula*), the Hawaiian Islands (*A.p. wyvilliana*) and Laysan Island (**Laysan Duck** *A.* or *A.p. laysanensis*). Concern has also been expressed about population declines at its range limits.

In New Zealand, its introduction has led to the rapid decline of the native **Grey Duck** *A. gibberifrons*. Mixed populations soon became indistinguishable from **Mallard**. In the southern USA, the **American Black Duck** *A. rubripes* appears similarly threatened, although there may be other factors at work in its decline. In Australia, it has hybridized with **Australian Black Duck** *A. poecilorhynca superciliosa*. These **Mallard** introductions, whether for restocking or other purpose, comprise birds from a variety of populations, some the product of many generations of captive breeding and others raised from captured sedentary or migratory stock. Undoubtedly, in some places, there has been a blurring of subspecies identity.

In the USA, perhaps one million birds are released yearly for hunting. The introduced population in Bermuda derives from introductions of American origin, but whether captive or wild-bred is not known.

Other aspects

In the AEWa area, where the **Mallard's** broad habitat requirements can be met, it is likely to thrive provided that it does not form a welcome and easily absorbed part of the faunal food chain nor a become victim of locally virulent avian diseases. Domestic duck escapes sometimes thrive in similar conditions. The **Mallard's** aggressive nature and its known ability to hybridize well with other *Anas* species and surprisingly well with other *Anatidae* means that it could present a threat to native ducks and geese where it has been introduced.

A common feature of large-scale introduction/restocking by hunters and of large-scale farming of domestic ducks is that both processes can provide ideal conditions for disease organisms to spread (through overcrowding) and to develop (through increased opportunity from large numbers of individuals, frequent breeding year-through and isolation from the pathology of wild-living birds. As a consequence, there is a far greater chance that disease spread by released birds to wild-living populations (and not just of the same species) will have effects on the wild-living individuals which will be unable to develop effective resistance. There is a plethora of American studies into wildfowl disease biology and vectors.

Potential future trends

Subspecies identity in some areas may be under threat from the increasing numbers of feral domestic and **Feral/hybrid Mallard type** ducks. Furthermore, the duck-rearing industry has expanded in many parts of the world, and escapes have interbred freely with 'wild' Mallard. The long-term genetic consequences

could include a blurring of distinctions between subspecies, as has happened to the UK's **Canada Goose** *Branta canadensis* populations.

The **Mallard** must be treated as a high-risk introduction outside its range, as is clearly demonstrated by the disastrous effects it has had on native species in many parts of the world. However, action to curb hunting releases on the present scale, should that be deemed necessary, would meet resistance, even outside the species' natural range. It will probably continue to spread naturally. Action to control the "Muddy Duck" populations of urban **Feral/hybrid Mallard type** will probably not occur unless some disease factor affecting humans is found through research, because such birds are strong favourites with the general public. It is possible that **Feral/hybrid Mallard type** populations will begin to spread away from urban waters more often simply because the pressures of high-density living will ensure that selection for adaptability will drive more individuals to leave. **Mallard** is a most pressing case, but little is likely to have been changed by 2010 except at and beyond the margins of its range where some effective legislation may come into being. There will probably be no changes to hunting releases in the near future.

6.1.15 Red-crested Pochard *Netta rufina*

Status in its natural range

In its western range, its distribution is highly-fragmented from south and east Spain through much of continental Europe eastward from southern France, but its eastern range from the Black Sea and Turkey east to north-west China is more continuous. It prefers deep, large lakes of fresh or brackish water where there is abundant margin vegetation. In the 20th century it has spread erratically into central Europe, displaying low site-fidelity to its breeding locations, making it difficult to count and monitor, but it has long been a popular ornamental species, and so its isolated appearances as an escape masked the natural spread. How much of the present western distribution, apart from that in Spain, is due to natural spread and how much to feral stock becoming naturalized is not known for certain, although up to the 1950s, natural spread probably predominated. After that time, captive breeding grew quickly to meet demand, and escapes became and remain common. Few countries in Europe record it as an escape, yet even where it is quite common, collections and parks maintain their stocks from captive breeding sources. The Dutch captive population in 1991 exceeded 1,700 birds (Laar *et al.* 1994) and in 1994, 2,500 (Anon 1998). In South Africa it is designated a PROHIBITED species. It is **Not Globally Threatened**.

Hybridization

In captivity it has hybridized with 17 duck species. As a free-flying ornamental bird, it does hybridize, but it is unclear to what extent and with what result.

Introductions outside the AEWA area

There are few statistics about introductions, but because the male is so striking in appearance, it is one of the most popular species purchased for "garden-pond" collections. Inevitably, juveniles are surreptitiously released because such collections have no room for grown broods, and only large captive-breeding firms have a selling market.

Occurrence in the AEWA area

AFRICA

South Africa

There have been occasional escapes, but it has hybridized readily in captivity there with three indigenous species, **African Black Duck** *Anas sparsa*, **African Yellow-billed Duck** *A. undulata* and **Rosy-billed Pochard** *N. peposaca*.

ASIA MINOR & THE MIDDLE EAST

United Arab Emirates

At least four birds were free-flying on Sir Bani Yas Island for a period during the 1990s.

EUROPE

The Netherlands

The current estimate of 25 bp represents a slight decline (the species was first recorded in 1973), but it is unobtrusive during nesting.

United Kingdom

It was first recorded as an escape in 1900, and as breeding in the wild in 1937. Sporadic breeding probably became annual most years fairly soon after, and although around 7 bp are recorded most years, the total is very probably higher, simply because of the species' peripatetic nature and the low level of interest in introduced birds. Over 150 individuals appear on winter counts.

Elsewhere

In Germany, Switzerland and Austria, it has come to be regarded as a species gained through natural range expansion, but given its status in captivity, it is likely that escapes continue at a high rate.

Potential future trends

The unclear and varied status of the **Red-crested Pochard** in Europe means that even if some evidence of it becoming a threat to established species (such as through hybridization) were found, it would not be possible to implement any control measures, because the species occurs naturally in eastern Europe and through continued range expansion, by 2015, it will probably have been recognised as a naturally occurring species, and the western European population should have easily exceeded 1,000 bp.

6.1.16 Ruddy Duck *Oxyura jamaicensis*

Status in its natural range

Its natural range lies in the New World, the three subspecies occurring on freshwater swamps, lakes, pools and marshes with emergent vegetation and open water from western and west-central Canada and north-western USA to western South America and the Caribbean. It appears to be the most dominant of the *Oxyura* genus when sharing captivity. When escapes have encountered the **VULNERABLE White-headed Duck** *O. leucocephala* in Spain, its dominance over wild congeners is confirmed. It is designated a PROHIBITED species in South Africa. It is **Not Globally Threatened**.

Hybridization

In captivity, it has hybridized with two duck species including **White-headed Duck**. Escapes reaching Spain have hybridized with **White-headed Duck** in the wild, and a few third-generation hybrids have been recorded. Initial findings are that first and second generation hybrid back-crosses with **Ruddy Duck** are fertile and dominant, but too few third-generation hybrids have been studied for meaningful results. Where there is a preponderance of indications that an introduced species is a threat to an indigenous species, particularly when the indigenous species is in some degree of danger in any case, then the precautionary principle should be applied. The eradication of c. 4,000 **Ruddy Ducks** in Europe will have no effect at all on its status in its natural range.

Introductions outside the AEWA area

Although several countries are moving towards a complete ban on keeping **Ruddy Duck** in captivity or releasing it into the wild outside its normal range or anywhere near the range of any other *Oxyura* species, **Ruddy Duck** remains in captivity in considerable numbers. There are no overt plans to introduce **Ruddy Duck** anywhere, but two things are likely: it is probable that there will be many covert releases from the less scrupulous dealers as a ban is enforced, and it is possible that a black market will operate to meet the needs of those obsessed individuals who feel the need to possess something that has been banned.

Occurrence in the AEWA area

AFRICA

Morocco

At least one and possibly more birds were recorded in Morocco in 1995 and 1996.

ASIA MINOR & THE MIDDLE EAST

Turkey

It was first recorded in Turkey in the late 1980s, a hybrid with **White-headed Duck** also being reported in 1998 (Anon 1999).

EUROPE

Austria

Individuals have been recorded in the late 1990s.

Belgium

Although it was first recorded in the 1980s, only about three birds are recorded annually, and it may not have become established. Although Belgium supports the idea of extirpating the species, they do not wish to incur expenditure until they are sure the UK's control measures will be pursued diligently.

France

There is probably an established population at Lac Grand-Lieu of 10bp, but recording and cooperation across the country is variable, so perhaps several times this number are breeding. A low estimate of total numbers is of 50 birds. Officially, the first record is from 1987, but British birdwatchers travelling through France have seen the species much earlier. France has applied control measures since 1998, to good effect, but only in those areas where local agreement had been reached. The French ornithological establishment has a national interest in widespread international effective control measures; they have had to suspend plans to re-introduce **White-headed Duck** to Corsica until the risk from **Ruddy Duck** is confirmed as acceptably low.

Great Britain (excludes Northern Ireland)

Since the first escape from Slimbridge in 1952, the population had grown by 1997 to over 3,600 individuals (Hughes *et al.* 1999). Many records from the continent refer to wanderers from this group, but a proportion undoubtedly came from escapes on the continent. However, the problem is international. Trial control measures have been undertaken to determine the most effective methodology. Some public

opinion has been against the cull and the birdwatching press has allowed many ill-informed and subjective letters to appear before printing objective ripostes.

Iceland

It was first recorded in 1976. There are *c.* 10-15 individuals, breeding occurring for the first time in 1990. Local persecution of **Slavonian Grebe** *Podiceps auritus* has been noted.

Ireland (including Northern Ireland)

The first record dates from 1973. The present population is estimated at 50-54 bp (Perry *et al.* 1998), with 130 individuals being a conservative pre-breeding total. There are clear increasing trends in numbers and range. Any control programme will require parliamentary or legislative action north and south of the border. There is no open season in Northern Ireland, and in Eire the species is listed in the Irish Wildlife Act as being protected.

Italy

First recorded in 1988, it is present in two provinces (four individuals).

The Netherlands

It has been present in small numbers since 1973 at least, but currently only 2 bp are recorded. Unofficial figures are higher. The Netherlands will support a cull if the UK's programme is seen to be applied properly.

Spain

The species was first recorded in 1973. Coordinated survey work in the early 1990s suggested that more than 120 individuals, including hybrids but excluding winter migrants from other countries, were resident. This was thought to be an underestimate, but one which applied evenly nationwide due to the comprehensive cover of the surveys. Fully-coordinated control measures started in 1993. Over 100 birds, including hybrids were shot in 1998. The drop in sightings is thought to be a reflection of a genuine decline and not a function of the species becoming gun-shy.

However, the Spanish, having demonstrated that a coordinated control campaign will work, intend to finance further annual efforts, but long-term action is in question if Britain fails to mount an effective control programme. The Spanish record of hybrids is comprehensive for the first-generation, but for the second-generation is comprehensive only for back-crosses with **Ruddy Duck**. Second-generation hybrids back-crossed with **White-headed Duck** are more difficult to identify from plumage characteristics. There is little information on second-generation hybrids whose parents were themselves hybrids. A few third-generation hybrids of back-crosses with **Ruddy Duck** have been identified.

Sweden

From the first record in 1976 until 1988, there were 16 records.

Switzerland

Currently there are one to three individuals recorded yearly.

Ukraine

There is one record of a straggler from 1996. Ukraine holds a significant eastern European population of **White-headed Duck**, which could soon be at risk.

Other aspects

The **Ruddy Duck** is very much a test case for the future. There is little prospect of being able to adopt a sound, coordinated and international strategy for dealing with an introduced waterbird species which poses a threat to an indigenous waterbird species in the medium term if the **Ruddy Duck** case is dealt with hesitantly, or if coordination is poor. Action seen as temporizing or muddled could severely affect the implementation of conservation policies. It would certainly make it more difficult to make the AEWA work.

Potential future trends

If current population trends continue, there is the danger that the populations of **White-headed Duck** will be negatively impacted by extensive hybridization.

6.2 Species Which have Escaped and Bred or Survived at Least One Year in the Wild

Of the 113 summary accounts, 95 cover introduced waterbird species which do not appear to present a clear threat to any indigenous AEWA area species. The remainder are line entries in taxonomic sequence for the 16 species with full species accounts, and for two hybrid populations which are subsumed into two of the full species accounts. The 95 summary species accounts comprise those species which have at least three (given undoubted under-recording) recent records of escapes since 1960, which have survived for a time in the wild, and which may breed, but as far as is known, not at self-sustaining levels. Given regular escapes into the wild, some of these 95 species may pose a threat in future if breeding populations become established.

The following abbreviations have been used in this section, **UAE** = United Arab Emirates, **bp** = breeding pairs, **pwc** = popular in waterbird collections, **a&h** = adaptable and hardy, **NGT** = Not Globally Threatened (del Hoyo *et al.* 1992 & 1996) (the status of a species is given in **Bold**), **SA** = In South Africa, categorized as...

In some species accounts PROHIBITED or REGULATED appears. This terminology is based on the precautionary system for categorizing waterfowl species (or subspecies where these originate outside South Africa or outside the continent) proposed by a South African Cape Province ornithologist working at Cape Nature Conservation (Shaw 1999). The system is discussed in **Section 9.1.11**.

Lesser Rhea *Pterocnemia pennata*

Only marginally a waterbird, this species in its native Chile and Argentina occurs on both wet and dry plains. It was bred in Ukraine in free-living flocks from around 1936 to at least 1951. Seemingly bred for their feathers, the birds were released by an organization devoted to intensive studies of hybridization. Some **Greater Rhea** *Rhea americana* may also have been present.

a&h¹, NGT¹

White Pelican *Pelecanus onocrotalus*

Found from eastern Europe to western Mongolia in shallow, warm fresh and brackish waters, this species has declined markedly in the Palaearctic through wetland drainage and persecution. It winters in Africa and India. Several have escaped in Britain and have survived for some time, but not bred. It is not known whether any of these birds migrated and then returned.

NGT

Dalmatian Pelican *Pelecanus crispus*

Occurring mostly on rivers, lakes and estuaries in scattered small, mostly relict populations from Yugoslavia to the Far East, this species winters from Iran to China. There are a few records of escapes (which have not bred) in Britain.

Endangered

Pink-backed Pelican *Pelecanus rufescens*

Its natural range is sub-Saharan Africa south almost to the Tropic of Capricorn. However, it is the most adaptable of pelicans, sometimes occurring remote from water when locusts are plentiful. It surprisingly seems to be able to survive if food is available on ice-free waters. A tree-nester, it is tolerant of human presence. Accidentally introduced Italy, it has occurred in several locations. A few escapes (non-breeding) have been recorded in Britain.

NGT

Cormorant *Phalacrocorax carbo*

Its natural range is extensive, from eastern USA through Europe, and Africa east to Japan and the Antipodes. In the wild, it is attracted to the unnaturally high densities of fish in fishfarms and fishponds, and is regarded by fishing and angling interests as a pest. Those released in Israel were not from local populations. In the context to the resident and semi-migratory cormorants throughout Israel, the releases pose insignificant threats to other species.

a&h¹, **NGT**

Night Heron *Nycticorax nycticorax*

It occupies a wide range of temperate and tropical wetland and riverine habitats around the world, except for Australasia, and so is adaptable. Records of escapes outside its range in the AEWA area come only from Britain, where there are two long-established, but partially-supported small colonies which seem to be either stable or declining slowly.

a&h, **NGT**

Cattle Egret *Bubulcus ibis*

Its natural range is the warm mid-latitudes; India, China and scattered locations in southern Europe, Asia Minor and Africa. Its range is expanding, its rapid spread to the New World this century probably being natural. It occurs there continuously from the USA to north-central South America. Least tied of all herons to water, it often associates with livestock or wild ungulates, but it is also a successful forager amongst root crops. Accidentally introduced (there is debate as to its origin, and it is usually not treated as introduced) in Italy, the species is likely to become established if not controlled. A further natural spread to Italy is likely in the next decades. A small colony in France, regarded as being possibly of natural origin, may be the source of the birds recorded in Britain and Germany. It is uncommon in captivity. Its varied diet makes it a potential threat to ground-nesting birds, at least locally.

a&h, **NGT**

Western Reef Heron *Egretta gularis*

Exclusively coastal in tropical West Africa and from the Red Sea to south-eastern India, it has dark and white forms. Accidentally introduced in Italy, it seemingly is not thriving in a mixed heronry. Its narrow habitat and temperature requirements make it an unlikely Mediterranean coloniser, even on southernmost coasts. Some authorities treat it as conspecific with **Little Egret** *Egretta garzetta*.

NGT

Little Egret *Egretta garza*

This species is spreading at the north-western edge of its European range, which stretches south and east throughout much of Eurasia, Africa and Australia. It has learnt to exploit fishponds. It has been introduced, rather eccentrically, in South Africa at a single location where an artificial marshland has been created. It is not a risk to other waterbirds.

a&h, **NGT**

Great (White) Egret *Egretta alba*

Its natural range is the warm mid-latitude wetlands across Eurasia, Americas, south-east Asia to Australia, and parts of Africa. There is a slow spread north-west in Europe. Accidentally introduced in Italy, its survival prospects are good in suitable habitat, if not controlled. Uncommon in captivity.

NGT

Goliath Heron *Ardea goliath*

This huge heron is usually encountered near water or in shallows across much of tropical Africa. There is a small free-flying zoo population, from which birds wander, in the UAE¹. This species is unlikely to prove any kind of threat to local waterbirds.

NGT

Painted Stork *Mycteria leucocephala*

This species is wide-ranging, occupying three main areas in India, south-east Asia and China. It seeks out mostly shallow freshwaters, but can occupy coastline. As for the **Goliath Heron** *Ardea goliath*, this species is free-flying in the UAE, but on private estates, where it may have bred.

NGT

Yellow-billed Stork *Mycteria ibis*

It occurs mostly within tropical Africa in wetlands and swamps. This species was free-flying in the UAE. Of 12 birds known to be released, none bred, and none remained after 1998.

NGT

White Stork *Ciconia ciconia*

Its natural range is mostly central and eastern Europe, extending patchily to central Asia. The only escapes recorded outside its range have been in Britain, but mostly confined to single birds, no breeding being known.

NGT

Sacred Ibis *Threskiornis aethiopicus*

See Full Species Account.

pwc, **NGT**

Scarlet Ibis *Eudocimus ruber*

This species occurs in northern South America, but due to its prominent colouring, it is highly prized by collection owners. Like some of the storks above, it exists in a free-flying population in the UAE. Birds in European collections are mostly pinioned, partly because of their value.

pwc, **NGT**

African Spoonbill *Platalea alba*

Its range comprises most of tropical Africa where there are shallow lakes and marshes. Its blood-red bill makes it popular, so escapes, such as recorded in Italy and Britain, are to be expected. It is probably one of the least adaptable of the spoonbills, and as such is unlikely to survive long in the wild.

NGT

Greater (European) Flamingo *Phoenicopterus ruber*

See Full Species Account. It has hybridized with introduced **Chilean Flamingo** *P. chilensis*.

pwc, a&h, NGT

Chilean Flamingo *Phoenicopterus chilensis*

See Full Species Account. It has hybridized with introduced **Greater Flamingo** *P. ruber*.

pwc, a&h, NGT

Lesser Flamingo *Phoenicopterus (Phoeniconaias) minor*

Its natural range mostly comprises the tropical alkaline lakes at high altitude in East African Rift Valley and north of the Kalahari desert. It is the most numerous flamingo. Although it wanders widely, it is probably less adaptable than other flamingos. It associates with **Greater Flamingo** *P. ruber*. Accidentally introduced in Italy, it has escaped elsewhere in Europe, and has been recorded a few times in Britain.

pwc, NGT

Fulvous Whistling Duck *Dendrocygna bicolor*

This species has a wide tropical range, covering Central and South America, much of Africa and India. The Whistling Duck genus is popular among the public. The South Africans, because of the debate as to whether this species is monotypic or not, recommend that, nationally, birds originating from outside the African continent should not be kept in captivity. Escapes recorded in Britain are unlikely to thrive. Those in the UAE may do so amongst the now extensive artificial waterbodies and channels. It has hybridized in captivity with five other *Dendrocygna* species. The Dutch captive population (Laar *et al.* 1994) exceeds 1,900 individuals.

SA¹ PROHIBITED² (Non-African birds), REGULATED² (African birds): pwc, NGT

Lesser Whistling Duck *Dendrocygna javanica*

Its natural range comprises the warm tropical wetlands of India and SE Asia. It is unlikely to thrive as escape in temperate latitudes, but in warmer climes it could do so. Escapes have been recorded in Switzerland and the UAE. It is unlikely to be a threat, except within the natural range of **Fulvous Whistling Duck** *D. bicolor*, with which it has hybridized in captivity.

SA PROHIBITED¹, pwc? NGT

Black-billed (West Indian) Whistling Duck *Dendrocygna arborea*

This species occurs in small numbers in tropical swamps and marshes in the West Indies where it is in major decline. Possibly there are more birds in captivity than in the wild. It is most unlikely to thrive as

an escape in temperate latitudes. It has been reported as an escape only in Switzerland. It can hybridize with **Plumed Whistling Duck** *D. eytoni*.

SA REGULATED¹, **Rare, near-threatened**

Red-billed (Black-bellied) Whistling Duck *Dendrocygna autumnalis*

This species is found in tropical lagoons in Central and South America. There are two subspecies, which have hybridized in captivity. It is most unlikely to thrive as an escape in temperate latitudes. It has been recorded as an escape only in Switzerland. Outside its climatic requirements it is unlikely to thrive.

SA REGULATED, pwc? **NGT**

White-faced Whistling Duck *Dendrocygna viduata*

Its natural range is the tropical wetlands of Africa and South America and so is unlikely to thrive as an escape in temperate latitudes. Escapes have been recorded in Britain and Switzerland, and in South Africa it has hybridized with **Fulvous Whistling Duck** *D. bicolor*, perhaps also in the wild.

SA REGULATED, pwc, **NGT**

Mute Swan *Cygnus olor*

See Full Species Account. It has hybridised in captivity with three swan and four goose species.

SA REGULATED, pwc, a&h, **NGT**

Whooper Swan *Cygnus cygnus*

This species, a winter visitor to western Europe and further east, breeds in the sub-arctic Palaearctic taiga in pools and lakes. Feral or wild pairs have bred occasionally in northern Scotland, and escapes have paired and bred occasionally in Britain. The small (5 bp¹, perhaps 20 adults overall) Schleswig-Holstein population, present from 1978, may have originated or be sustained by wild, or injured wild birds. The introduced free-flying birds in the UAE either became extinct or migrated in the 1970s. (Wintering birds do reach the Arabian Gulf).

SA REGULATED, pwc, a&h, **NGT**

Black-necked Swan *Cygnus melanocorypha*

Its natural range covers the swamps of southern South America. Escapes have occurred throughout western Europe (but recorded only in Britain and Switzerland), one unreported individual surviving more than one severe winter in Moray, Scotland. Up to six birds were known to be free-flying in the UAE in 1969, their subsequent history being unknown. Although escapes associate with other *Cygnus* species outside the northern breeding season, it is not known to have bred or hybridized, possibly because its life-cycle is locked into austral seasons

SA REGULATED, pwc, a&h, **NGT**

Trumpeter Swan *Cygnus buccinator*

This swan breeds in the swamps, marshes and shallow lakes of the western Nearctic boreal forest zone. It has become increasingly popular in collections, but has been reported as an escape only in Britain, where recently a wild-living pair bred successfully.

SA REGULATED, pwc, a&h, **NGT**

Black Swan *Cygnus atratus*

See Full Species Account. It has hybridized in captivity with several swan and goose species.

SA REGULATED, pwc, **NGT**

Bean Goose *Anser fabalis*

This goose breeds in the Palaearctic taiga beside lakes, rivers and pools. There are up to five subspecies, two of which are declining, the other three being stable in range and numbers or increasing. The species winters in temperate latitudes from western Europe to Japan. Feral populations, arising mainly from escapes, have developed differently in the UK, The Netherlands and Belgium. The UK records show some 30 individuals, breeding being unproven, The Netherlands probably has a smaller total, and has one breeding record, but Belgium has at least 400 birds, of which a small proportion will breed each year. All three populations have developed mostly since the late 1970s. It is uncertain whether the feral population is augmented by overwintering winter migrants, or whether some "resident" birds join the spring migration. Studies of winter migrants during winter to establish breeding productivity from the numbers of juveniles are being rendered increasingly difficult because the productivity of resident birds, unlike the migrants which average one good year in three or four, is consistent between years and can mask the true state. It is possible that future studies of the productivity of wild populations will be possible only through expensive annual Siberian expeditions. At present, the feral Belgian population is not a threat to other waterbirds, but it has hybridized in captivity with other *Anser* spp and with **Barnacle Goose** *Branta leucopsis*.

SA REGULATED, a&h, **NGT**

Swan Goose *Anser cygnoides, forma domestica*

This species is widespread from south-central Siberia to north China in widely different habitats, usually associated with water. Across China, a variety of domesticated forms exist, in appearance ranging from identical to the wild stock to pure white. Hybridization with other goose and duck species has occurred widely both in China and where the **Swan Goose** has been imported (its aggressive nature allows it to be employed as a means of warning of intruders), both amongst wild or feral stock and in captivity. Its occurrence is greatly under-recorded within the AEWB area, especially because it is regarded as a "farmyard bird". In Germany, sources vary in their opinion of its status from "poor survival rate" to "self-sustaining", although all agree that escapes have bred and also hybridized. The Netherlands has 5 bp known, the UK has records of occasional bp and hybridization, whereas Switzerland has records of neither amongst the escapes. The number of generations which escapes in Europe are distant from wild stock are unknown, but it remains possible that introduced birds could establish breeding flocks large enough to stimulate mass breeding (Green 1997). The population could then grow rapidly, creating some local risk at least to indigenous waterbirds. It has hybridized in captivity with 16 species of *Anatidae*.

SA PROHIBITED, a&h, **NGT**

Pink-footed Goose *Anser brachyrhynchus*

This species breeds on rocky outcrops and gorges in open tundra in Greenland, Iceland and Svalbard. It is recorded as feral only in the UK, where 190,000 migrants winter (Stone *et al.* 1997), the residents (greatly under-recorded) seemingly have bred very occasionally, although over 90 birds have been recorded at 29 locations. Hybridization has been recorded with six other goose species, amongst both feral and captive birds, but it presents a very low risk to indigenous waterbirds.

pwc, a&h, **NGT**

White-fronted Goose *Anser albifrons*

This goose breeds on the Holarctic open tundra and inland coast in marshes and by pools and rivers. There are up to five subspecies, of which one, the Greenland *flavirostris* comprises the British feral population (on average 5 bp out of >75 individuals), which does not associate with other subspecies which winter in Britain. The Dutch have recorded similar numbers, and the Germans believe that they have some 40 birds widely scattered; only once have they recorded breeding. Hybridization has been recorded in captivity with 16 goose species occasionally amongst feral birds, but so far it presents no indication of a threat to indigenous waterbird species.

SA PROHIBITED, pwc, a&h, **NGT**

Lesser White-fronted Goose *Anser erythropus*

All subspecies and populations of this goose are in decline. It breeds in the scrubby, lightly-wooded taiga edge across the Palaearctic. It is a non-aggressive small goose, popular in waterbird collections, where it has been recorded as hybridizing with several other goose species. Although there are breeding records for escapes in Britain, there have been only some 70 records of escapes since the 1980s. There is an ongoing re-introduction programme in Sweden, but the original small Finnish and Swedish populations have all but disappeared. It has hybridized in captivity with five goose species. The Dutch captive population exceeds 450 individuals (Laar *et al.* 1994).

SA REGULATED, pwc, a&h, **Rare**

Greylag Goose *Anser anser*

See Full Species Account. It has hybridized in captivity with 23 *Anatidae* species and with domestic geese.

SA PROHIBITED, a&h, **NGT**

Feral/hybrid Goose *Anser anser forma domestica*

See **Greylag Goose** Full Species Account.

Bar-headed Goose *Anser indicus*

See Full Species Account. It has hybridized in captivity with eight *Anatidae* species.

SA REGULATED pwc, a&h, **NGT**

Snow Goose *Anser caerulescens*

This species is a high Nearctic breeder on low, thinly-grassed tundra. There are two subspecies. Escapes in western Europe are quite commonly encountered but are very much under-recorded, in part possibly because of its superficial resemblance to domestic geese. Feral birds also seem less migratory than wild birds. In Germany, national records show some breeding attempts in a widely-scattered feral population of unknown number, but Schleswig-Holstein (where it has been present since 1978) reports breeding proof in a small population of 10 birds. Ukraine has had a feral population of unknown size for "several decades", but only a single breeding record. The UK, however, has a feral population of over 250 birds (very under-recorded), and on average, 10 bp are recorded, mostly among a small but probably self-sustaining Scottish flock. This species can be aggressive when feeding or breeding as a group and has hybridized quite widely (with 11 *Anatidae*) amongst other geese. It is, therefore, potentially a local threat to indigenous waterbirds. The Dutch captive population exceeds 200 individuals (Laar *et al.* 1994).

SA PROHIBITED, pwc, a&h, **NGT**

Ross's Goose *Anser rossii*

Very much a smaller version of **Snow Goose** *A. caerulescens*, this non-aggressive species has a natural range in the central Canadian high Arctic, usually choosing rocky, scrubby islets in arctic lakes. Although there are some 15 records of escapes in Britain, it has occasionally bred ferally, and is certainly under-recorded. It has hybridized with five goose species in captivity, but at present is unlikely to prove any kind of a threat to indigenous waterbirds.

SA REGULATED, pwc, a&h **NGT**

Emperor Goose *Anser canagica*

In its natural range of the Aleutians and western Alaska, it breeds on open tundra near coastal lagoons or inland lakes and pools. The species is in decline. It has been recorded as an escape only in Switzerland and Britain, in low numbers which likely are underestimates, but not as a breeder. It has not been recorded as hybridising in captivity with six goose species.

SA REGULATED, pwc, a&h, **NGT**

Canada Goose *Branta canadensis*

See Full Species Account. It has hybridized with 16 *Anatidae* species.

SA PROHIBITED, pwc (where there is no naturalized population), a&h, **NGT**

Barnacle Goose *Branta leucopsis*

See Full Species Account. It has hybridized in captivity with 10 *Anatidae* species.

SA REGULATED, pwc, a&h, **NGT**

Red-breasted Goose *Branta ruficollis*

This species breeds in the dry shrub and lichen tundras across high-Arctic Central Siberia, wintering around the Black and Caspian Seas. Numbers are declining severely. It breeds fairly readily in captivity, having hybridized with three goose species. Escapes (greatly under-recorded) have been recorded in UK and Germany since the 1960s, but breeding has been noted only in Germany. The Dutch captive population exceeds 1,000 individuals (Laar *et al.* 1994).

SA REGULATED, pwc, a&h, **NGT**, with the caveat **INSUFFICIENTLY KNOWN**.

Hawaiian Goose *Branta sandvicensis*

Extensively bred in captivity after its near-extinction on Hawaii, where its habitat comprised poorly-vegetated lava slopes and sometimes grassland, re-establishment attempts have been unable to produce secure self-sustaining populations, due to the thriving introduced ground predators, the source of the original problem. Predator eradication is ongoing, but continuing habitat decline has aggravated the difficulties. It was introduced in 1989 to the UAE, where a breeding attempt was made, but there are no records after 1991. Hybridization in captivity with **Swan Goose** *Anser cygnoides* has been recorded.

SA REGULATED, pwc **VULNERABLE**

Egyptian Goose *Alopochen aegyptiacus*

See Full Species Account. It has hybridized in captivity with 18 *Anatidae* species. It bred in south-east Europe until the mid-18th century.

SA REGULATED (if origin legitimate) or SA PROHIBITED (if of external origin), pwc (where there is no naturalized population), a&h, **NGT**

Magellan (Upland) Goose *Chloephaga picta*

Its natural range is the dry pastures of southern South America and also the Falkland Islands. There are two subspecies. In the 1930s, several hundred were introduced into Britain. Despite some successful breeding, the population failed to flourish. Since the mid-1980s, there have been two breeding records among escapes. In Belgium, one report suggests that up to 15 bp have bred recently. It has hybridized in captivity with seven goose species.

SA REGULATED, pwc, a&h, **NGT**.

Ashy-headed Goose *Chloephaga poliocephala*

This species occupies damp forest clearings, often on high ground, sometimes on islands across southern South America. Although it is common in Chile, it is scarcer elsewhere, subject to inadvertent persecution by farmers intent on reducing the numbers of more abundant species with which it associates. A number of individuals have been recorded as escapes in Switzerland in the 1990s. It has hybridized in captivity with four *Anatidae* species.

SA REGULATED, pwc, a&h, **NGT**

Ruddy Shelduck *Tadorna ferruginea*

See Full Species Account. It has hybridised with two duck species in captivity. The Dutch captive population exceeds 425 birds (Laar *et al.* 1994).

SA PROHIBITED, pwc, a&h, **NGT**

South African Shelduck *Tadorna cana*

Its natural range comprises shallow brackish wetlands in south-western southern Africa. The large population uses only a small number of moult sites where potentially it is vulnerable to catastrophe. It probably is fairly adaptable if escapes can occupy suitable habitat. Escapes have been recorded in Switzerland, where it hybridized with escaped **Ruddy Shelduck** *T. ferruginea*, in Britain, where a wild-living family in 1996 may have bred as escapes, or may have escaped as a family, and in South Africa in an area where it is normally not encountered, as part of a private establishment attempt on an artificially-created marshland. The reporting rate in western Europe probably under-records the escape rate. It has hybridized in captivity with four *Anatidae* species.

SA REGULATED for local populations, SA PROHIBITED for remote populations, pwc, **NGT**

Australian Shelduck *Tadorna tadornoides*

It occurs on the permanent and ephemeral brackish shallow lagoons in the southern half of Australia. It probably is vulnerable as an escape in temperate latitudes. Escapes have been recorded in Switzerland. It has hybridized in captivity with five *Anatidae* species.

SA PROHIBITED, pwc, **NGT**

Shelduck *Tadorna tadorna*

This species is a widespread breeder on coastal mudflats and salt waters (western range) and fresh waters (eastern range) across the largely temperate or continental Palaearctic to China, wintering north of the Tropic of Cancer. The small Czech population is probably not descended wholly from wild birds, as is the case for Neusiedlersee in eastern Austria, where there is a record of hybridization with **Ruddy Shelduck** *T. ferruginea* of unknown provenance. Those in Ukraine, on the Ascania-Nova reserve may well be the descendants of the birds introduced as part of a large-scale hybridization research project. It has escaped in South Africa, but natural vagrancy is possible. It has hybridized in captivity with 15 *Anatidae* species. The Dutch captive population exceeds 925 birds (Laar *et al.* 1994).

SA PROHIBITED, pwc, a&h, **NGT**

Paradise Shelduck *Tadorna variegata*

It breeds in shallow waters mostly on the high grassy plains of New Zealand. It is likely to survive well as an escape in temperate latitudes, as proved by escapes in Switzerland. It has hybridized with one other shelduck species in captivity.

SA PROHIBITED, pwc? a&h, **NGT**

Spur-winged Goose *Plectropterus gambensis*

The two subspecies' distributions are not fully known within its natural range stretching from Sub-Saharan Africa southwards, in marshlands, lakes reservoirs amid scattered trees in grassland or arable land. This species is probably far more commonly kept in a semi-domesticated state than reported. A free-flying escape has been recorded in the UAE. It has hybridized in captivity with 20 *Anatidae* species.

SA REGULATED for birds of southern origin, SA PROHIBITED for birds of northern origin. **NGT**

Muscovy Duck *Cairina moschata*

See Full Species Account. In the AEW region, invariably of *forma domestica* origin, but feral as well as commensal populations exist, if at times for short periods. It has hybridized with 14 *Anatidae* species.

SA REGULATED, a&h, **NGT**

Wood Duck *Aix sponsa*

The natural range of this species covers western, south-east and central North America. It survives well in still and slow-moving temperate fresh waterbodies, but breeding success (it nests in tree holes) is dependent on consistently warm late winter and early spring weather. As an escape, it is encountered widely across Europe, as far as Romania and Ukraine, and it has also been recorded in South Africa. In a few small areas in Europe, there may be self-sustaining populations, but it is suspected that escape recruitment plays a major part in maintaining numbers. It is a very popular bird with individual collectors whose care possibly ensures successful breeding to the extent that the juveniles are covertly released. It has hybridized in captivity with 26 *Anatidae* species. The Dutch captive population exceeds 3,850 birds (Laar *et al.* 1994).

SA REGULATED, pwc, a&h, **NGT**

Mandarin *Aix galericulata*

See Full Species Account. It has hybridized with four duck species.

SA REGULATED, pwc, a&h, **INSUFFICIENTLY KNOWN**

African Pygmy Goose *Nettapus auritus*

It occurs from Sub-Saharan Africa southwards in swamps, marshes, shallow lakes and slow waters where there is an abundance of aquatic vegetation. There is an attempt to establish the species privately in South Africa on an artificial marshland in an area where normally it does not occur. It has hybridized with **Chiloe Wigeon** *Anas sibilatrix* in captivity.

SA REGULATED, NGT

Maned Goose *Chenonetta jubata*

Its natural range is the freshwater marshes of Australia and Tasmania. Escapes have been recorded in Switzerland. It has hybridized with two goose species in captivity.

SA PROHIBITED, pwc, a&h? NGT

Brazilian Teal *Amazonetta brasiliensis*

In the wild, this species occurs on inland wooded pools throughout tropical north-eastern and east-central South America. There are two subspecies. It is adaptable to various habitats, but in a narrow temperature range. However, escapes in Switzerland have survived for some time. It has hybridized in captivity with several New World waterfowl.

SA REGULATED, NGT

Wigeon *Anas penelope*

It breeds throughout the Palaearctic open-forest taiga and tundra in freshwater marshes, on lakes and lagoons from Iceland to the Chukotsky peninsula, wintering in temperate and tropical latitudes from West Africa to Japan and the Philippines. From the early decades of the 20th century, it has been released steadily, but not in a coordinated manner, in UK, but natural range expansion has now made such actions redundant. It has hybridized in captivity with 17 *Anatidae* species.

SA REGULATED, pwc, a&h, NGT

American Wigeon *Anas americana*

The natural range of this species comprises the open wetlands of the high and sub-Nearctic. It winters south to Central America. Although natural occurrence of this species in Europe cannot be excluded, especially in the British Isles, it has been reported quite often as an escape in Britain, Belgium and Switzerland, undoubtedly under-recorded. It has hybridized in captivity with 16 *Anatidae* species. The Dutch captive population exceeds 525 birds (Laar *et al.* 1994).

SA REGULATED, pwc, a&h, NGT

Chiloe Wigeon *Anas sibilatrix*

It occurs on the slow, still waters of southern South America. There are more than 50 records of escapes in Britain since the 1970s, and others in Belgium and Switzerland. It has hybridized in captivity with a number of species.

SA PROHIBITED, pwc, a&h, NGT

Speckled Teal *Anas flavirostris*

It breeds on a variety of freshwaters, often at high altitude in western and southern South America. Although there are only eight records of it as an escape in Britain, all are from the 1990s, reflecting its

increasing popularity in collections, and it certainly has been under-recorded. It has hybridized in captivity with eight other duck species.

SA REGULATED, pwc, a&h, **NGT**

Gadwall *Anas strepera*

A widespread, but often locally-occurring breeding species of the Holarctic mid-latitudes, it prefers fresh and brackish shallow wetlands possessing ample aquatic and fringing vegetation. From the 1900s, there has been a slow, steady but somewhat covert and uncoordinated series of introductions in the UK, possibly continuing despite its natural range having increased north-westward to encompass Britain.

SA PROHIBITED, pwc, a&h, **NGT**

Red-billed Teal *Anas erythrorhynca*

It prefers standing waters with abundant floating and emergent vegetation from southern Sudan southwards, including Madagascar. It is largely sedentary. Only two escapes have been recorded in Britain, but it has become a more popular collection species recently. In South Africa, establishment has been attempted privately in an area where it does not normally occur, in artificial marshland, but with what success is not known. It has hybridized in captivity with one other duck species.

SA REGULATED, pwc, **NGT**

Baikal Teal *Anas formosa*

Its natural range is the taiga and southern tundra small lakes, rivers and marshes of eastern Siberia. It winters in Korea, Japan and south-east China. It is likely to survive well as an escape in temperate latitudes, but breeding in such circumstances is suspected, not proven. It is a highly popular collection species, escapes having been recorded in Switzerland, Britain, and especially Italy, where it can be found in seven provinces, having been present in varying numbers since the 1940s. It has hybridized in captivity with a number of similar species. The Dutch captive population exceeds 1,000 birds (Laar *et al.* 1994).

SA REGULATED, pwc, a&h **VULNERABLE**

Chestnut (-breasted) Teal *Anas castanea*

This species' natural range comprises the mainly estuarine, brackish open areas of southern Australia. There have been several records of escapes in Britain and Switzerland since the 1980s, but because this is a popular collection species, it is likely to have escaped elsewhere. It has hybridized in captivity with 14 duck species.

SA PROHIBITED, pwc, a&h? **NGT**

Falcatad Teal *Anas falcata*

This duck breeds on freshwater lakes and lagoons, often in wooded country from south-east Siberia to the Kuril Islands, wintering along coasts further south. With only some 25 records as an escape in Britain since the 1950s and infrequent records from Italy, this striking species seems not to be as common in collections as its appearance might warrant. It has hybridized in captivity with eight *Anatidae* species.

SA REGULATED, pwc? **NGT**

Silver Teal *Anas versicolor*

This species, one of whose three subspecies perhaps should be a full species, occupies a slightly

discontinuous range from the central Andes southwards. It prefers open-country shallow freshwater lakes, swamps and ponds bordered by abundant vegetation. At only five records of escapes in Britain since the 1980s, this species is probably under-recorded. No record was obtained of hybridization in captivity with any other species.

SA REGULATED, pwc, NGT

Cape Teal *Anas capensis*

This largely sedentary African species associated with shallow brackish or saline lagoons has its northern range centred along the Rift Valley, its southern range broadening to encompass much of southern Africa. Because of its generally nondescript appearance, the five records of escapes in Britain probably do not reflect the true picture. In South Africa, there has been a private establishment attempt on an artificial marsh in an area where the species does not normally occur. It has hybridized in captivity with three duck species.

SA REGULATED, pwc, NGT

Mallard *Anas platyrhynchos*

See Full Species Account. It has hybridized with 45 *Anatidae* species and two fowl species.

SA PROHIBITED, pwc (small collections) a&h, NGT

Feral/hybrid Mallard Type *Anas platyrhynchos forma domestica*

See **Mallard** Full Species Account.

Meller's Duck *Anas melleri*

The uncommon natural (Madagascar) and introduced (Mauritius in 1850s) populations of this species prefer the high plateaus' freshwater lakes, pools and marshes, although it can be found in fast-flowing streams down to lower altitudes in Madagascar. It has hybridized in captivity with seven duck species.

NGT

Spot-billed Duck *Anas poecilorhynca*

Its natural range comprises the wetlands of fresh or brackish water from India to China. There are three subspecies. Escapes have been recorded in Switzerland, but its close resemblance to female **Mallard A. platyrhynchos** makes it easy to overlook. In Oman, a small number of escapes seem to be breeding (possibly since 1996), with some evidence also of hybridizing with wild **Mallard A. platyrhynchos**. It has achieved semi-domesticated status in parts of its range, hybridizing in captivity with eight duck species.

SA PROHIBITED, pwc, a&h, NGT

Pacific Black Duck *Anas superciliosa*

It has a natural range of the freshwater wetlands of the south-west Pacific, Australia and New Zealand. Although widespread, it is under threat in south-west Australia and New Zealand from the dominant introduced **Mallard A. platyrhynchos**, and so is unlikely to thrive as escape in temperate latitudes where *A. platyrhynchos* is in occupation. In captivity, it has hybridized with 16 *Anatidae* species. It has lived as an escape in Switzerland, but its nondescript appearance could hide its identity.

SA PROHIBITED, pwc, NGT

Pintail *Anas acuta*

Although there is still some debate, its two former (remote island) subspecies are now more often recognised as full species, making the Pintail monotypic. Its Holarctic breeding range comprises the shallow freshwater marshes, lakes and rivers bordered by dense vegetation in open taiga and tundra. It winters south to the equator in some places. Throughout the first half of the 20th century, it was subject to irregular but persistent establishment attempts in UK, and although these may continue, natural range expansion has made such actions unnecessary. South African records may be of natural vagrants, but there it has been introduced privately on artificial swampland. In captivity it has hybridized with 26 duck species.

SA REGULATED, NGT

Hottentot Teal *Anas hottentota*

This species inhabits the wetlands of East and south-east Africa where abundant floating and emergent vegetation exists. There are only a few escape records from Britain and Switzerland, but it has become common in collections. It has hybridized in captivity with only one duck species.

SA REGULATED, pwc, a&h? NGT

Bahama (White-checked) Pintail *Anas bahamensis*

Its natural range comprises the mangroves and brackish waters of the West Indies and north and central South America. It probably is vulnerable as an escape in temperate latitudes, although with over 30 escape records in Britain since the 1980s, breeding attempts are suspected. The Swiss have recorded escapes, and in Israel, a pair from small population at Tel Aviv University has bred. In captivity, it has hybridized with nine duck species.

SA REGULATED, pwc, NGT

African Yellow-billed Duck *Anas undulata*

Its natural range comprises the fresh and brackish waters of East, Central and Southern Africa. It has been recorded as an escape in Switzerland. In captivity it has hybridized with 13 duck species. The northern subspecies *rueppelli* is largely sedentary, but the southern, the nominate *undulata* is locally migratory dependent on the persistence of standing water.

SA PROHIBITED (*rueppelli*), REGULATED (*undulata*), NGT

Garganey *Anas querquedula*

This highly migratory species breeds in the swampy meadows, flooded fields and marshes of the mid-paleartic latitudes. It winters south to the equator, but wanders widely. Those recorded in South Africa are a mixture of known escapes and likely vagrants. It has hybridized in captivity with 11 duck species.

SA REGULATED a&h, NGT

Blue-winged Teal *Anas discors*

Its breeding range is the mid- to high Nearctic, in marshes, pools, lakes and swampy grasslands. It winters south to north-western South America. In Britain, the figure of at least 10 escape records in recent years represents but a fraction of the likely total, because breeding, long expected, was proved for the first time in 1996. It has hybridized with six duck species in captivity. The Dutch captive population exceeds 1,000 birds (Laar *et al.* 1994).

SA REGULATED, pwc, NGT

Cinnamon Teal *Anas cyanoptera*

Its natural range is western North and South America, breeding in a wide variety of open-country fresh and brackish shallow waters possessing abundant floating and emergent vegetation, from sea level to 5000 m asl. Northernmost and southernmost populations tend to migrate to warmer climes where they may encounter the more sedentary populations. There are five subspecies. Birds from migratory northern and southern populations are hardier and more adaptable in captivity than those from sedentary populations, and so are more likely to thrive as escapes. The UK has over 25 escape records of this striking and popular species in recent years, but with 2-4 bp reported, many must go unreported. Switzerland has had several escapes, and it is known to occur in other western European countries, such as Belgium and The Netherlands, although details of formal records have not been forwarded. It has hybridized in captivity with seven duck species.

SA REGULATED, pwc, **NGT**

Shoveler *Anas clypeata*

This species has a vast breeding area across the mid- to high Holarctic latitudes, occupying well-vegetated, mostly shallow water in open country. It winters generally south of the described range. Those recorded in South Africa are a mix of escapes and probable vagrants. The small population at a sewage farm near Riyadh in Saudi Arabia is thought to originate from escapes. In captivity it has hybridized with 12 other duck species.

SA REGULATED, pwc, **NGT**

Cape Shoveler *Anas smithii*

This species prefers the plankton-rich open, largish, fresh or brackish shallow waters of south-west southern Africa. A private attempt has been made to establish the species on an artificial swamp in South Africa in an area where it normally does not occur. In captivity, it has hybridised with only one duck species.

SA REGULATED, pwc, **NGT**

Marbled Duck *Marmaronetta angustirostris*

Its breeding distribution is highly fragmented from Spain to Central Asia due to its narrow habitat preference of abundantly-vegetated freshwater marshes in arid country. Because the majority of such wetlands have been drained, "improved" or diminished this century, this species is declining everywhere. The UK has over 20 escape records in recent years, Belgium several, and France a sizeable number in the south, where a breeding population is suspected. A group of four may be breeding in Oman after escaping in 1998. There are over 1,200 in captivity in The Netherlands. It has hybridized with only one duck species in captivity. Given that the European population in the wild is probably no more than 4,000 individuals, and that the south-west Asian (including Mesopotamia) population may have crashed to 5,000 individuals from six times that number in the 1980s due to the draining of the marshlands in Iraq, the total captive population could represent a vital conservation resource.

SA REGULATED, pwc, **VULNERABLE**

Southern Pochard *Netta erythrophthalma*

There are two subspecies whose habitat requirements and present status differ: *erythrophthalma* of the large, deep waterbodies of East to South Africa, and *brunnea* of the shallow marshes of northern South America. There are Swiss escape records in recent years, and in South Africa there has been a private

attempt to establish *erythrophthalma* in an artificial swampland in an area where it does not normally occur. It has hybridized in captivity with two duck species.

SA REGULATED, pwc, **NGT** (*erythrophthalma*); PROHIBITED, pwc, **VULNERABLE** (*brunnea*)

Rosy-billed Pochard (Rosybill) *Netta peposaca*

Its natural range comprises the swamps and marshes of the south-eastern part of central South America. There are recent escape records from Britain and Switzerland. In captivity it has hybridized with eight duck species.

SA PROHIBITED, pwc, **NGT**

Red-crested Pochard *Netta rufina*

See Full Species Account. It has hybridized with 16 duck species. The Dutch captive population exceeds 1,700 birds (Laar *et al.*1994).

SA PROHIBITED, pwc, a&h, **NGT**

Ringed Teal *Callonetta leucophrys*

This species breeds in tropical swampy and marshy clearings amid the forests of southern and central South America. It is probably vulnerable as an escape in temperate latitudes, yet escapes have bred in Germany, where the population size is unknown. There is a total of more than 25 escape records in UK in the 1990s, and it has also been recorded in Switzerland. It has escaped occasionally in South Africa. In captivity it has hybridized with two duck species of South American origin.

SA REGULATED, **NGT**

Pochard *Aythya ferina*

It prefers well-vegetated swamps, marshes and lakes of the mid-Palaeartic latitudes, wintering mostly well to the south, sometimes into the Tropics. At least from the 1900s, there have been determined attempts to establish this species in Britain as a regular breeder, attempts which may have succeeded, although its present status may be due more to natural range expansion. Its introduction into the UAE may have failed simply because the free-flying birds migrated. The birds in the main reservoir in Andorra are thought to be introductions. It has hybridized with 16 duck species in captivity.

SA REGULATED, pwc, a&h, **NGT**

Ring-necked Duck *Aythya collaris*

Its natural breeding range comprises the northern North American open-country shallow marshes possessing much floating vegetation, and it winters in southwestern USA, Mexico and western Central America. There are two subspecies. Occurrences in the UK may be of natural origin. Belgium has recorded probable escapes. The species has hybridised with seven other duck species in captivity. The Dutch population exceeds 525 birds (Laar *et al.*1994).

SA REGULATED, a&h, **NGT**

Ferruginous Duck *Aythya nyroca*

This species has a fragmented distribution from Central Europe to western China, occupying shallow pools and marshes with abundant emergent and shoreline vegetation. Its long decline continues, loss of shallow marshes being an obvious, but not sole reason, much seemingly suitable habitat being abandoned. The relatively few British records of escapes give but a partial picture. It was introduced into the UAE, but with marked lack of success. Between 1973 and 1989, there was a small feral Dutch breeding population,

probably sustained by escape recruitment from the captive population which exceeds 1,500 individuals (Laar *et al.* 1994). Its present status as an introduction is uncertain, but no breeding has been recorded in the 1990s. In captivity, it has hybridized with 13 duck species.

SA PROHIBITED, pwc, NGT

Tufted Duck *Aythya fuligula*

Its preference is for large, deep freshwater lakes across the Palaearctic, mostly north of the range of the **Pochard** *A. ferina*, although it shares the latter's wintering areas. It has been recorded as an escape in South Africa. It has hybridized with 17 duck species in captivity, including **Cape Teal** *Anas capensis*.

SA PROHIBITED, a&h, NGT

New Zealand Scaup *Aythya novaseelandiae*

It breeds on the large and deep freshwater lakes of New Zealand from sea level to 1,000 m asl. Formerly in decline due to overhunting, its population is now expanding to occupy reservoirs. There are a handful of recent escape records in Britain. In captivity, it has hybridized with only one duck species.

SA PROHIBITED, a&h, NGT

Lesser Scaup *Aythya affinis*

Its natural distribution comprises the inland pools and marshes of open country in northern North America. It winters south to Central America. Escapes have been recorded in Switzerland, but the provenance of any found in Britain would be less clear. It has hybridized with eight duck species in captivity.

SA REGULATED, a&h, NGT

Steller's Eider *Polysticta stelleri*

A high-Arctic breeder of the lakes, pools and tundra bogs of the eastern Palaearctic and western Nearctic, its range is expanding westwards, but Alaskan populations are declining. It winters in unfrozen Arctic waters, south to Japan, and east to the White Sea, Varangerfjord and the Baltic. It has become more popular recently in collections. Switzerland has escape records. The Dutch captive population is around 25 birds (Laar *et al.* 1994).

SA REGULATED, a&h, NGT

Bufflehead *Bucephala albeola*

Its natural range comprises the boreal shallow lakes of northern North America. It winters south of the ice-cover or along coasts and as far south as Guatemala. Escapes have been recorded in Switzerland, and almost certainly there have been escapes from the more than 500-strong Dutch captive population (Laar *et al.* 1994). It has hybridized in captivity with one duck species.

SA REGULATED, pwc, a&h, NGT

Barrow's Goldeneye *Bucephala islandica*

This species has a disjunct range, being found in Iceland, Greenland Labrador and southern Alaska to northern California, in open and wooded country, breeding on lakes, pools and rivers from sea level to 3,000 m asl. It winters on coasts. The Icelandic population has a male:female ratio of 2:1. In captivity,

it dominates **Goldeneye** *B. clangula*, and hybridizes with it. There have been more than 10 UK escape records, likely a considerable underestimate. The Dutch captive population is almost 500 birds (Laar *et al.* 1994).

SA REGULATED, pwc, a&h **NGT**

Goldeneye *Bucephala clangula*

Its natural range is the northern Holarctic. It is a tree-hole nester beside lakes and pools surrounded by conifers, and it has been re-established in such habitat in Scotland, but using nestboxes. The Dutch breeding population may be partly of natural origin, but from the 850-strong (a conservative figure) captive population (Laar *et al.* 1994), escapes certainly will continue. It can wander widely on migration, but generally moves to ice-free waters. There are two subspecies. It is subordinate to, and has hybridized with **Barrow's Goldeneye** *B. islandica* in captivity, where both species have been recorded as destroying clutches of their own and other species.

SA UNCATEGORIZED, pwc, a&h, **NGT**

Hooded Merganser *Lophodytes cucullatus*

This species, a tree-hole nester from eastern and western North America, breeds by small lakes and fast streams. It migrates south to unfrozen waters. There are two subspecies. This attractive small species has become common recently in collections, the UK having more than 15 recent records, and Switzerland several. The Dutch captive population exceeds 1,600 (Laar *et al.* 1994).

SA UNCATEGORIZED, pwc, a&h, **NGT**

Argentine Blue-billed Duck *Oxyura vittata*

This secretive species has a natural range comprising shallow fresh waters and marshes with abundant bordering vegetation across South America below the Tropic of Capricorn. Although Britain has only two escape records, one was for an individual which returned in spring to the same site for three consecutive years. Unreported birds could, therefore, easily remain so while breeding annually.

SA REGULATED, pwc, **NGT**

White-headed Duck *Oxyura leucocephala*

Its range is highly fragmented, stretching from south-west Spain to north-west China. It breeds on fresh or brackish small lakes, pools and marshes where ample shoreline vegetation exists. A partial migrant, it winters on large waterbodies, continental populations moving to Asia Minor, Iran and Afghanistan. It has hybridized in Spain with escaped **Ruddy Duck** *O. jamaicensis* originating from the UK. Spain and France have eradication programmes for **Ruddy Duck** (qv), but until the population in the UK has been significantly reduced, French and Italian plans to re-establish **White-headed Duck** are on hold. The UK has more than 10 recent escape records. The Dutch captive population exceeds 325 birds (Laar *et al.* 1994).

SA REGULATED, pwc, **VULNERABLE**

Maccoa Duck *Oxyura maccoa*

Its natural range is disjunct, comprising shallow freshwater reedbeds, usually well above sea level in the Ethiopian Highlands, East Africa and southern Africa. It is believed to be subordinate to **Ruddy Duck** *O. jamaicensis*, spreading from European escapes. One example of **Ruddy Duck**, origin unknown, may

already have encountered the northern population. Escapes have been recorded in Switzerland, and there has been an private establishment attempt in South Africa in artificial marshland in an area it is not normally encountered.

NGT

Ruddy Duck *Oxyura jamaicensis*

See Full Species Account. It has hybridized with two duck species, including **White-headed Duck** *O. leucocephala*.

SA PROHIBITED, a&h, NGT

Moorhen *Gallinula chloropus*

The 12 subspecies occupy a vast range encompassing most of the temperate and tropical regions where waterbodies with abundant emergent and fringing vegetation exist. In South Africa, a private establishment attempt has introduced the species, in artificial swampland, to an area where it does not normally occur.

NGT

Purple Swamphen *Porphyrio porphyrio*

There are at least 13 subspecies, occupying a vast natural range stretching from southern Europe south to South Africa and east to south-east Asia, New Zealand and Samoa. It breeds in fresh and brackish waters fringed by reeds and other dense vegetation. Some west Mediterranean populations are re-establishments. The five recent UK escape records are of two different subspecies. (19th- and early 20th-century UK records are quite numerous and apply mostly to "souvenir" birds reaching the UK by ship). Its introduction in the UAE seems not to have been viable.

NGT

Crane *Grus grus*

This large species has a natural range stretching from Fennoscandia to north-east Siberia, in which it breeds in shallow wetlands, forested swamps, bogs and sedge marshes. It uses regular flyways to migrate through food stopovers to suitable wetlands, some in the tropics. Its apparently eccentric introduction to the UAE may have ended when the free-flying birds migrated.

pwc, NGT

Sarus Crane *Grus antigone*

This species has become commensal with man across part of its range, which comprises canals, ditches (north-west India), temporary and permanent wetlands (SE Asia). In Australia, it prefers shallow fresh marshes and fresh and brackish flooded grassland. There are three subspecies. The six UK records are likely an inaccurate reflection of its occurrence as an escape.

NGT

South African (Grey) Crowned Crane *Balearica regulorum*

The two subspecies occupy the savanna wetlands of East Africa and eastern South Africa. The free-flying population in the UAE seemed to have persisted for some time.

NGT

(Black) Crowned Crane *Balearica pavonina*

This species occupies a relatively narrow belt of Sub-Saharan Africa from West Africa to Sudan and Kenya,

utilizing grassland temporary and permanent shallow wetlands. It has been recorded irregularly as an escape in Italy, but some of this species may have been introduced to the UAE along with the **South African Crowned crane** *B. regulorum*.

NGT

Demoiselle Crane *Anthropoides virgo*

Until recently in decline, this species has begun to show the ability to adapt to agricultural land in Ukraine and Kazakhstan, instead of remaining tied to the disappearing savanna steppe found from eastern Europe to north-east China. There are two subspecies. There have been some 20 records in UK since the 1960s, some of which may have been vagrant wild birds. An attempt was made to introduce this species in the UAE.

NGT

Grey-headed Gull *Larus cirrocephalus*

This species has scattered, mostly coastal, populations from Ecuador to Peru and Brazil to Argentina, but inland populations are commoner along rivers, at lakes, marshes and rocky areas of West Africa, Ethiopia, Mali, South Africa and Madagascar. It, and some other small gull species have become increasingly popular as large-aviary free-flying exhibits, but the total of four British escape records, likely a severe under-recording, is less of a surprise than the absence of records for other, distinctive gull species which are known to have escaped and wandered.

a&h, NGT

6.3 The Compilation of an International List of References on Invasive and Introduced Organisms

Despite the fragmentary nature of the data on introduced waterbirds, many very specific studies have been carried out across the world. Feedback from respondents indicated that there was a keenly-felt need for a single international list of references. The opportunity was taken to ask respondents to supply relevant recent references, and to this collection were added references cited in those published papers and books consulted during the project.

This glossary forms the separate document entitled *References to Invasive and Introduced Organisms*. Although many of the references in are in English, others were mostly in French, Dutch, German, Italian, Latvian, Russian and Spanish. Transliterations of the meanings of the Latvian and Russian titles have been substituted for the original languages. It would be valuable to regularly update this document, in electronic form, as a useful tool for the many key workers researching introduced organisms.

The above document is composed of three sections, none of which are mutually exclusive.

Introduced Waterbird Species - references which are entirely, or mainly concerned with introduced waterbirds. **Introduced Bird Species** - references which are mainly or partly concerned with introduced bird species, but also cover subjects such as hybridization, disease pathology, aviculture and breeding of bird species for hunting releases. **Invasive and Introduced Organisms** - references which generally are concerned with organisms other than birds and which have been introduced - beyond their natural range or are invasive.

7. INTRODUCED WATERBIRDS: GOVERNMENTAL AND NGO PERCEPTIONS

Responses were obtained for 77 of the 120 countries to which the questionnaires were sent and a further seven answers have been promised (**Appendix 4**). The two versions differed in the expected level of detailed knowledge of the issue of introduced waterbirds of the respondent. For each country, the questionnaires asked for evidence of the presence and status of introduced waterbirds, whether there were any protection measures in place, whether any conservation legislation was implemented and whether any countermeasures had actually been taken to deal with such waterbirds.

In this section the answers obtained from the questionnaires are summarised to highlight major findings, any factors that appear to have a bearing on the presence and status of introduced waterbirds in the AEWA area countries, as well as legislative and practical measures implemented to combat their presence. The many gaps in the information received from many correspondents will be apparent.

7.1 Population Estimates

The principal concern about introduced waterbirds is that self-sustaining and increasing populations of introduced species may present risks to indigenous species. From correspondence and from examination of the literature, it is apparent that almost always feral populations becomes self-sustaining only after a period in which numbers are maintained by escape recruitment generally from zoo collections or private collections of free-flying waterbirds. There is thus a clear need for the timely collection of population estimates as it is during the establishment phase that remedial measures are best attempted. At present, many introduced waterbird population estimates are probably underestimates because few of the birds have been recorded often and thoroughly enough to give much confidence in the results. This near generic problem may well lead to the importance of any incipient problems being recognised only once the introduced populations are well established. There are a few exceptions, **Egyptian Goose** *Alopochen aegyptiacus* in The Netherlands and **Canada Goose** *Branta canadensis* in Britain are well monitored.

7.2 Factors Affecting the Presence and Spread of Introduced Waterbird Species

There is a broad relationship between the wealth of a country and the existence of introduced waterbird species. Collections of birds, captive breeding of birds and free-flying escapes frequently leading to breeding in an alien environment tend to be associated with wealthier countries.

The increasing popularity of bird-collections has increased the demand for exotic waterbirds, and has been accompanied by an increasing escape rate. It should be a priority to reduce escapes significantly before introduced populations can establish themselves. Many more waterbird species now escape than they did in the 1980s, because many more exotic species are captive-bred. The October issue of *Aviornis* **143** lists over 58,000 exotic birds for sale, 1,051 collections and many commercial breeders in Belgium and The Netherlands. For those introduced waterbird species which are present, and often breeding in good numbers, there is some suggestion that birds recorded on the periphery of the main population distribution have arrived there from the core of the main introduced population, and not solely from local escapes (*e.g.* **Mandarin Duck** in Romania and European Russia, **Canada Goose** in Latvia and France). Furthermore, from the increase in wintering numbers south of summering or breeding concentrations, birds descended from non-migratory captive or feral stock probably have rediscovered seasonal movement or migration as a survival strategy (*e.g.* **Egyptian Goose**, **Mandarin** and **Ruddy Duck** *Oxyura jamaicensis*).

In general, the status of species such as **Sacred Ibis** *Threskiornis aethiopicus* in France which escape into suitable environments and which do not have specialist habitat and food requirements is improving. Longer-established introduced species such as feral or hybrid **Greylag** *A. anser* and **Canada Geese** in general have thriving populations, thus increasing the chances of interactions indigenous and other introduced species.

7.3 The Threat Posed by Introduced Waterbird Species to Indigenous Waterbird Species

Interpretation of the responses has indicated that in many countries there is a chance of a significant or locally widespread threat, but given the speculative nature of any prediction from fragmentary data the likelihood of each threat materialising is uncertain. Future studies should be designed to improve the existing baseline data quality to ensure that future judgements are based on better data. To allow firm predictions to be made much more would have to be known about the biology of the species in their own and alien environments. In particular the factors that determine their population growth would have to be much better understood.

7.4 Governmental Responses to Introduced Waterbirds

Paradoxically, some countries such as Botswana which have no introduced species problem have planned sound, comprehensive legislative countermeasures. Importation essentially is banned, as is keeping birds in captivity and release into the wild. Countries which have introduced a swathe of legislation through the years can find it difficult legally to implement any countermeasures. Eire, for example, has several introduced species on its protected list and Italy has legislation banning imports but no curb on releases. Furthermore, many countries have countermeasures within their conservation legislation, but no funding nor physical resources to implement it. The AEWA forum seems ideal for raising the need to harmonize legislation, at least in general aims and content.

In this section some laws are listed that are not strictly relevant to the issue of introduced waterfowl, but which are pieces of legislation that could be used to limit the importation or provide the framework for controlling populations of introduced species. There are precedents for this. Eire, for example, used legislation designed to deal with animal health, disease and quarantine to control the imports of non-native species.

The details below have been supplied by respondents. Where Range states are not listed, respondents have not supplied the information. In some instances further detail can be obtained from the database but generally most of the relevant information has been summarised in this text.

7.4.1 Africa

Botswana

The respondent supplied a copy of the Botswana Fauna Conservation Act, which provides for the conservation of wild animal life, including birds. The Act defines reserves and controlled hunting areas and defines protected game in 102 Sections and seven Schedules. There is a sound framework for any refinements and changes in the future. There is a general prohibition on introductions of any kind. The regulations seem practical and the Attorney-General's office is well-practised in their implementation.

Côte d'Ivoire

No evidence has been submitted of any officially implemented policy towards introduced species.

Eritrea

The Eritrean conservation legislation has been inherited from Ethiopia. No evidence has been submitted of any officially implemented policy towards introduced species.

Guinea-Bissau

There is a hunting law which protects some of the species on the AEWA list, but although there is manpower, there are neither physical resources nor funding to allow the law to be applied and enforced.

New laws are in preparation covering the protection and exploitation of wildlife. No evidence has been submitted of any officially implemented policy towards introduced species.

Kenya

Of c. 77 statutes relating to the environment, the most important for waterbird conservation are probably the Wildlife (Conservation & Management) Act and the Water Act. Kenya is a signatory to the Ramsar Convention and has listed two sites.

Madagascar

The main conservation benchmarks used as an authority or precedent in Madagascar are the CITES provisions. Particular waterbird species designated as needing protection are **Greater Flamingo** *Phoenicopterus ruber*, **Lesser Flamingo** *Phoenicopterus minor* and **Great Egret** *Egretta alba*. No evidence has been submitted of any officially implemented policy towards introduced species.

Mauritania

Mauritanian forestry law prohibits the introduction of all fauna and flora without a preliminary study. All introductions must comply rigorously with the conditions laid down for each case by the Ministry of Environment.

Namibia

Namibia has a strict permit-control section to prevent the import and keeping of invasive aliens. Consequently, for example, the importation of **Mallard** *Anas platyrhynchos* is prohibited. Species which pose an uncertain risk are allowed in to the country but must be kept in wire-enclosed cages. There are no active countermeasures against introduced species, but field staff are sometimes instructed to capture or shoot alien species.

Seychelles

Strict quarantine measures are in force for all non-native species. The actual or proposed introduction of any species liable to become feral are sufficient grounds for banning or controlling it.

South Africa

The Cape Nature Conservation organization and supporting bodies believe that South Africa will legislate to classify non-native waterfowl species as REGULATED or PROHIBITED (**Section 9.1.11**).

In the Western Cape Province, the Western Cape Province Ordinance 19/74, the Environmental Conservation Act (73/89), Animals Protection Act (71/62), and the National Parks Act (54/71) are the main conservation legislation. Ordinance 19/74 section 31 states that "...no person shall without a permit authorizing him to do so, release any exotic wild animal in the Province." Section 18(1) states "If the Director is of the opinion that any wild animal found on any land is detrimental to the preservation of fauna or flora, is likely to be dangerous to human life, is wounded diseased or injured, is causing damage to crops or other property whether movable or immovable, of any person, or should be hunted in the interests of nature conservation, he may, with the approval of the Administrator, cause such an animal, of such number or such species as he may determine, to be hunted on such land or on any land to which such animal, or in the case of a species of wild animal, the number of such species determined by him may flee while being pursued for the purpose of being hunted in terms of this section.

The permit system for keeping ornamental waterfowl is being amended to disallow the introduction, breeding and keeping of **Mallard**, because of the threat facing **African Yellow-billed Duck** *A. undulata*

from successful hybridization with the dominant **Mallard**. An attempt is being made to extirpate **Mallard** and its hybrids from Western Cape Province.

In Mpumalanga Province, the Mpumalanga National Conservation Act 10/98 lists all waterbirds as protected except those categorized as "common game" which may only be hunted if a permit is granted, and then only in a fixed open season. These seasons are promulgated, as are closed seasons.

Zambia

The Wildlife Act (Zambia) states that no one is allowed to collect eggs or live birds. Zambia is a signatory to CITES and the Ramsar Agreement. Two locations have been designated Ramsar sites to further protect waterfowl, especially **Wattled Crane** *Grus carunculatus*, **Saddle-billed Stork** *Ephippiorhynchus senegalensis* and duck species. Only by special licence from the Minister (probably of the Environment) may any stork be hunted. A special licence is also required to hunt **Wattled Crane**, **Sacred Ibis**, **Glossy Ibis** *Plegadis falcinellus* and certain other species. This approach has been adopted to counter indiscriminate hunting (consumptive utilization) of these species by encouraging selective competition among hunters, thus giving stronger protection to the majority in most locations. The Act also prohibits the introduction of non-native species, as a general measure, and provides special guidelines (countermeasures) to be followed in the event that introduced species are found.

7.4.2 America

Canada

The Wild Animals and Plant Protection Act contains general provisions such as the Migratory Birds Regulation S.33 which states that: "No person shall introduce into Canada for the purposes of sport, acclimatization, or release from captivity a species of migratory bird not indigenous to Canada except with the consent in writing of the Director".

7.4.3 Asia

Uzbekistan

The relevant conservation legislation is in the Convention on Biodiversity Conservation, Rules of Hunting in the Republic of Uzbekistan. The introduction of wild animals is prohibited by the Law on Protection and Use of Fauna in the Republic of Uzbekistan.

7.4.4 Asia Minor and the Middle East

Israel

Introduced species are not seen as a problem yet, and so they have not been brought to the attention of the Nature Reserves Authority. Consequently, there are no measures to counter any such introductions.

Lebanon

Protection measures comprise the law on hunting, the promulgated bans on hunting and the projected protected areas in Lebanon. No evidence has been submitted of any officially implemented policy towards introduced species.

Turkey

The regulations on introduced species are contained in the Turkish Terrestrial Hunting Legislation, provincial autonomous legislation and regional catalogues of endangered species. This legislation allows

for control measures but authorization for their implementation is complex and it is therefore implemented as well as resources allow.

United Arab Emirates

From 1976-1991 there was a ban on hunting birds except for **Cormorant** *Phalacrocorax spp.* There are few, if any restrictions on the importation of birds into the UAE. No evidence has been submitted of any officially implemented policy towards introduced species.

7.4.5 Europe

Austria

Legislation for conservation and hunting (thus also for waterfowl) is regulated separately by each Austrian Bundesland, in each of which “wild geese” and “wild ducks” are hunted, protection being applied during the breeding season. All other species (except non-native introduced species) not listed in the legislation are also protected. In almost all Bundesländer, the introduction of non-native species is prohibited in general legislation. Furthermore, Austria must comply with the EC Birds Directive concerning introductions.

Belgium

Conservation laws in Belgium prevent the hunting of all swans and geese and generally are well-respected. Introduced swans and geese therefore have thrived to the increasing concern of responsible bodies. Two lobbies have developed. One lobby wants to establish a limited hunting season to help prevent further expansion, while the other wants to gather information first through an extensive ringing programme, so that movements can be better known before any countermeasures are decided. Seemingly, official action awaits some form of consensus between the lobbies. Meanwhile, the populations of introduced waterbirds continue to increase. Belgium is signed up to the EC Birds Directive concerning introductions.

Cyprus (Federal Republic)

In March 1988, Cyprus ratified the Bern Convention including Law 88 which states that all AEWAL-list waterbirds are protected except for specified members of the *Anatidae*, *Charadriidae* and *Scolopacidae*.

Various other laws and measures on conservation have been adopted by the Federal Republic of Cyprus which could potentially be used in relation to introduced species. These include the Law of Protection of Health and Welfare of Animals (1994), the Contagious Diseases (Animal) Law (319/1987), The Importation and Permission to Use Animals, Animal Derivatives, Biological Products and Animal Feed Order (250/1990), The Game and Wild Birds Law (39/1974), CITES 1973 (Law 20/1974), The Convention Concerning the Protection of World Cultural Heritage and Natural Heritage 1972 (Law 23/1974), The Convention of the Conservation of the European Wildlife and Natural Habitats 1979 (Law 24/1998), The Convention on Biological Diversity 1992 (Law 4(III)/1996).

Eire

As a form of pest control, there is an open season for **Greylag Goose** and **Canada Goose** in September except in certain localities where shooting can take place from October to January but to minimize the illegal hunting of other goose species permits have to be obtained. Nevertheless, **Ruddy Duck** is on the protected list, and so enabling legislation may be required before Eire can implement any eradication plan. The import of exotic waterfowl into Eire is subject to licensing under the 1976 Wildlife Act as well as a variety of animal health, disease, control and quarantine regulations.

Finland

Hunting of **Canada Goose** has been allowed, with special permission, for some years, but it is possible that introduced **Mute Swans** *Cygnus olor* might be hunted in future, although this would be controversial. The annual **Canada Goose** bag is of about 1,000, but game statistics reporting has deteriorated in the 1990s.

France

French Conservation Statutes are aimed at waterbirds of conservation concern, but because of their broad outlook they contain contradictions which have become more apparent with time. Fervent advocacy of narrow interpretations of the term "introduced" allows some introduced species to be protected. Each introduced species seems to be subject to individual interpretation leading to **Canada Goose** being allowed to thrive while **Ruddy Duck** is shot in some areas (Pierre Yésou, ONC Nantes; Geneviève Barnaud, Museum National d'Histoire Naturelle; Bernard Deceuninck, LPO Rochefort - *per. comms*).

Germany, Schleswig-Holstein

No information has been received about legislation from the rest of Germany. National protection measures in Schleswig-Holstein function through the Bundesnaturschutzgesetz (setting minimum national protection levels for feral animals) and the Landesnaturschutzgesetz (setting Land protection levels for habitats such as moors, marshes, elder swamps *etc*). The Landesnaturschutzgesetz forbids the introduction of non-native animals to Schleswig-Holstein.

Georgia

Georgia is a signatory to at least three International and four National items of conservation legislation and agreements which have some bearing on introduced species. It has ratified the Ramsar Convention (28 July 1996) and signed the Convention on the Protection of the Black Sea against Pollution (21 April 1992) and the Rio Convention on Biological Diversity (2 June 1994). It has also enacted the national Law on Environmental Protection (1996), which states the general requirements applying to environmental protection, the Law on Protected Areas (1996) which is harmonised to EU legislation documentation standards, the Law on the Protection of Animals (1996) and the Law on Kolkhei Protected Territories and their Management (1998) which covers amongst other things Ramsar site protection requirements.

A summary of Georgian Conservation Laws has been provided under separate cover to DETR and further details can be obtained on the Internet at a site which was being updated in September 1999
GNFP:HYPERLINK <http://server.parliament.ge/GOVERNANCE/GOV/TERRA.html>.

Hungary

The most recent conservation legislation is contained in Act 12/1993.(III.31) KTMr. Apart from the introduction and maintenance of **Pheasant** *Phasianus colchicus* populations by hunters and two pairs of **Mute Swan** introduced in the 1960s into NW Hungary, Hungary has no established custom of introducing non-native species even though there appears to be no legislation forbidding it. It is possible that some introductions have not been documented.

Iceland

All birds in Iceland are protected by law (64/1994), but hunting is allowed for 11 species on the AEWA (Regulation 456, 17 August 1994). No evidence has been submitted of any officially implemented policy towards introduced species.

Italy

There is no law to prevent introductions into the wild, but there is a law restricting importations but details have not been given. If an import permit is granted, there is no sanction against releases.

The Netherlands

There is a thriving waterfowl collection industry in The Netherlands. An idea of the level of the problem can be gained from the Dutch Pheasants and Waterfowl Association (Aviornis International Nederland, Arthur van Schendelstraat 27,5421 RE Gemert, The Netherlands) which inventories its members' collections, but compliance is voluntary. The 1991 figures from only 33% of collection owners reveal that over 25,000 exotic waterfowl were kept in captivity, an inevitable source of escapes. (The magazine *Dutch Birding* lists sightings of exotic waterfowl most months).

Legislation concerning non-native species has been strengthened in recent years, partly due to a large increase in the Bullfrog population. In 1993, new provision under the Nature Conservation Act determined that the Minister for Agriculture, Nature Management and Fisheries could forbid the purchase, sale, stocking or releasing of animals, eggs, pupae or larvae of non-native wild species.

A new regulation, under article 54 of the Game Act, identifies exotic species and came into force in 1995. It adds Egyptian Goose (*Alopochen aegyptiacus*) and Ruddy Duck (*Oxyura jamaicensis*) to the list of non-native fauna, allows for control of these species on someone else's property and allows for the use of game licence holders for this purpose. The control may only take place on the order of the Ministry of Agriculture, Nature Management and Fisheries on the grounds of and with due consideration of the conditions and limitations laid down in the order.

The new Flora and Fauna Act includes a total ban on the release of animals or their eggs that do not naturally occur in The Netherlands in the wild and a ban on planting or sowing certain plants (article 14). The Minister can also rule that the numbers of specified animals must be limited in specified areas. The Flora and Fauna Act replaces the Bird Protection Act, the Game Act, the Act of Threatened Exotic Species (which implements the CITES agreement) and part of the Nature Conservation Act.

Monitoring of compliance is carried out by the regular police forces and by Ministry specialists. However, there is an acknowledgement that there are practical problems in the implementation of such legislation and that the ban is mainly a declaration of principle from the Government as well as a legal framework for introductions into the wild by nature conservation agencies, research institutes and zoos.

Norway

At present there are no legal collections of wild ducks, geese or swans in Norway. The Norwegian Wildlife Act contains regulations on importation, captivity and introduction of species. Conservation measures are almost 100% effective at stopping all new introductions. All species are protected with the exception of nominated game and waterbird species in the hunting season. **Canada Goose** is subject to an open season.

Slovenia

The 1983 Decree on the Protection of Endangered Species of Wild Animals forbids the introduction of new species into the wild where a threat may exist to indigenous species. The 1999 Nature Conservation Act gives additional protection to the full range of species. Article 17 forbids introductions, tight exception clauses referring to natural balance and biodiversity. Non-native game species are similarly covered. Hunting is considered to be the only valid reason for releasing artificially-reared stocks into the wild. **Mallard** yearly bag totals reflect the annual release numbers, between 6,000 and 12,000 birds per year from 1986-1998.

Slovakia

Appendix 4 of the latest legislation, the Slovak Ministry of Environment Decree 93/1999 on Protected Plants and Animals, and on the Evaluation of Protected Plants, Animals and Trees lists the AEW species deemed in need of protection.

Non-native species protected by the Bonn Convention (**Appendix 5** to Decree 93/1999) are also protected, as part of binding international agreements through Act 287/1994. Paragraph 3 of Decree 93/1999 gives further protection to designated animals at all stages of their life cycle, to animals in authorized collections and to habitats from unauthorized manipulation and from non-native species likely to threaten native ecosystems. It permits the latter's elimination. Keeping records of the breeding or control (allowed if there is a risk of disease) of protected species is mandatory by district authorities. Slovakia adheres to CITES obligations. Additional guidelines concerning introductions and invasive species are being developed.

Under paragraph 26 of Act 287/1994, the nature protection body can withdraw protection to a species after evaluation of the circumstances for reasons of hygiene, veterinary importance or if a property needs to be repaired or maintained (*e.g.* bats living in a building). Species which are not listed as being protected may be caught or killed subject to agreement with nature conservation or hunting authorities.

Spain

There are several pieces of Spanish legislation and data sources that are relevant to the issue of introduced waterfowl: the Washington Convention (CITES), Directive 79/409/CE, Law 4/89, Royal Decree 439/90, the species considered "Endangered" in the Spanish Vertebrate Red Data Book and some provincial autonomous legislation and regional catalogues of endangered species. This system is generally regarded as effective. Protection has led to increased eagle and vulture populations. Spanish countermeasures have been effective in controlling **Ruddy Duck**.

Switzerland

The Federal Act on Wildlife, Countryside and National Heritage Protection with Ordinances (1966) which forbids the introduction of non-native waterbirds also contains measures to protect habitats important for waterbirds, such as fens. The Federal Act on Animal Welfare (date not given) forbids the release of captive animals, and makes the provision of suitable enclosures mandatory. The Decree relating to Reserves for Waterbirds and Migrants of International and National Importance with Inventory (1991) states that in most sites hunting is wholly or partly forbidden, and that recreational activities are forbidden or curtailed, although the latter are not well observed. Some international sites are not federally listed, but rationalization is under way. Breaches of these Acts are rarely prosecuted but there have been Swiss ornithological initiatives to increase awareness of introduced bird species.

Measures to control introduced populations lie within the competence of federal and cantonal hunting authorities and already some actions have been taken such as the egg-control of **Mute Swan** and shooting of a variety of hybrid ducks (**Mallard**/domestic duck/**Muscovy Duck** *Anas platyrhynchos/A.p. forma domestica/Cairina moschata*).

United Kingdom

The UK is signatory to the UN Convention on Biological Diversity, the Bern Convention, the Bonn Convention and the AEW, all of which have sections concerning the prevention, control or eradication of non-native species. The AEW also contains a number of Action Plans to deal with perceived actual or potential threats to indigenous waterbird species. The UK is also subject to EC Directive 79/409 on the Conservation of Wild Birds, Article II of which requires Member States to ensure that introduced bird species will not prejudice the indigenous local flora and fauna. The UK Wildlife and Countryside Act (1981) Section 14 makes it an offence deliberately or accidentally to introduce any species which is not ordinarily resident nor a regular visitor. However, the practical application of the relevant measures from

the above tranche of legislation and agreements is weakened by the presence of loopholes (Holmes & Simons 1996) which allow no legal barrier to prevent the spread by feral naturalization of species which occur naturally, such as **Barnacle Goose** *Branta leucopsis*, whose wild populations winter in the UK and northwest Europe. Holmes and Simons note that existing legislation is not always well implemented (*e.g.* **Bar-headed Goose** *Anser indicus*).

United Kingdom (Jersey)

The Protection of Birds Act (Jersey) 1963 protects all species except certain passerines such as **Starling** *Sturnus vulgaris* which can be designated as pests. Replacement legislation in preparation will incorporate the 1963 Act but will protect all flora and fauna, and will amend the unprotected passerine list to include **Jay** *Garrulus glandarius*. The 1963 Act and associated amending legislation prohibit the release of non-native species, including in the 1980s a prohibition of releases of **Pheasant** *Phasianus colchicus* for shooting. However, wildfowl are not subject to this legislation, and introductions may not have come sufficiently to the notice of the authorities.

Table 1 Summary of the Range States' legislation dealing with introduced waterbird species. The assessment is subjective but is based on the responses to the questionnaires received up to August 1999 - see text for further details about the quality and effectiveness of the legislation.

Continent	Range State	Legislation Quality	Legislation Effectiveness
Africa	Botswana	✓✓✓	✓✓✓
	Côte d'Ivoire	None	None
	Eritrea	NK	NK
	Guinea-Bissau	✓	✓
	Kenya	✓✓✓	✓✓
	Madagascar	NK	NK
	Mauritania	✓✓	✓✓
	Namibia	✓✓✓	✓✓(P)
	Seychelles	✓✓✓	✓✓✓
	South Africa	✓✓✓	✓✓✓
	Zambia	✓✓✓	✓✓
America	Canada	✓✓✓	✓✓
Asia	Uzbekistan	✓✓✓	✓✓
Asia Minor & Middle East	Israel	✓✓	✓✓(P)
	Lebanon	✓✓	NK
	Turkey	✓✓✓(P)	✓✓
	United Arab Emirates	None	None
Europe	Austria	✓✓✓	✓✓
	Belgium	✓✓✓	✓✓
	Cyprus (FR)	✓✓✓	✓
	Eire	✓✓	✓✓
	Finland	✓✓✓	✓✓✓
	France	✓✓	✓✓
	Georgia	✓✓✓	✓✓(P)
	Hungary	✓✓	✓✓✓
	Iceland	✓✓✓	✓✓✓(P)
	Italy	✓✓	✓✓
	Norway	✓✓✓	✓✓✓
	Slovenia	✓✓✓	✓✓✓
	Slovakia	✓✓✓	✓✓
	Spain	✓✓✓	✓✓
	Switzerland	✓✓✓	✓✓
The Netherlands	✓✓	✓✓(P)	
United Kingdom	✓✓✓	✓✓	
UK (Jersey)	✓✓✓	✓✓	

Key NK = Not known, (P) = Probably, ✓ = Some or low, ✓✓ = Mixed or partial
 ✓✓✓ = Good or high.

8. GAPS IN COVERAGE IN THE AEW A AREA

The questionnaires have been sent to all countries within the AEW A area but not all had responded by August 1999. In this section, the AEW A status of each country for which no responses were obtained is given as well as an estimate of the number of introduced waterbirds that they may hold and a brief reasoning for the estimate. The estimated number of introduced waterbirds in a country is based primarily on the number of such birds in adjacent or similar countries for which responses have been obtained, but these estimates have been and will continue to be updated until the end of the project from a variety of sources including personal contacts and distributional atlases. The latter have often proved to be disappointing sources of information as often non-indigenous species are ignored or do not clearly indicate the population status of the species. None of the national avifauna lists available referred to introduced waterbird species (*e.g.* Meininger & Atta (1994) for Egypt and van Perlo (1995) for Tanzania). The likely importance of any absence of information is highlighted.

A respondent to the questionnaire has suggested that in developing nations where much of the population has to survive on a subsistence economy that all available sources of protein are exploited. This makes it difficult for introduced waterbirds to establish themselves and thus estimates of the likely number of introduced species in such countries have tended to be kept low unless very definite information to the contrary exists. Estimates are also kept low for arid countries where suitable habitat is rare. Estimates tend to be made higher for more developed nations where bird collections tend to be more common.

The estimates of introduced waterbird species per country in the tables in this section are based on the numbers of such species reported for countries of broadly similar size, climate, location and habitat types. The figures cited after each table as the likely maximum number of introduced waterbird species to be encountered acknowledge that the data supplied by responding countries held some surprises, and that there is therefore some chance that the highest estimate in each table could be exceeded. Apart from the developed nations included in the tables, the average number of introduced waterbird species in all the other countries is probably less than one. Of the countries yet to respond, probably only in Denmark is there a significant chance of an introduced waterbird species impacting an indigenous waterbird species, given the indigenous species that are likely to be present.

8.1 Africa

The largest geographical information gap lies in Africa (**Table 2**). It would be particularly useful to obtain information from North African countries. A response has been promised from Egypt. This should be particularly valuable as the Nile delta is an area where introduced species could thrive, especially amongst the declared nature reserves.

It is not thought that more than four species of introduced waterbird are present in any of the non-responding countries. In most cases it is unlikely that more than one species of introduced waterbird will be present and it has not been possible to obtain any evidence of any impact on the local waterbirds by these species.

Table 2 The AEWA status (S=signatory, NS=non-signatory) and number of introduced waterbird species (IWS) estimated to be present in each country in Africa for which no questionnaire was returned.

Country	Signatory Status	Number of IWS (estimate)
Algeria*	NS	1-3
Angola	S	0-1
Benin	S	0-1
Burkina-Faso	NS	0-1
Burundi	S	0-1
Cape Verde	NS	0-2
Central African Republic	S	0-1
Chad	S	0-1
Comoros	NS	0-1
Congo	NS	0-1
Djibouti	NS	0-1
Egypt*	S	1-4
Equatorial Guinea	S	0-1
Gabon	S	0-1
Libya*	NS	1-2?
Malawi	S	0-1
Morocco*	S	1-3
Niger	NS	0-1
Nigeria	NS	1-4
Sao Tome/Principe**	S	0-1
Sierra Leone	NS	0-1
Sudan	S	0-1
Tanzania (Un Rep)	S	1-3
Tunisia*	S	1-3
Western Sahara	NS	0
Zaire	NS	0-1

* North African country liable to be visited by vagrant European introduced waterbirds e.g. Morocco and **Ruddy Duck**

** Even though it is unlikely that introduced waterbirds would reach Sao Tome/Principe, if they did so they could be a serious threat to some of the large number of endemics present.

8.2 America

Information on Greenland should be supplied as part of the awaited Danish response, so there should be no gaps in America.

8.3 Asia

There are no gaps in Asia.

8.4 Asia Minor and Middle East

Several countries in this area probably have a number of introduced waterbird species on artificial waterbodies or on private estates, much as in the United Arab Emirates and Oman. The area has many wealthy individuals, some of which own large bird collections. Nine countries have not yet responded to the questionnaire (**Table 3**).

Table 3 The AEWA status (S=signatory, NS=non-signatory) and number of introduced waterbird species (IWS) estimated to be present in each country in Asia Minor and the Middle East for which no questionnaire was returned.

Country	Signatory Status	Number of IWS (estimate)
Bahrain*	NS	3-6
Iran (Islamic Rep)	S	0-2
Iraq	NS	0-1
Jordan	S	0-2
Kuwait*	NS	2-8
Palestine	NS	0-1
Qatar*	NS	3-6
Syria	NS	0-2
Yemen	NS	0-1

* Countries with waterbird collections that often include non-native species which could escape.

It is not thought that more than eight species of introduced waterbird are present in any of the non-responding countries and in most cases it is unlikely that more than two are present. No evidence has been obtained of any impact on local waterbird populations by these species. There is the danger that the waterbird collections in the area may lead to escapes which if they establish themselves could spread into Africa or perhaps into the Indian sub-continent.

8.5 Europe

In Europe, twelve countries have not yet responded to the questionnaire (**Table 4**).

Table 4 The AEWA status (S=signatory, NS=non-signatory) of, and the number of introduced waterbird species (IWS) estimated to be present in each country in Europe for which no questionnaire was returned.

Country	Signatory Status	Number of IWS (estimate)
Albania	NS	0-1
Bosnia-Herzegovina	NS	0-1
Denmark*	S	5-10
Faeroes	NS	NA
Liechtenstein	S	NA
Macedonia	S	0-1
Moldova**	S	0-1
Monaco	NS	NA
San Marino	NS	NA
Spain (Balearics)**	S	0-2
Spain (Canary Is)	S	0-1
Yugoslavia (FR)	NS	0-1

* Information on introduced species not held directly by initial contacts. Further delays caused by fieldwork and medium-term absences. A response is hoped for by the end of the year which should cover Greenland.

** A response has been promised.

It is not thought that more than eight species of introduced waterbird are present in any of the non-responding countries. In most cases it is unlikely that more than one species of introduced waterbird will be present. Within the non-respondent countries no evidence has been obtained of any impact on local waterbird populations by introduced waterbirds. Denmark is the likely exception.

8.6 Collecting the Missing Data

Late data from Egypt, Denmark, the Balearics and probably Moldova should be obtained shortly and added to the database. Some of the gaps in Africa may be reduced through normal AEWA forum activity. Courtesy of SOVON in The Netherlands, data from Benin should be forthcoming. It would probably be best for requests to concentrate on the North African countries via the AEWA forum. Information from Syria and Iran may be difficult to obtain. Information from the Balkan countries may be forthcoming once their internal situation stabilises.

Some of the remaining questionnaires may be returned by late respondents. If it were to be decided to update the database at regular intervals any data arriving beyond October 1999 could be incorporated into the database.

8.7 Updating the Database

As can be seen from this section there are many gaps that remain to be filled. Furthermore, it is likely that if this report is circulated widely new and unexpected sources of information will become available. New information may not only become available for countries from which no questionnaires have been returned, but also for the countries for which data have been incorporated into this report. It would therefore be a sound policy to ensure that the database is regularly updated.

9. STATUS OF INTRODUCED WATERBIRDS IN THE AEWA AREA, AND THEIR EFFECT ON NATIVE WATERBIRDS - PROJECT CONCLUSIONS AND RECOMMENDATIONS.

9.1 Conclusions

The following sections draw conclusions from the preceding results of the project, but are not necessarily followed by recommendations. However, wider distribution of this report may lead others to make recommendations based on these conclusions, but within their own organizations.

9.1.1 Literature

There is no comprehensive body of literature on introduced waterbirds. It is notable that much of what does exist is skewed towards commercial (*e.g.* duck-farming) or sporting (*e.g.* duck-shooting) interests and deals with the disease pathology of captive birds. There is also a concentration upon hybridization, mostly between captive birds.

Little too is known of the population dynamics, biology and behaviour of introduced waterbirds. Information on population sizes and distributions is poor in many countries and some is old.

The literature is additionally very narrow in scope, and is often limited geographically, by sample size or deals with but one aspect of one species.

The lack of information on introduced waterbirds partially reflects the fact that the whole subject has been treated as a fringe academic interest, until comparatively recently. It also results from a lack of recording, which has partially been because such species have typically not been considered to be part of national avifaunas. This acquired prejudice remains widespread. The data on introduced waterbirds are fragmentary at present and, therefore, are difficult to collate. A single source of pertinent references within the AEWA would aid work in the field and encourage workers to add to it. The compilation of references presented in the separate document, *References to Invasive and Introduced Organisms*, would serve well as the basis of a centralised AEWA list, provided that the list be accessible to researchers and be amended regularly.

9.1.2 Project findings

A summary of findings from the questionnaires and the recent literature is presented below.

Releases

The reasons for releases of bird species into the environment have changed with time. Few releases occur nowadays for sentimental reasons, for example those of **Mute Swans** *Cygnus olor* (Lever 1987) in many countries, and those that do are mostly illegal. Release programmes which aim to re-establish a species into a formerly-occupied area are now preceded by extensive research (Evans & Pienkowski 1991). However, releases for sporting purposes occur on vast scales, usually without any independent studies on the impact on the natural population of the same species (*i.e.* on long-term genetic effects or disease pathology).

Exotic species in captivity and their escape

The range of waterbird species bred in captivity in the UK and the total numbers of birds involved, excluding those bred for sporting interests, is vastly greater than is generally known. The limited information from The Netherlands suggests that other western countries are little different. Information from aviculturists' magazines (*e.g.* Anon 1998) reveals thousands of advertisements of birds legally (or quasi-legally) for sale across Europe.

Escape rate

These exotic waterbirds often escape and birds may not be marked in case of escape (Rob Lensink *pers comm*). Pinioning is not practised universally nor is it popular. Even the tagging or ringing captive birds, compulsory though it may be for some species in some countries, is relatively infrequent (Colin Richardson *pers comm*). Many wildfowl collections comprise a few free-flying birds at a private "garden pond". The lack of information on the stocks of introduced species means that it remains difficult to establish escape rates. Breeders and bird collections do not generally record escapes for statistical purposes. In any case, deliberate if covert and illegal releases are commonplace among owners of small collections who have no wish to fund a naturally-expanding collection. Such releases probably form a major component of introduced waterbird populations.

Species are most likely to become established in the wild if there are high rates of escape. This not only improves the chances of individuals of a species forming viably-sized groups, but also increases the odds on escapes finding an unoccupied ecological niche. Establishment of a wild population depends not only on the survival of individuals, but also their breeding success. There have been few studies of the establishment of such populations, however, and population estimates and information concerning breeding productivity are usually lacking until species become more common. The case of the Ruddy Duck *Oxyura jamaicensis* in the UK is an exception to this (Hughes 1996). The role played by escape-recruitment in the success of a breeding population is also not fully known for any introduced species.

Where escapes occur

The majority of escapes occur in western nations, notably because there are more waterbird collections in these countries. However, the survival of escapes may depend on economic and cultural factors. In parts of southern Europe, species which may survive well elsewhere, may fail to become established due to high hunting pressure (Nicola Baccetti *pers comm*). In Africa, waterbirds are often hunted for food and escapes not wary of man would be particularly susceptible.

Effects of feral breeding flocks

Feral breeding flocks may also impact upon natural populations. In The Netherlands, the winter presence of significant numbers of largely resident families of, for example, **Barnacle Goose** *Branta leucopsis* has seriously affected the calculation from winter counts of the productivity of migrant birds (Marc van Roomen *pers comm*). Resident **Barnacle Geese** typically produce more young than natural populations from the Arctic which may succeed only one year in four.

Evolutionary re-adaptation of some introduced waterbird species

Some introduced waterbird species have developed migratory habits. These include **Bar-headed Goose** (N. Baccetti *pers comm*), **Egyptian Goose** *Alopochen aegyptiacus* (Verena Keller *pers comm*) and **Mandarin Aix** *galericulata* (N. Baccetti *pers comm*), which, in Europe, undertake short movements to escape harsh winter weather in the north and east.

9.1.3 An assessment of introduced waterbirds as potential threats to native waterbird species

Of the 111 introduced waterbird species and two hybrid forms reported to this project, 16 (given full species accounts) are assessed as presenting a real or potential threat to native species (See **Section 7**). Given the lack of detailed information, this assessment is based on the precautionary principle. It is therefore to be expected that future studies will show that the majority these 16 species are much less of a threat than suggested here. However, it is probable that current population estimates of many of these species are underestimates (due to the lack of observer coverage and records) and that escape rates, often already high, are likely to increase.

Sacred Ibis *Threskiornis aethiopicus*

Numbers are rapidly expanding (>1,000 birds) in mixed heronries in north-west France to the extent that native heron species may (Bernard Deceuninck *pers comm*) be being lost, at a local scale, through competition. Small numbers also breed or have bred in Italy and the United Arab Emirates.

Greater Flamingo *Phoenicopterus ruber*

In the mixed flamingo colony unexpectedly founded by escaped birds in north-west Germany, this species is very much in the minority to **Chilean Flamingo** *P. chilensis*. It has bred there on occasions, and has also hybridized successfully (Johan Mooij *pers comm*). A number of escaped **Greater Flamingo** in Europe are of the New World subspecies *roseus*. The potential threat of subspecies blurring is therefore twofold, firstly from *roseus* individuals mixing with wild **Greater Flamingos** and secondly from the successful breeding of escapes of the two subspecies. Numbers are probably too small to have a significant effect as yet, but over 300 flamingos may winter in The Netherlands.

Chilean Flamingo *Phoenicopterus chilensis*

There are at least 130 individuals in the mixed flamingo colony in north-west Germany. A New World species, it has bred successfully, and could establish itself elsewhere amid wild **Greater Flamingo** flocks in the near future, thus potentially threatening them.

Mute Swan *Cygnus olor*

Introductions continue to occur to the south of its natural range, but natural spread from wild stocks or introduced stocks established elsewhere has also played a part. In winter **Mute Swans** can benefit dabbling ducks by uprooting deep-growing weeds. In central Europe, however, **Mute Swans** may threaten those birds which nest beside evanescent shallow waters. Aggregates of **Mute Swan** concentrate at these shallow waters to feed, and while grazing on the exposed weed, may trample the nests and young of river terns, for example of **Black Terns** *Chlidonias niger* in France (Pierre Yésou *pers comm*).

Black Swan *Cygnus atratus*

So far this species has been limited by two factors, its dependence in Europe on urban waters and parkland (possibly learnt from its captive-bred environment) and that many seem to remain locked into the austral breeding cycle of its native range. Winter broods fail for obvious reasons. However, the species has become increasingly reported, and could prove a competitive threat to the **Mute Swan**. If numbers increase beyond a certain threshold, then there could be rapid population growth, for which there is a precedent in New Zealand, where it is very aggressive in defending its territory.

Greylag Goose *Anser anser*, incorporating **Feral/hybrid Greylag Goose** *A.a. forma domestica*

Greylag Goose is the principal ancestor of the white farmyard goose and the **Feral/hybrid Greylag Goose**. A possible 20,000 **Feral/hybrid Greylags** live in The Netherlands and Germany. Partly-resident flocks of **Greylag Goose** have become established, re-established, or have been introduced in many parts of Europe. Much hybridization is reported with feral forms. Although some of these resident birds are known to have joined the natural migrant populations which winter amongst these birds (Johan Mooij *pers comm*), the numbers and effects are unknown. The presence of large goose flocks has undoubted local effects on smaller waterbirds, which may be displaced from preferred habitats. However, the main threat presented, especially by the feral forms, is of genetic disturbance to the arctic-breeding *rubirostris* **Greylag Goose** subspecies. Hybrids are known to have joined these migratory flocks.

Bar-headed Goose *Anser indicus*

Surprisingly, this very hardy species has not thrived particularly well in the wild as an escape, perhaps due to captivity-induced dependence on man, and it is only slowly increasing across Europe. In captivity, the species forms close-knit flocks which interfere with other species' breeding, whereas in its natural range, wildfowl breeding density is low, thus reducing the impact of such flocks. It is therefore prudent to suggest that should the species achieve a critical threshold of numbers which would produce the flock sizes which stimulate breeding, then it could spread rapidly and have considerable local effects on smaller waterbirds.

Canada Goose *Branta canadensis*

There may be up to 70,000 Canada Geese in Britain (assuming a slowed rate of increase (Delany 1992 & 1993; Kirby *et al.* 1998) and a similar number in the rest of northern Europe. Much of the large Fennoscandian population may now be hunted in an attempt to stop the increase. Germany has a rapidly-increasing population, from which over 300 examples of hybridization with **Greylag Goose** *Anser anser* are known (Christoph Randler *pers comm*).

Barnacle Goose *Branta leucopsis*

Only in the last decade has the Barnacle Goose established sizeable feral populations in the UK, Fennoscandia, Germany, The Netherlands and Belgium. Outlying populations also occur to the south. Most populations show signs of an increase, now that it has adapted to breeding in lowland wetlands, and as it seems tolerant of man, it may yet pose similar threats as the **Canada Goose**.

Egyptian Goose *Alopochen aegyptiacus*

Originally confined as an escape to eastern England, the Egyptian Goose has spread rapidly throughout the Low Countries and northern Germany, where there is now a population five times that of the UK (Lensink 1999). In The Netherlands the species is rapidly spreading on drained polders (Lensink 1999). The species defends its nest territory and family aggressively and may pose a considerable threat to other waterbirds should this rate of spread continue. However, its spread may also help it become re-established on its former (18th century) breeding range in southern Hungary and Romania (Jacques van Impe *pers comm*).

Ruddy Shelduck *Tadorna ferruginea*

Ruddy Shelduck breed sporadically in lowland marshes in the UK, the Low Countries and Germany and by lakes in Switzerland where it may spread to high-altitude open montane forest, which is more representative of some of its natural habitat. The northernmost birds winter in the Dutch delta area and may form a self-sustaining population in the near future. The natural population in south-east Europe is in decline, but may respond to conservation action. If the species establishes itself in western Europe, then it could competitively exclude other hole-nesting birds.

Muscovy Duck *Cairina moschata forma domestica*

Domestic **Muscovy Ducks** are common in the AEW region, but feral or semi-feral birds are often overlooked, even in areas where feral breeding is known to have occurred. Although there are many anecdotal accounts of hybridization, few countries have systematically recorded the species' occurrence. The species may be dominant over smaller geese, as well as smaller waterbirds, and it may well competitively exclude them where breeding groups exist. The threat it presents at present is small, but the species needs to be recorded more comprehensively to determine if that threat will grow.

Mandarin *Aix galericulata*

The feral populations of Mandarin in continental Europe are believed to be increasing, and winter sightings

in Italy, probably a proportion in Switzerland and possibly those in Romania suggest that an element has become migratory. This could prove vital for these populations to become self-sustaining. The species is known in captivity to destroy eggs of other cavity-nesting species, and this could have local effects if repeated in the wild. However, the conservation value of the introduced **Mandarin** population remains high given the uncertain future of the natural population in east Asia (Baz Hughes *pers comm*).

Mallard *Anas platyrhynchos* incorporating **Feral/hybrid Mallard type** *A.p. forma domestica*

The **Mallard** is the principal ancestor of the white farmyard domestic duck, and of the varicoloured **Feral/hybrid Mallard type** ducks which occur on urban waterbodies throughout the species' natural distribution. The **Mallard** has hybridized with over 40 species of waterbirds, many in the wild, often producing fertile offspring. Through hybridization it has proved a major threat to indigenous duck species in Australia and New Zealand (Lever 1987). Introductions for hunting and other purposes have put at risk several **Mallard** subspecies. In southern Africa the survival of a number of indigenous duck species would be at risk should **Mallard** ever become established. Control policies may be difficult given not only the popularity of hybrids with the general public, but also the influence of very powerful hunting lobby, which breeds and releases 400,000 and 1,000,000 **Mallard** each year in the UK and USA respectively. The **Mallard** and the **Feral/hybrid Mallard type** are the single greatest threat to other waterbird species, through both hybridization and widespread competitive exclusion.

Red-crested Pochard *Netta rufina*

The majority of breeding attempts by Red-crested Pochard in western and central Europe are believed to have been by escaped birds. However, a range expansion from natural populations to the east has obscured its status. Consequently, this project has received few records of introductions, although the presence of escapes, often as breeders, is known in many countries. In addition to this threat, the Red-crested Pochard has hybridized with a number of southern African species and would prove a distinct threat should it become established there.

Ruddy Duck *Oxyura jamaicensis*

The Ruddy Duck, an introduction from North America, now has a sizeable population in the UK (Stone *et al.* 1997), smaller populations in other north-western European countries and has been noted from Ukraine to Morocco. It has been found to hybridize with the **White-headed Duck** *O. leucocephala* (designated **Vulnerable**) both in captivity and in the Spanish part of the latter's European range (Borja Heredia *pers comm*), and as such there is a clear need for coordinated control measures. There has been effective control in Spain (Borja Heredia *pers comm*) and in parts of France (Geneviève Barnaud *pers comm*), and measures are to be taken in Belgium and The Netherlands. However, the authorities in these and other countries have expressed their unwillingness to continue unless there is an integrated control campaign across Europe. Meanwhile, the French have suspended their plan to re-establish the **White-headed Duck** in Corsica until the **Ruddy Duck** has been controlled throughout Europe.

9.1.4 Trends

The ownership of exotic wildfowl has increased rapidly across Europe and is likely to continue to do so both there and elsewhere. Waterbird collections open to the public have become increasingly popular. The trade in breeding and selling exotic bird species is also thriving. Without strict regulation, it is possible that wild populations will be to make up any shortfalls. The range of waterbirds available for purchase is wide. For introduced waterbirds in the AEWA area, forecasts up to 2015 are as follows:

Escape rates

Escapes of waterbird species, already high, will increase unless the passion for keeping wildfowl wanes.

Recording of introduced species

Generally, the recording of introduced species will gradually improve as formal systems are adopted by national ornithological authorities, although there will long be a disinclination to do so. This may result in an apparently large population increase for some species.

Introduced population sizes and distributions

The population size of most of the 16 species mentioned above will increase unless control measures are introduced. Several are likely to increase rapidly as they occupy areas of suitable habitat large enough to prevent density-dependent effects from operating in the short term. The growth in these populations will lead to an increase in vagrants away from the core ranges in areas where currently there are few records. Most of the 16 species listed above will increase their breeding ranges to become more widely distributed, in some cases forming new core populations which will themselves lead to vagrant birds in new locations.

Other introduced waterbird species

Several of the other 95 introduced species described in the short species accounts (**Section 6.2**) are also likely to thrive, and thus may be considered possible threats to native waterbirds in the future. Such species will be recorded frequently as escapes.

Location of future problems

The presence of non-native waterbird species is at the very least undesirable. The main future problem area will be in north-western Europe, from Ireland east through to Germany, where the majority of waterbird collections are held. Countries to the south and east will also experience increased rates in the occurrence of non-native waterbird species. This is also likely to happen in Africa, but to a lesser degree, notably because the barrier to movement presented by the Sahara. Southern Africa is the most-prepared region to deal with non-native species. In addition, introduced species here also encounter an extensive range of predators. The avifauna of parts of the Middle East might be affected by the wealth-driven increase in artificial waterbodies.

Indigenous waterbird species under threat from introduced waterbird species

The **White-headed Duck** will remain at risk from the **Ruddy Duck** until the latter is extirpated in the Palaearctic. **African Yellow-billed Duck** *Anas undulata* and **African Black Duck** *A. sparsa* are also potentially at risk should the **Mallard** establish a southern African population. The **Meller's Duck** *A. melleri* is likewise potentially at risk, both in its native Madagascan and introduced Mauritian ranges, from feral **Muscovy Duck**, domestic duck or **Feral/hybrid Mallard types**.

9.1.5 Contradictory responses

AEWA understanding of the scale of occurrence of introduced waterbird species will continue to be clouded for some time by contradictory responses from some countries, notably because of the poor-quality information, but in part due to a reluctance to admit ignorance.

9.1.6 Hunting releases

The arbitrary nature of many hunting releases - different subspecies or captive-bred hybrids between subspecies may be released - and the vast scale of some hunting releases (for example, probably a minimum of 1.5 million **Mallard** annually worldwide) (for UK, Ogilvie & RBBP 1999) present a potential threat to the genetic identity of wild populations. There are few independent studies in this area. The AEWA forum could pre-empt controversy by seeking to encourage that such activities be put on a sounder basis.

9.1.7 Which introductions are the greatest threat to migratory waterbirds?

Literature on the wide subject of introduced organisms suggests that invasive or introduced plants and other organisms which live in water may pose a medium-term threat to waterbodies and surrounding habitat. The degradation of any waterbird's habitat may be critical to local populations; in extreme cases habitat may become unusable and this could be critical to breeding and migratory species.

9.1.8 Usefulness of the data obtained by the project

Despite the fragmentary nature of the data received, it is evident that they reflect a dynamic situation where the number and range of exotic waterbird escapes is increasing. The data therefore have a limited life unless the database is regularly updated and analysed so that conclusions and recommendations from this project may be tested and amended where necessary. As a corollary, the gaps in knowledge for Range States where responses were not forthcoming need to be obtained and added to the database.

9.1.9 Improvement of data quality

There is an opportunity for the AEWa forum to encourage research within Range States to improve data quality on introduced waterbird species. It is likely that improved data quality would assist in the formulation of sound AEWa policies concerning introduced waterbird species. The most valuable first step would be for Range States to introduce a reporting category for waterbirds which would be employed on all relevant forms of survey or count. Regular monitoring of introduced waterbird species within AEWa Range States would allow choices to be made about limiting population growth before populations became so large that such action would incur considerable expenditure.

9.1.10 The need for a method of assessing the risk captive waterbird species may present to indigenous waterbird species

Shaw (1999), of the South African Cape Nature Conservation organization, has developed a precautionary system of categorizing waterfowl species (or subspecies where these originate outside South Africa or outside the continent) as PROHIBITED or REGULATED. PROHIBITED species or subspecies are those which should not be kept in captivity in South Africa under general laws and regulations except where over-riding reasons, such as conservation or species research, are accepted. REGULATED species or subspecies are those which may be brought into South Africa under the general laws and regulations. The principal grounds for a species being categorized as PROHIBITED are that it has been known to hybridize with indigenous species, its preferred habitats are similar to those habitats existing in South Africa, or it is known to be adaptable, invasive, or dominant. All non-indigenous subspecies of a species indigenous to South Africa are PROHIBITED. All species of non-indigenous waterfowl which are not categorized as PROHIBITED are categorized as REGULATED. This system has yet to be ratified. The above principles would serve well as the basis for a categorization system which could be applied by AEWa Range States. They provide a means of quantifying the risk that non-native species could present to indigenous species before such species have escaped to breed in a new area. An AEWa-agreed version of such a method would prove useful to legislators.

9.1.11 The advantages of reducing escape rates

The costs of applying control measures to eradicate an introduced waterbird species are high and would increase if escapes were to continue. It is therefore worth considering measures which would reduce escape rates, including registration schemes and penalties for allowing escapes to succeed. On "the polluter pays" principle, perhaps the greater burden of costs should be borne by the captive bird industry (if it can be identified) and not by governments. Reduced escape rates reduce the chances of sufficient successful breeding to maintain populations.

9.1.12 National conservation legislation and control measures for introduced waterbird species

The mixed responses received about national conservation legislation and control measures for introduced waterbird species revealed two main shortcomings. Firstly most countries have few specific control measures which can be applied without procedural difficulty or which deal adequately with non-native waterbird species. Secondly, many countries have few if any resources to apply the rules and regulations which exist.

9.2 Recommendations

Implicit in some of the foregoing conclusions is the need for further work or action to improve understanding of the status and effects of introduced waterbird species on indigenous waterbirds within the AEWA area. The resulting recommendations are:

- That the AEWA forum should consider practical means to reduce the escape rate of non-native waterbirds within AEWA Range States as the single most effective way of reducing any threat, potential threat or adverse effect that such introductions may have on indigenous waterbirds species.
- That the AEWA forum, made aware that many introduced waterbird species are increasing rapidly in number and range, should inform the Range States of the circumstances, and encourage those Range States affected to coordinate and implement counter measures where required.
- That the AEWA forum, as a fundamental means of improving the poor state of knowledge about introduced waterbirds, should encourage each Range State to adopt a formal method of reporting the occurrence and status of non-native waterbirds, so that all relevant surveys and counts include non-native waterbird species. The monitoring of populations of introduced waterbird species would also aid decisions on limiting population growth before such action became too expensive.
- That the AEWA forum should be made aware that the data collected during this project do not contradict the view that the spread of **Ruddy Duck** *Oxyura jamaicensis* is a serious threat to **White-headed Duck** *O. leucocephala*, that the informed opinion from southern Africa is that **Mallard** *Anas platyrhynchos* is potentially a serious threat to **African Yellow-billed Duck** *A. undulata*, and possibly to **African Black Duck** *A. sparsa*, and that the very common domestic form of **Muscovy Duck** *Cairina moschata* is so little known that it is not possible to state whether its ability to hybridize with many *Anatidae* presents an insignificant threat to indigenous wildfowl in all locations in all circumstances. (**Meller's Duck** *A. melleri*, native to Madagascar and introduced to Mauritius may be at long-term risk from domestic variants of **Mallard** and **Muscovy Duck**).
- That the AEWA forum, recognising the arbitrary nature (wrong subspecies or hybrids) and vast scale (over one million **Mallard** in Europe alone) of many annual hunting releases which put at risk the genetic identity of wild populations, should encourage hunting associations to put such activities on a sounder basis.
- That the AEWA forum should remain aware that introduced organisms, particularly plants and water-based organisms, may prove far more of a long-term threat to indigenous waterbirds than introduced waterbirds could, by degrading the quality of waterbodies, especially those which are small and shallow.

- That the AEWA forum consider introducing or developing a method of categorizing the degree of threat captive non-native waterbird species theoretically might present to indigenous waterbird species so that the potential or actual risk could be quantified. (The system proposed for use in South Africa would serve as a useful model. It at least provides the basis for legislation concerning, or regulation of captive stocks of non-native waterbird species. The South African assessments are listed in a separate document accompanying this report).
- That the AEWA forum, recognising that Range State national conservation legislation and measures to deal with the importation, sale, keeping and release of introduced waterbird species are often incompatible between even neighbouring States, may be non-existent, cannot be applied without procedural difficulties, and recognising that often the resources are not available to implement the rules, should encourage Range States to work towards common standards in measures dealing with introduced waterbird species.
- That the AEWA forum, recognising that the usefulness of the data obtained by this project have a limited life because they describe a dynamic situation where the numbers of waterbird escapes and species involved are increasing, consider a method of updating and maintaining the database, whereby the updated information is analysed and vetted before entering it into the database, and the predictions made in this report are tested and amended.
- That the AEWA, in order to support and encourage research on introduced waterbird species, maintain a centralised list of references pertinent to future work on introduced waterbirds, which may be easily accessed by researchers and amended regularly.

Acknowledgements

First and foremost, the splendid willingness of the respondents to search for, extract and supply so much information was essential to the success of the project. All such contributions played their part, but those of Olaf Geiter from Rostock University, Rob Lensink, Christoph Randler, Colin Richardson and Kevin Shaw did so with distinction. Secondly, the huge tasks of preparing the initial correspondence and assembling the resultant collated data into a report were completed with much-appreciated rapidity and good humour by Ms Dawn Morris and, when under much competing pressure in the final stages, by Ms Nicola Read. We are particularly grateful to Dr Baz Hughes of the Wildfowl and Wetlands Trust whose help and suggestions in the early stages allowed the project to be up and running very quickly. Michael Wilson of the Edward Grey Institute as always responded in real time when asked for translations of Cyrillic correspondence. Bert Lenten of the AEWIA Interim Secretariat provided much useful understanding of the Agreement, and John Clorley and others at the DETR gave timely comment and support. The project leader is indebted to his co-authors for their timely contributions. The project leader would like to thank Sir Christopher Lever for his immediate warm encouragement when the project began, and is grateful to all his colleagues at the BTO who helped so promptly in various ways, particularly John Marchant, Dr Graham Austin, Dr Nigel Clark, Dr Humphrey Crick and Dr David Noble who provided much useful information and many insights, and Dr Peter Lack and Dr Niall Burton for concise and timely comment on the draft report.

Also, thank you to the following people:

T Aarvak	F Arcanger	B Behrouzi-Rad	Dr P Botha
C K Abaka-Haizel	Dr G Archibald	A Beignet	D Boukhalfa
B Abou El Abbas	T Ardamatskaya	A Beintema	D Bound
M Abdou-Kérim	J Arinaitwe	I Bejenaru	J E Bowessidjaou
O Habib Abdoulmalik	J P Arnauduc	J Bekhuis	R Boycott
Y Dellelegn Abebe	T Asanti	A Belemlih	M Garba Boyi
R Abila	Dr S Asbirk	Dr V P Belik	R E Brasseur
G Abramia	J Ash	A Belousova	R Braund
G Adams	Dr G Aubrecht	M Benmergui	A Brenninkmeijer
S Adamu	E M Auezov	Dr L A Bennun	V Bretagnolle
A Ader	M Awer	R Benoit	Dr P Brichetti
A F Adjademe	G Aydemir	C M Bento	Dr K Brouwer
J Boco Adjakpa	J Ayeni	Fr D Bergeron	A M Browne
E van Adrichem	R Azadi	W Bergmans	Sir P Lever Bt
M A El Agbani	A Abdul Aziz	V van den Berk	F Bure
S Aggarwal-Khan	A Ba	R K Berndt	A B Byaruhanga
L Akambi	N Baccetti	Prof Dr P Berthold	D Callaghan
Dr M van den Akker	P J Bacon	O Biber	A S Camara
K Akoi	Dr Ml Baglo	M Bigan	K Camphuijsen
Dr F Akriotis	Prof Dr F Bairlein	R Bijlsma	P Campredon
Dr G Ale	E Bakiono	T Bino	P Canevari
J Allan	V Bakken	J M Biscoito	M Carbonell
D Alon	E Ballon	J B Bisi	P Caruette
K H Al-Robaae	A Kader Bangoura	A Bjärvall	S Cassama
J Ambagis	Dr A Bankovics	D Bloch	J Chalas
P Andersen-Harild	V V Baranyuk	T Bo	B A Chande
M D Anderson	C Bärlocher	F Bockandza-Paco	M A
A Andersson	G Barnaud	G Boere	Charalambides
A Andreev	R T Barrett	J J Boisard	V A Chetverikov
C Andres	T P Lopes de Barros	P Boldreghini	R Chira
O Anisimova	Dr H Bastian	R Boljesic	J Chizororo
N Kwaku Ankudey	E Battokok	Dr R C Jamar de	R Christensen
V M Anufriev	G Baulieewa	Bolsee-Beudels	M Chundama
L Aongola	P C Beau brun	G Bomisso	J Chytil
A Araujo	J H Beekman	E Boross	P Claffey

B Clarion	L von Essen	Dr G A Gudmundsson	D Kamanaweshe
M Clout	A A Estafiev	Dr F Gürkan	J van der Kamp
Dr M Cohen	P Ewins	M Hadjichristoforou	A Karem
K Colhoun	A U Ezealor	E Hadjisterkotis	J Macharia Kariuki
A Concialini	F Peyere de Fabreques	Dr H Hafner	J M Katondo
J E Cortes	R D Fall	W Hagemeyer	B Kebba
G Da Costa	J Fantoni	A Hailu	N Keita
L Costa	S Faragó	O Hamerlynck	V Keller
G Cowan	Prof M Fasola	H Hamrouni	Dr J Kerekes
D Craddock	Dr H M Felemban	G I Handrinos	A Kern
Dr A Crivelli	G Finney	T Harouna	J Keskaik
J Culverwell	Dr J Fjeldsa	C Haskins	V V Khrokov
D Daha	M Flade	M Zuhair Hassanain	A Yohannes
M Dakki	A Fleury	G Hatti	Kidane
G Dandliker	V E Flint	O Hatzofe	Prof Dr R
Dr N Davidson	P Flint	G Hearl	Kinzelbach
B Deceuninck	Dr J Flousek	B van Helvoort	C de Klemm
O Dehorter	J Fog	B Heredia	Dr P de Knijff
V G Delov	Dr M J Ford	Dr M Herremans	A V Kondratyev
Col D Deng Deng	Dr L Fornasari	V Herrenschidt	M Koran
K Devos	T Fox	C and S Hillman	P Koskimies
B della Failla d'Huyse	M Fraissinet	Prof P Hockey	T S Koster
A Dia	J Franchimont	D Hoffmann	I O Kostin
I Dia	N Franco	H J Den Hollander	V Kostyushin
A Oumar Diallo	S Frazier	J Holmes	S K Kotchanov
M Diallo	T Freeman	Dr K Hudec	P Kotkova
Y Diawara	Dr R W Furness	F Hüttmann	A Koumba-
G Dick	P Gailly	P Iankov	Mfoubou
D Dien	A Galat-Luong	J Mokoko Ikonga	R Kouokam
F Dieterich	C Galbraith	V Ilyashenko	A Kozulin
S Baha El Din	E Fernandez Galiano	Dr Jacques Van Impe	D Kpelle
M Baha El Din	Dr A Gardarsson	J Pinilla Infiesta	S Kraatz
S Diouf	Dr A Gariboldi	P Isenmann	A Krištin
D Za Zastitu Divljim	A C Gaspar	A Malam Issa	V G Krivenko
M Gimenez Dixon	W Gatter	HRH The Litunga Yeta IV	C Krogell
F Djedjo	R Geiser	Bojidar Ivanov	Z Krzeminski
S Djerang	I Geister	Dr V V Ivanowsky	Dr J Kucera
K A Dobrowolski	G Gelinaud	E Jaakkola	L Kuczynski
T Dodman	N Gerasimov	M Janiga	E Kuijken
R Dominique	R Gerlach	W Jankowski	A Kuresoo
Dr J A Donazar	H Ghazouani	N Jarrett	T Kureya
Prof Dr S Dontchev	Dr D Gibbons	G Jarri	Dr P Kurlavičius
R H Drent	N Gichuki	A Jauro	V Laboudallon
Dr E Drobelis	O Girard	K Jenderedjian	O Lachenaud
C Dronneau	S Gitau	P Uhd Jepsen	J Lafitte
F Dubs	S Kebede Gizaw	B Jepsen	R Lalumière
A Duncan	L Gjiknuri	I Jepsen	B Maïmouna Lamizana
P Duncan	Z Glowacinski	H Jerrentrup	Dr A Landmann
M Dvorak	L Glowka	E Syroechkovsky Jr	D Langslow
Prof A Dyrzc	Dr I Gorban	M Julien	Dr Y N Lanovenko
B Ebbinge	S Gori	J Jurgis	E G Lappo
M van Eerden	P D Goriup	J Kabaki	Dr R Lardelli
Dr A Einarsson	Dr A G Gosler	T Kabii	T Larsson
S Eis	A J Green	J Kadlecík	F Launay
Dr V Ejere	M Grell	W Kakuru	K Laursen
G Eken	P Grice	J Atle Kålås	G Laws
M Ekker	Dr J Gromadzka	H Kalchreuter	R P Lebeau
Dr E Ahmed Elbadry	M Gromadzki	C Kalden	Dr E G Lebedeva
J A Torres Esquivias	Dr A Grüll	Dr V Kalyakin	Y Lecocq

N Lefranc	S Monna	M La Perle	H Sell
E Leibak	Dr L Monteiro	C Perrins	V Serebryakov
A Leito	J Mooij	K W Perry	A A Serhal
H Lethier	V Morozov	H Persson	F Codjo Sessou
R Libois	M Moser	S Petrie	E L Severre
J Lipsbergs	S Motalaote	Dr T Petrov	S Seydou
M Litterick	J M B Mphande	S Pihl	Y Shchadilov
Dr R M Little	J Mužinić	Dr M Pitta	H Shirihai
K E Litvin	J Muller	S Plunkett	Dr M Shobrak
J Lombard	W Muller	G Polet	E Shy
P Lorge	A Müller-Helmbrecht	R Pouget	D D Siaffa
K H Loske	Y Mungroo	H Pöysä	J P Siblet
A Lundberg	D Munteanu	J Priednieks	P Sigwall
S Lundquist	I Munteanu	U Querner	Dr R Simmons
P Luwum	F Mupemo	R Rabarisoa	G Simon
I MacDonald	P Musil	Dr G Ramadan-Jaradi	M Skakuj
J Madgwick	S Mwiya	Dr J Ramos	P Skoberne
J Madsen	F K Nani	Dr R M Randall	I Škornik
P Mafabi	S Nash	T Randla	H Skov
M Maghnouj	O Nasirwa	A Ranner	P Smiddy
G Magyar	G Ndagijimana	R Ratas	Dr J W Sneep
R Mahéo	R Ndetei	A Reed	M Snethage
A Maiga	A Ndiaye	E C Rees	M Sorrenti
M Máñez	V Neronov	J Refn	B Soto
P Mangué	R Neves	S Remie	J L Soufflet
D Hloso Maphisa	N Ngoupande	J Renault	R Staav
P Marhoul	N N'Guessan	G Renault	Dr V Stanevičius
J Markkola	M E Nguimagi	S Riba	P Stassin
R Marti	Dr B Nicolai	J P Robin	Dr K Štastný
C Martin	P Nicolau-Guillaumet	G Rocamora	T Stawarskyk
Dr C Martínez	L Nilsson	Prof H Rogacheva	D T Stevens
Prof B Massa	D Njantou	K H Rogers	A Stipniece
A El Mastour	Dr J Ngog Nje	M van Roomen	Ø Stønkersen
S Mathiasson	M R Norton	P Rose	M Strazds
S Matindi	Dr E Nowak	R Rosoux	D Stroud
T Matiza-Chiuta	S Kofi Nyame	E Rossi	C Stuffmann
D M Matlakala	P Nzioka	R Rufino	B Štumberger
A Matschke	Dr M A Ogilvie	L Pius Rutina	E Suchomelova
H V McKay	J O'Halloran	E Rutschke	P Südbeck
J McNeely	K Okoumassou	L Saari	C Sudfeldt
P Meininger	I Olesu-Adejei	M. Sablière	J Sultana
Dr W Meissner	Dr P Oliveira	Dr P Sackl	E Sultanov
H Meltofte	N Onofre	C Sagno	Dr W Suter
M Mercer	A Òren	M Y Abdel Salam	S Švažas
Y Mercier	V Orlov	Y A Salem	J Svec
O J Merne	D Oschadleus	M K Sam	Dr S Svensson
A Tekleab Mesgehna	T Osiejuk	M Saniga	Dr S Issa Sylla
M Metais	J M Ouadba	R Santolini	Prof E
G Micali	M Ouarouch	J Saparmuradov	Syroechkovski
Prof B Micevski	W Oumar	D Sargeant	Dr T Szép
Dr T Michev	J Oyugi	P Saurola	J Szmeja
H Mikkola	L Palma	N Schäffer	A Tadic
Y N Mineyev	C Paolini	Dr L Schifferli	Z Takenov
Dr T Mingozzi	R Parz-Gollner	V Schricke	H M A Tatwany
A Mischenko	J Patterson	W Schroeder	A M Teixeira
M Mjorera	A Peal	Dr K Schulze-Hagen	A Teme
R Möckel	N Peja	D A Scott	N Teneue
N Monametsi	J Pellantova	L Sebogo	J Thal
P Moniz	Dr S Peris	P Seddon	R Thampy

M Thevenot
D Thomas
G Thompson
A Thyssen
Dr J Tiainen
J B Til
P Tilba
A Timmerman
J Tindigarukayo
A Tishechkin
E Tkatchenko
Dr L Tomiałojć
Dr P S Tomkovich
T Tournebize
H Tournier
N Traoré
B Treca
P Triplet
B Trolliet

Dr J Trouvilliez
V Tytar
Prof L Underhill
A Vadineanu
Dr R A Väisänen
M Lo Valvo
D Vangeluwe
N Varty
K Vassilakis
J van Vessem
J Viksne
Dr V G Vinogradov
A Vintchevski
Raimo Virkkala
M Vitaloni
E Vojikova
Z M Vokhiwa
Y Vyazovich
C S Wanzie

S Warren
Mr Wassmer
G Watola
P Weber
J Weiss
J H Wells
S Wendt
E Wenger
Dr T Wesołowski
M Wieloch
T Wierzbowska
E Williams
Dr K Witt
M Wondafrash
I Wuerdinger
B K H Yaokokore
Prof E G Yavrouyan
D Yeatman-Berthelot
D Yelli

S Yerokhov
P Yésou
Dr R Yosef
H G Young
A K Yurlov
M Zalakevicius
N Zaloumis
E Zalounis
A Zhumakan-Uly
Zhatkanbayev
M Zhmud
M Zijlstra
Dr F Zino
R Zloteanu
Dr V Zubakin
Dr V Zubko

References

See *References to Invasive and Introduced Organisms* (separate document) for comprehensive list of references concerning introduced and invasive organisms.

Anon. (1998) *Aviornis International*, **143** (October) [In Dutch].

Anon. (1999) *Bird Conservation International*, **8**, 310.

Browne, A.M. & O'Halloran, J. (1997) Introduced Canada *Branta canadensis* and Greylag Goose *Anser anser* populations in Ireland, 1994. *Irish Birds*, **6**, 233-236.

Craik, J.C.A. (1995) Effects of North American Mink on the breeding success of terns and smaller gulls in west Scotland. *Seabird*, **17**, 3-11.

Craik, J.C.A. (1997) Long-term effects of North American Mink *Mustela vison* on seabirds in western Scotland. *Bird Study*, **44**, 303-309.

Cranswick, P.A., Pollitt, M.S., Musgrove, A.J. & Hughes, R.C. (1999) *The Wetland Bird Survey 1997-98: Wildfowl and Wader Counts*. BTO/WWT/RSPB/JNCC, Slimbridge.

Delany, S.N. (1992) *Survey of Introduced Geese in Britain, Summer 1991: Provisional Results*. Report to JNCC, MAFF, NT. WWT Slimbridge.

Delany, S.N. (1993) Introduced and escaped geese in Britain in summer 1991. *British Birds*, **86**, 591-599.

Evans, I.M. & Pienkowski, M.W. (1991) World status of the Red Kite. A background to the experimental reintroduction to England and Scotland. *British Birds*, **84**, 171-187.

Gillespie, G.D. (1985) Hybridization, introgression and morphometric differentiation between Mallard *Anas platyrhynchos* and Grey Duck *Anas superciliosa* in Otago, New Zealand. *Auk*, **102**, 459-469.

Green, R.E. (1997) The influence of numbers released on the outcome of attempts to introduce exotic bird species to New Zealand. *Journal of Animal Ecology*, **66**, 25-35.

Holmes, J.S., Marchant, J., Bucknell, N., Parkin, D.T. & Stroud, D. (1998) The British list: new categories and their relevance to conservation. *British Birds*, **91**, 2-11.

Holmes, J.S. & Simons, J.R. (eds) (1996) *The Introduction and Naturalisation of Birds* (Preface). JNCC, London.

del Hoyo, J., Elliot, A. & Sargatal, J (eds) (1992 & 1996) *Handbook of the Birds of the World, Vols 1 & 3*. Lynx Edicions, Barcelona.

Hughes, B. (1996) The Ruddy Duck *Oxyura jamaicensis* in the Western Palearctic and the threat to the White-headed Duck *Oxyura leucocephala*. In: *The Introduction and Naturalisation of Birds* (eds. J.S. Holmes & J.R. Simons), pp 79-86. The Stationery Office, London.

Hughes, B., Criado, J., Delany, S., Gallo-Orsi, U., Green, A.J., Grussu, M., Perennou, C. & Torres, J.A. (1999) *The Status of the Ruddy Duck (Oxyura jamaicensis) in the Western Palearctic and an Action Plan for its Eradication, 1999-2002*. Report by the Wildfowl & Wetlands Trust to the Council of Europe.

- Kirby, J.S., Austin, G.E., Rowcliffe, J.M., Wernham, C.V., Pettifor, R.A. & Clark, N.A. (1998) *Population Dynamics of Canada Geese in Great Britain and Implications for Future Management*. A preliminary report to the Department of the Environment.
- Laar, B.v.d., Maas, P.A., Vossen, P. & Berg, A.B.v.d. (1994) Geese and ducks in captivity in The Netherlands in 1991. Mededelingen, *Dutch Birding*, **16**, 148-149.
- Lensink, R. (1999) Aspects of the biology of Egyptian Goose colonizing The Netherlands. *Bird Study*, **46**, 195-204.
- Lever, Sir C.L. (1987) *Naturalized Birds of the World*. Longman, Harlow.
- Lever, Sir C.L. (1994) *Naturalized Animals*. T. & A.D. Poyser, London.
- Long, J.L. (1981) *Introduced Birds of the World*. David & Charles, Newton Abbot.
- Mackenzie, D. (1999) Alien Invaders. *New Scientist, This Week*. 24 April, 18-19.
- Marchant, S. & Higgins, P.J. (eds) (1990) *Handbook of Australian, New Zealand & Antarctic Birds. Vol. 1. Ratites to Ducks*. Oxford University Press, Oxford, Auckland & New York. pp 1400.
- Meininger, P.L. & Atta, G.A.M. (1994) *Ornithological Studies in Egyptian Wetlands 1989/90*. FORE-report **94-01**, WIWO-report **40**.
- Ogilvie, M.A. & Rare Breeding Bird Panel. (1999) Non-native birds breeding in the United Kingdom in 1996. *British Birds*, **92**, 176-182.
- van Perlo, B. (1995) *Birds of Eastern Africa*. Collins.
- Perry, K.W., Wells, J.H. & Smiddy, P. (1998) Recent increases in abundance of Ruddy Ducks *Oxyura jamaicensis* in Ireland, 1995-98. *Irish Birds*, **6**, 217-222.
- Shaw, K.A. (1999) *Draft Report on the Regulated and Prohibited Waterfowl Species in the Western Cape Province, South Africa*. Cape Nature Conservation. (in prep)
- Stone, B.H., Sears, J., Cranswick, P.A., Gregory, R.D., Gibbons, D.W., Rehfish, M.M., Aebischer, N.J. & Reid, J.B. (1997) Population estimates of birds in Britain and the United Kingdom. JNCC/RSPB/WWT/BTO/GCT Report. *British Birds*, **46**, 1-22.

APPENDIX 1

Questionnaire Response Status of AEWAs States: Africa

Country	Responded	Number of introduced species	Country	Responded	Number of introduced species
Algeria	N		Madagascar	Y	3-4
Angola	N		Malawi	N	
Benin	N*		Mali	Y	1
Botswana	Y	0	Mauritania	Y	2
Burkina-Faso	N		Mauritius	Y	1
Burundi	N		Morocco	N	
Cameroon	Y	0	Mozambique	Y	0
Cape Verde	N		Namibia	Y	2
Central African Republic	N		Niger	N	
Chad	N		Nigeria	N	
Comoros	N		Rwanda	Y	0
Congo	N		Sao Tome/Principe	N	
Côte d'Ivoire	Y	0	Senegal	Y	1
Djibouti	N		Seychelles	Y	1
Egypt	N*		Sierra Leone	N	
Equatorial Guinea	N		Somalia	Y	0
Eritrea	Y	0	South Africa	Y	24
Ethiopia	Y	0	Sudan	N	
Gabon			Swaziland	Y	0
Gambia	Y	0	Tanzania (Un Rep)	N	
Ghana	N*	0	Togo	Y	0
Guinea	Y	0	Tunisia	N	
Guinea-Bissau	Y	0	Uganda	N	0
Kenya	Y	0	UK Ascension	Y	0
Lesotho	Y	0	Western Sahara	N	
Liberia	Y	0	Zaire	N	
Libya	N		Zambia	Y	0

N* = Response promised

Questionnaire Response Status of AEWA States: America

Country	Responded	Number of introduced species	Country	Responded	Number of introduced species
Canada (NE Arctic)	Y	0	Greenland (Denmark)	N*	

Questionnaire Response Status of AEWA States: Asia

Country	Responded	Number of introduced species	Country	Responded	Number of introduced species
Kazakhstan	Y	0	Turkmenistan	Y	0
Russia (Asian)	Y	0	Uzbekistan	Y	1

Questionnaire Response Status of AEWA States: Asia Minor & Middle East

Country	Responded	Number of introduced species	Country	Responded	Number of introduced species
Bahrain	N		Oman	Y	2
Cyprus (N & S)	Y	0	Palestine	N	
Iran (Islam Rep)	N		Qatar	N	
Iraq	N		Saudi Arabia	Y	2
Israel	Y	4	Syria	N	
Jordan	N		Turkey	Y	1
Kuwait	N		United Arab Emirates	Y	24
Lebanon	Y	0	Yemen	N	

N* = Response promised

Questionnaire Response Status of AEWAs States: Europe

Country	Responded	Number of introduced species	Country	Responded	Number of introduced species
Albania	N		Lithuania	Y	1
Andorra	Y	2	Luxembourg	Y	3
Armenia	Y	0	Macedonia (Yug)	N	
Austria	Y	16	Malta	Y	0
Azerbaijan	Y	0	Moldova	N*	
Belarus	Y	1	Monaco	(with France)	
Belgium	Y	15	Norway <i>etc</i>	Y	2
Bosnia-Herzegovina	N		Poland	Y	1
Bulgaria	N		Portugal	Y	0*
Croatia	Y	1	Portugal, Azores	Y	3
Czech Republic	Y	7	Portugal Madeira <i>etc</i>	Y	0
Denmark	N*		Romania	Y	4
Estonia	Y	0	Russia (European)	Y	2
Faeroes (Denmark)	N		San Marino	(with Italy)	
Finland	Y	5	Slovakia	Y	1
France	Y	17	Slovenia	Y	1
Georgia	Y	0	Spain	Y	1
Germany	Y	21	Spain, Balearics	N*	
Gibraltar	Y	0	Spain, Canary Is	N	
Greece	Y	1	Sweden	Y	5
Hungary	Y	0	Switzerland	Y	43
Iceland	Y	6	The Netherlands	Y	20
Ireland	Y	4	Ukraine	Y	11
Italy	Y	17	United Kingdom	Y	72
Latvia	Y	2	FR Yugoslavia	N	
Liechtenstein	(with Switzerland)				

N* = Response promised, 0* = Possible reevaluation.

For comment on the gaps in coverage, see **Section 8** of the report.

APPENDIX 2

Summary Breakdown by Continental Region and Range States of the Introduced Waterbird Species Reported by Respondents.

Africa

Range State	Species
Madagascar	Swan Goose, Muscovy Duck, Mallard, Feral/hybrid Mallard type
Mali	Feral/hybrid Mallard type
Mauritania	Muscovy Duck
Mauritius	Meller's Duck
Namibia	Mallard, Feral/hybrid Mallard type
Senegal	Muscovy Duck
Seychelles	Feral/hybrid Mallard type
South Africa	Little Egret, Greater Flamingo, Fulvous Whistling Duck, Mute Swan, Black Swan, Feral/hybrid Goose, South African Shelduck, Shelduck, Muscovy Duck, Wood Duck, Mandarin, African Pygmy Goose, Red-billed Teal, Cape Teal, Mallard, Feral/hybrid Mallard type, Pintail, Garganey, Shoveler, Cape Shoveler, Southern Pochard, Red-crested Pochard, Ringed Teal, Tufted Duck, Maccoa Duck, Moorhen
Zimbabwe	Mute Swan, Ruddy Duck

Asia

Range State Species

Uzbekistan Mallard

Asia Minor & the Middle East

Range State Species

Israel Cormorant, Egyptian Goose, Ruddy Shelduck, Bahama Pintail

Oman Spot-billed Duck, Marbled Duck

Saudi Arabia Mallard, Shoveler

Turkey Ruddy Duck

United Arab Emirates Goliath Heron, Painted Stork, Yellow-billed Stork, Sacred Ibis, Scarlet Ibis, Fulvous Whistling Duck, Lesser Whistling Duck, Mute Swan, Whooper Swan, Black-necked Swan, Black Swan, Greylag Goose, Hawaiian Goose, Egyptian Goose, Ruddy Shelduck, Spur-winged Goose, Mallard, Red-crested Pochard, Pochard, Ferruginous Duck, Purple Swamphen, Crane, South African Crowned Crane, Demoiselle Crane

Europe

Range State	Species
Andorra	Mallard, Pochard
Austria	Chilean Flamingo, Mute Swan, Black Swan, Bar-headed Goose, Greylag Goose, Snow Goose, Canada Goose, Barnacle Goose, Egyptian Goose, Ruddy Shelduck, Shelduck, Muscovy Duck, Wood Duck, Mandarin, Feral/hybrid Mallard type, Ruddy Duck
Belarus	Ruddy Shelduck
Belgium	Black Swan, Bean Goose, Bar-headed Goose, Canada Goose, Barnacle Goose, Egyptian Goose, Magellan Goose, Ruddy Shelduck, Wood Duck, Mandarin, American Wigeon, Chiloe Wigeon, Marbled Duck, Ring-necked Duck, Ruddy Duck
Croatia	Mute Swan
Czech Republic	Black Swan, Bar-headed Goose, Canada Goose, Ruddy Shelduck, Shelduck, Wood Duck, Mandarin
Finland	Mute Swan, Bar-headed Goose, Greylag Goose, Canada Goose, Barnacle Goose
France	Sacred Ibis, Chilean Flamingo, Mute Swan, Whooper Swan, Black Swan, White-fronted Goose, Bar-headed Goose, Greylag Goose, Snow Goose, Canada Goose, Barnacle Goose, Egyptian Goose, Ruddy Shelduck, Wood Duck, Mandarin, Marbled Duck, Ruddy Duck
Germany	Great White Egret, Cattle Egret, Greater Flamingo, Chilean Flamingo, Mute Swan, Black Swan, Swan Goose, White-fronted Goose, Bar-headed Goose, Greylag Goose, Snow Goose, Canada Goose, Barnacle Goose, Red-breasted Goose, Feral/hybrid Goose, Egyptian Goose, Ruddy Shelduck, Muscovy Duck, Wood Duck, Mandarin, Ringed Teal
Greece	Mute Swan
Iceland	Chilean Flamingo, Mute Swan, Black Swan, Bar-headed Goose, Mandarin, Ruddy Duck
Ireland	Greylag Goose, Canada Goose, Mallard, Ruddy Duck
Italy	Pink-backed Pelican, Western Reef Heron, Sacred Ibis, African Spoonbill, Lesser Flamingo, Chilean Flamingo, Mute Swan, Black Swan, Bar-headed Goose, Canada Goose, Egyptian Goose, Wood Duck, Mandarin, Falcated Teal, Baikal Teal, Ruddy Duck, Crowned Crane
Latvia	Mute Swan, Canada Goose
Lithuania	Greylag Goose
Luxembourg	Mute Swan, Wood Duck, Mandarin
Norway <i>etc</i>	Canada Goose, Barnacle Goose
Poland	Ruddy Shelduck
Portugal, Azores	Mandarin, Muscovy Duck, Feral/hybrid Mallard type
Romania	Bar-headed Goose, Egyptian Goose, Wood Duck, Mandarin
Russia (European)	Canada Goose, Mandarin
Slovakia	Black Swan
Slovenia	Mallard
Spain	Ruddy Duck

Sweden	Bar-headed Goose, Canada Goose, Egyptian Goose, Mandarin, Ruddy Duck
Switzerland	Lesser Whistling Duck, Red-billed Whistling Duck, Black-billed Whistling Duck, White-faced Whistling Duck, Mute Swan, Black-necked Swan, Black Swan, Swan Goose, Bar-headed Goose, Greylag Goose, Emperor Goose, Canada Goose, Barnacle Goose, Egyptian Goose, Ashy-headed Goose, Ruddy Shelduck, South African Shelduck, Australian Shelduck, Paradise Shelduck, Muscovy Duck, Wood Duck, Mandarin, Maned Goose, Brazilian Teal, American Wigeon, Chiloe Wigeon, Baikal Teal, Chestnut Teal, Spot-billed Duck, Pacific Black Duck, Hottentot Teal, Bahama Pintail, African Yellow-billed Duck, Cinnamon Teal, Southern Pochard, Rosy-billed Pochard, Ringed Teal, Lesser Scaup, Steller's Eider, Bufflehead, Hooded Merganser, Maccoa Duck, Ruddy Duck
The Netherlands	Greater Flamingo, Chilean Flamingo, Black Swan, Swan Goose, Bean Goose, White-fronted Goose, Bar-headed Goose, Canada Goose, Barnacle Goose, Feral/hybrid Goose, Egyptian Goose, Magellan Goose, Ruddy Shelduck, Wood Duck, Mandarin, Muscovy Duck, Red-crested Pochard, Ferruginous Duck, Goldeneye, Ruddy Duck
Ukraine	Lesser Rhea, Black Swan, Bar-headed Goose, Greylag Goose, Snow Goose, Canada Goose, Ruddy Shelduck, Shelduck, Wood Duck, Mandarin, Mallard
United Kingdom	White Pelican, Dalmatian Pelican, Pink-backed Pelican, Night Heron, Cattle Egret, Great White Egret, White Stork, Sacred Ibis, African Spoonbill, Greater Flamingo, Lesser Flamingo, Chilean Flamingo, Fulvous Whistling Duck, White-faced Whistling Duck, Mute Swan, Whooper Swan, Black-necked Swan, Trumpeter Swan, Black Swan, Swan Goose, Bean Goose, Pink-footed Goose, White-fronted Goose, Lesser White-fronted Goose, Bar-headed Goose, Greylag Goose, Snow Goose, Ross's Goose, Emperor Goose, Canada Goose, Barnacle Goose, Red-breasted Goose, Egyptian Goose, Magellan Goose, Ruddy Shelduck, South African Shelduck, Muscovy Duck, Wood Duck, Mandarin, Wigeon, American Wigeon, Chiloe Wigeon, Speckled Teal, Gadwall, Red-billed Teal, Baikal Teal, Chestnut Teal, Falcated Teal, Silver Teal, Cape Teal, Mallard, Pintail, Hottentot Teal, Bahama Pintail, Blue-winged Teal, Cinnamon Teal, Marbled Duck, Rosy-billed Pochard, Red-crested Pochard, Ringed Teal, Pochard, Ferruginous Duck, New Zealand Scaup, Barrow's Goldeneye, Hooded Merganser, Argentine Blue-billed Duck, White-headed Duck, Ruddy Duck, Purple Swamphen, Sarus Crane, Demoiselle Crane, Grey-headed Gull.

APPENDIX 3

BOU Definitions of Sub-Categories of Non-Native Birds

Additional information

The following specialist definitions are included as background information only. They largely coincide with those the British Ornithologists' Union has adopted. There are other proposals, and they have considerable merit, but until such time as a wider consensus can be obtained, specialists reading the questionnaires are asked to think in terms of the definitions below.

Naturalized introduction An established species which would not occur naturally without introduction by man.

Naturalized establishment A species which has become established in an area where previously it had occurred but had not bred naturally, having been a vagrant, passage migrant or winter visitor.

Naturalized re-establishment A species successfully re-established in areas of former natural occurrence. (Note that "re-established" is favoured over "re-introduced". The latter term has been used often to describe species which have been re-established in an area of natural occurrence, following an extinction, but such usage is incorrect because it implies that the species was *introduced* before becoming extinct).

Naturalized feral A domesticated species established in the wild. (Note that mere keeping in captivity does not necessarily constitute domestication. The species must undergo some change in genotype, phenotype or behaviour in captivity).

Vagrant naturalized species Species from established naturalized populations in a neighbouring country.

The above definitions largely follow Holmes & Simons 1996 and Holmes *et al.* 1998.

APPENDIX 4

Questionnaires Used in Project

Appendix 4.1 General Questionnaire

Appendix 4.2 Detailed Questionnaire

Appendix 4.3 General Questionnaire in French

NB The second sheet of each questionnaire has been reduced to A4, from A3, and the number of lines have been reduced to allow for easier production of this report.

Appendix 4.1

GENERAL QUESTIONNAIRE ON INTRODUCED WATERBIRDS - THEIR EFFECT ON NATIVE WATERBIRDS (See covering letter)

Part 1 (General)

Any alien waterbird species which gives rise to concern should at least be mentioned. If you have more detailed comment to make whether general or under any of the headings below, please do so in Part 3 or on separate sheets.

NB "Your country" can mean where you have lived, worked or travelled: please specify which country.

Evidence.

- G1. Do you know of collections of non-native waterbirds in your country? Yes/No
Please enter any details in **Part 3** of addresses, general locations or any registration scheme.
- G2. Within your country, do you know of introduced populations of waterbirds arising from deliberate or accidental releases? Yes/No
- G3. If Yes, please list these introduced species below, giving details of locations and habitat occupied.

	Introduced species name (include scientific name if known)	Location (Place name, grid reference or latitude & longitude)	Description of area occupied. Give habitats if known
	a	b	c
1			
2			
3			
4			
5			
6			
7			
8			
9			

References and data

- G4. Please tell in Part 3 me where your information about introduced waterbird species comes from. Names and addresses of other people, specialist or non-specialist, who could add to that information are also most welcome.

Protection Measures and Conservation Legislation (excluding AEWA, Bern, Bonn and UN conventions)

- G5. **Within your country are there any protection measures or conservation legislation for the species** in the attached list? (Please list them in **Part 3**) Yes/No/Not Known
- G6. If Yes, do you think these protection measures are practical? Yes/No/Not Known
- G7. If Yes (at G6), are they implemented? Yes/No/Not Known
- G8. If Yes (at G7), tell me how successful they are:
- G9. If No (at G7), give reasons why they are not successful:
- G10. Have you any responsibility for the preparation or implementation of any of these protection measures, even in a small way? Yes/No
- G11. If Yes, please describe these responsibilities:

Introduced Species - Countermeasures

- G12. In your country, do you know of any measures (*e.g.* agreements, legislation) taken to prevent accidental or deliberate introduction of non-native waterbirds? Yes/No
- G13. If Yes, please give details in **Part 3**.
- G14. In your country, do you know of any measures to control (*e.g.* shooting, trapping, egg-control) introduced waterbird populations? Yes/No
- G15. If Yes, please give details in **Part 3**.

Part 2. Status of introduced waterbird species. Please complete G16, using Yes (Y), No (N) or Not Known (NK) where possible. Please give the year(s) your information refers to after each introduced species name (in column a). Please remember to include scientific names if you know them.

G16. Introduced waterbird species status table.

	Introduced waterbird species name (give the year(s) of your information)	Is it present all year-round?	Is it widespread?	Is it only in one area?	Does it breed in your country?	Is its range increasing/ decreasing?	Is its population increasing/ decreasing?	Is its population naturally self-sustaining?	Does the species drive out native waterbirds?
	a	b	c	d	e	f	g	h	i
1									
2									
3									
	Does the species interbreed with native waterbirds? (If Y, list native species)	Are hybrids produced?	Has the introduced species brought any disease to native waterbirds? (If Y, list native species)	Has the introduced species brought any disease to domestic waterbirds? (If Y, list domestic species)	Has the introduced species changed or degraded native waterbird habitat? (If Y, list habitat types)	Has human activity changed or degraded native waterbird habitat to favour introduced species? (If Y, list habitat affected)			
	j	k	l	m	n	o			
1									
2									
3									
	How long (in years) has introduced waterbird species been present?	Do escapes or releases add to introduced population?	The national population of the introduced species; how many breeding pairs?		Does the introduced species present any other threat to native waterbirds?	Please put your full name, address and tel / fax / e-mail in this box UK Data Protection Act: Your personal details may be kept on a computer database to allow the possibilities of exploring responses more deeply and of developing feedback. If you do not want to be contacted by any third party as a result of this, please put a mark in this box G			
	p	q	r		s				
1									
2									
3									

G17. Please tell me in Part 3 anything you know about the extent of the breeding range or movements/migration of the introduced species (*e.g.* personal knowledge, books, references, articles).

NB A MORE DETAILED QUESTIONNAIRE IS AVAILABLE ON REQUEST

Part 3.

Section EG1. Your expanded comments. Part 3 Section EG1 gives you space to include greater detail than was permitted in parts 1 and 2. Please state which question your comments refer to (e.g. "G1 continued").

Section EG2. Additional comment. Part 3 Section EG2 gives you the space to make more general additional comment, not necessarily linked to the questions in Parts 1 and 2.

Appendix 4.2

DETAILED QUESTIONNAIRE ON INTRODUCED WATERBIRDS - THEIR EFFECT ON NATIVE WATERBIRDS
(See covering letter).

Part 1 (General)

Note that the term *Introduced* covers *naturalized feral* and *naturalized introduced* species. This assumes a self-sustaining population which may be difficult to prove. Therefore, any alien waterbird species which gives rise to concern should at least be mentioned. If you have more detailed comment to make whether general or under any of the headings below, please do so in Part 3 or on separate sheets.

NB "Your country" can mean where you have lived, worked or travelled: **please specify which country.**

--

Evidence.

S1. Do you know of collections of non-native waterbirds in your country? Yes/No

Please give details in **Part 3** or separately of addresses, general locations or any registration scheme.

S2. Within your country, do you know of any record or of any anecdotal evidence of introduced populations of waterbirds arising from deliberate or accidental releases? Yes/No

S3. If Yes, please list the introduced species below and give any available details of location and habitat occupied (**NB Part 2 asks for occurrence dates and population status**).

	Introduced species name (include scientific name)	Location (Place name, grid reference or latitude & longitude)	Description of area occupied. Give habitat if known
	a	b	c
1			
2			
3			
4			
5			
6			
7			
8			
9			

References and data

S4. Please list in **Part 3** any recent published information (name(s), date, title, journal/publisher) or data (please summarize) about any of these introduced waterbird species. Please also give the names and addresses of anyone else who could supply additional information.

Protection Measures and Conservation Legislation (excluding AEWA, Bern, Bonn and UN conventions)

S5. Within your country are there any protection measures or conservation legislation for the species in the attached list? (Please give details in **Part 3**). Yes/No/Not Known

S6. If Yes, do you think these protection measures are practical? Yes/No/Not Known

S7. If Yes (at S6), are these measures implemented? Yes/No/Not Known

S8. If Yes (at S7), estimate the extent to which they succeed:

S9. If No (at S7), why are they not in force?

Introduced Species - Countermeasures

S10. In your country, do you know of any measures (e.g. agreements, legislation) taken to prevent accidental or deliberate introduction of non-native waterbirds? Yes/No

S11. If Yes, please give details in **Part 3**.

S12. In your country, do you know of any measures which aim to control (e.g. shooting, trapping, egg-control) introduced waterbird populations? Yes/No

S13. If Yes, please give details in **Part 3**.

Part 2. Status of introduced waterbird species S14. Please complete S14 for each species you have listed in **Part 1**. To help you put the correct information in the correct columns (cols), please read these instructions (*) carefully: *If a column (col) does **Not Apply**, please use **NA**. *Where you do **Not Know**, put **NK**. *For data quality, use in cols **b to f**; **S=** Survey data, **C=** Counts, **U=** Unquantified observations or **I=** Indirect information (e.g. anecdotal). *Also in cols **b to f** put **totals** if known. *In col **e**, grade the breeding evidence as **pos=** possible, **prb=** probable or **c=** confirmed. *In col **f**, use **bp=** breeding pairs. In cols **g and h** use **inc =** increasing, **dec=** decreasing and **sta=** stable). *In columns **i to m** and **p to u**, use **NK or Y=** Yes, **N=** No. Please give the **year(s)** your information refers to after each introduced species name (**in col a**).

	Introduced species name (give the year(s) of your information)	Isolated individuals S/C/U/I (totals)	Isolated groups S/C/U/I (totals)	Wintering groups (northern winter) S/C/U/I (totals)	Breeding evidence S/C/U/I (totals) (pos/prb/c)	National population size estimate S/C/U/I (bp)	Status of breeding range inc/dec/sta	Status of breeding population inc/dec/sta	Hostile interaction with native waterbirds? Y/N/NK	Dominance over native waterbirds? Y/N/NK	Actual/potential** (See comment after S15) threat to native waterbirds? Y/N/NK	Is population self-sustaining? Y/N/NK	
	a	b	c	d	e	f	g	h	i	j	k	l	
1													
2													
	Is population added to by release or escape recruitment? Y/N/NK	How long (in years) has introduced species been present?	Name(s) of native waterbird species threatened? (Include scientific names)	Has the introduced waterbird species: (Choose from Y/N/NK in each col below)						If hybridization occurs:			
				reduced native waterbird survival/ breeding success? Y/N/NK Give native species	hybridized with native/ domesticated waterbirds? Y/N/NK Give native species	introduced diseases to native/ domesticated waterbirds? Y/N/NK Give native/ domesticated species	degraded native waterbird habitat? Y/N/NK Give habitats	thrived thro' human change to habitat? Y/N/NK Give habitats	displayed promiscuous mating? Y/N/NK	state hybrid fertility low/high/ NK	how many hybrid generations exist? 2/3/3+ NK/none	do hybrids prefer: hybrids/ native sp/ introduced sp/NK	
	m	n	o	p	q	r	s	t	u	v	w	x	
1													
2													

S15. If you know of **other threats** from introduced species, please list them in **Part 3**

** **Threats from introduced species. An introduced species which exists in small numbers may be an actual threat to only a few individual native waterbirds, but may be only a potential threat to the whole native population. Actual threats become significant if they occur on an increasing or widespread scale. Conversely, large numbers of an introduced species may present only a potential threat if there is little or no evidence to prove an actual threat. Please explain your threat assessments in Part 3.**

S16. Please comment in **Part 3** on any trend noted in **population numbers** or the **extent of the breeding range** or **movements/migration** (per introduced species).

S17. What is the confidence level of your population estimate in your answer to question S14 column f? Please choose one of the following:

NA/25%/50%100%

Please put your full name address and tel/fax/e-mail in this box.

UK Data Protection Act

Your personal details may be kept on a computer database to allow the possibilities of exploring responses more deeply and of developing feedback. If you do not wish this to happen, and you do not want to be contacted by any third party as a result of this, please put a mark in this box G

Part 3.

Section ES1. **Your expanded comments. Part 3** Section ES1 gives you space to include greater detail than was permitted in parts 1 and 2. Please state which question your comments refer to (e.g. "S1 continued").

Section ES2. **Additional comment. Part 3** Section ES2 gives you the space to make more general additional comment, not necessarily linked to the questions in Parts 1 and 2.

Appendix 4.3

QUESTIONNAIRE GÉNÉRAL SUR LES OISEAUX-D'EAU INTRODUIITS - LEUR IMPACT SUR LES OISEAUX-D'EAU INDIGÈNES (Voir lettre de presentation)

Partie 1 (Généralités)

Toute espee étrangère d=oiseaux d=eau posant problème devra au moins être mentionnée. Si vous avez des commentaires plus détaillés à soumettre qu=ils soient d=ordre général ou se rapportant à l=un des en-têtes ci-dessous, veuillez les faire à la Partie 3 on sur des feuillets séparés.

NB A Votre pays@ peut signifiez lá ou vóus avez reçu, travaillé ou voyagé: veuillez spécifiez le pays.

Évidence

- G1 Si vous avez connaissance de regroupements d'oiseaux d'eau non-indigènes à votre pays, précisez séparément leurs adresses, situation géographique ou tout système d'inscription les concernant. Oui/Non
- G2 Dans votre pays y a-t-il évidence de populations d'oiseaux d'eau introduites à la suite d'échappées délibérées ou accidentelles? Oui/Non
- G3 Si oui, veuillez si possible faire la liste en donnant tous détails sur les lieux et les surfaces occupées

	Nom de l'espèce introduite (inclure le nom scientifique s'il vous est connu)	Lieux (indiquer nom, référence de tableau quadrillé ou bien latitude et longitude)	Description des surfaces et zones occupées et de l'habitat connu
	a	b	c
1			
2			
3			
4			
5			
6			
7			
8			
9			

Références et données

- G4 Veuillez-citer à la Partie 3 les sources de vos preuves concernant les espèces d'oiseaux d'eau introduites. Toutes personnes, spécialistes on non, qui pourront ajouter d'autres renseignements de cette nature seront aussi les bienvenues.

Législation sur les Mesures de Protection et de Conservation (à l'exclusion des conventions AEWA, de Berne, de Bonn et des Nations Unies)

- G5 Existe-t-il dans votre pays, des mesures de protection ou/et de conservation concernant les espèces de la liste-ci-jointe? (Donnez-les à la Partie 3). Oui/Non/Ne sais pas
- G6 Si oui, pensez-vous que ces mesures sont d'ordre pratique? Oui/Non/Ne sais pas
- G7 Si oui (à G6), sont-elles mises à exécution? Oui/Non/Ne sais pas
- G8 Si oui (à G7), estimez la mesure de leur succès:
- G9 Si non (à G7), donnez les raisons pour lesquelles elles n'ont pas de succès:
- G10 Avez-vous une responsabilité, même minime, dans la préparation ou bien l'exécution de l'une de ces mesures de protection? Oui/Non
- G11 Si oui, veuillez les décrire.

Espèces introduites - Contre-mesures

- G12 Dans votre pays connaissez - vous des mesures (par exemple, des accords, législation) prises pour empêcher une introduction accidentelle on délibérée d'oiseaux d'eau non indigènes? Oui/Non
- G13 Si oui, en donner le détail à la Partie 3.
- G14 Dans votre pays, connaissez-vous des mesures prises pour controler ces populations d'oiseaux d'eau introduites? (telles que le tir, des trappes, actions sur les oeufs) Oui/Non
- G15 Si oui, veuillez en donner le détail à la Partie 3.

Partie 2. (Etat des espèces d'oiseaux d'eau introduites) Veuillez compléter G16 en mettant Oui, Non ou Inc (inconnu). N'oubliez pas l'année de référence, par colonne.

G16. **Tableau de l'état des espèces d'oiseaux d'eau introduites.**

Nom de l'espèce d'oiseau d'eau introduite (avec son nom scientifique)		Est-elle présente tout au long de l'année?	Est-elle répandue ou dans un seul endroit?	Est-elle dans une seule zone?	Se reproduit-elle dans votre pays?	Son aire d'occupation augmente-t-elle? décroît-elle?	Sa population augmente-t-elle? décroît-elle?	Sa population s'est-elle bien adaptée naturellement?	Cette espèce repousse-t-elle les oiseaux d'eau indigènes?
a		b	c	d	e	f	g	h	i
Cette espèce se croise-t-elle avec les oiseaux d'eau indigènes? (Si oui, avec les quelles)	En naissent-ils des hybrides?	L'espèce introduite a-t-elle amené des maladies aux oiseaux d'eau indigènes? (Si oui, donnez-en la liste)		L'espèce introduite a-t-elle amené des maladies aux oiseaux d'eau domestiques? (Si oui, donnez la liste des oiseaux domestiques)		L'espèce introduite a-t-elle changé ou dégradé l'habitat des oiseaux d'eau indigènes? (Si oui, donnez la liste des types d'habitat)		Les occupations humaines ont-elles changé ou dégradé l'habitat des oiseaux d'eau indigènes à l'avantage des espèces introduites? (Si oui, quels habitats sont ils affectés)	
j	k	l		m		n		o	
Depuis combien d'années l'espèce d'oiseaux d'eau introduite est-elle présente?		Est-ce que des oiseaux échappés ou recrutés s'ajoutent à la population introduite?		La population nationale de l'espèce introduite; combien de couples nicheurs?		Quelle autre menace l'espèce introduite représente-t-elle pour les oiseaux d'eau indigènes?		<p>Veuillez nous donner ici-même tous les renseignements nous permettant d'entrer en contact avec vous. (Nom, adresse, tél/fax/e-mail)</p> <p>Vos détails personnels seront peut-être tenus sur ordinateur pour nous aider à analyser vos données. Si vous ne voulez pas être contacté par autrui, mettez votre marque ici. G</p>	
q		r		s		t			

G17 En **Partie 3** seront les bienvenus tous les renseignements sur l'ampleur de l'étendue de la nidification, des Amouvements@ et de la migration des espèces introduites.

NB UN QUESTIONNAIRE PLUS DÉTAILLÉ RÉSERVÉ AUX BIOLOGISTES ET AUX ORNITHOLOGUES SPÉCIALISÉS SERA DISPONIBLE SUR DEMANDE (SEULEMENT EN ANGLAIS, JE REGRETTE).

Partie 3

Section EG1 **Vos commentaires développés. La Partie 3**, Section EG1, vous offre l'espace Nécessaire pour développer en détail les Parties 1 et 2. Veuillez bien précisez à quelle question vos commentaires s'adressent chaque fois (par exemple AG1 continué@).

Section EG2 **Vos commentaires supplémentaires.** La Partie 3, Section EG2, vous offre l'espace nécessaire pour des commentaires complémentaires qui ne seront pas nécessairement liés aux questions des Parties 1 et 2.

APPENDIX 5

Introduced Waterbird Species Records Omitted from the Report

The species below have been omitted because either they have been recorded fewer than three times in any one Range State since 1970, they have not been known to survive for at least a year in the wild, or they had been released into habitat unsuitable for their survival.

English name	Scientific name	Natural range
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	North America
Yellow-crowned Night Heron	<i>Nycticorax violaceus</i>	USA, C America, W Indies, northern S America, Galapagos
Yellow Bittern	<i>Ixobrychus sinensis</i>	India, SE Asia, Japan
Indian Pond Heron	<i>Ardeola grayi</i>	Iran, India, Burma, Sri Lanka, S Maldiv Islands
Great White Egret	<i>Egretta alba ssp modesta</i>	Eurasia, Africa, Americas, Australasia
Great Blue Heron	<i>Ardea herodias</i>	N & C America
Black Stork	<i>Ciconia nigra</i>	Europe to N China, S Africa
Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>	India, S China, Greater Sundas
Greater Adjutant Stork	<i>Leptoptilos dubius</i>	India, Indochina, Greater Sundas
Marabou Stork	<i>Leptoptilos crumeniferus</i>	Africa
Straw-necked Ibis	<i>Threskiornis spinicollis</i>	Australia
Buff-necked Ibis	<i>Theristicus caudatus</i>	S America
Glossy Ibis	<i>Plegadis falcinellus</i>	Eurasia, Africa, Americas, Australia
Puna Ibis	<i>Plegadis ridgwayi</i>	Peru, Bolivia
Andean Flamingo	<i>Phoenicoparrus andinus</i>	S America
Magpie Goose	<i>Anseranas semipalmata</i>	SW New Guinea, N Australia
Wandering Whistling Duck	<i>Dendrocygna arcuata</i>	East Indies, Australia, SW Pacific
Whistling Swan	<i>Cygnus columbianus ssp columbianus & jankowski only</i>	Northern Canada, NE Asia
Bewick's Swan	<i>Cygnus columbianus bewickii</i>	N Russia, N Siberia
Coscoroba Swan	<i>Coscoroba coscoroba</i>	Southern S America
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>	Islands off S Australia
Brent Goose	<i>Branta bernicla</i>	Holarctic
Andean Goose	<i>Chloephaga melanoptera</i>	Peru to Tierra del Fuego
Ruddy-headed Goose	<i>Chloephaga rubidiceps</i>	Southern S America
Orinoco Goose	<i>Neochen jubatus</i>	Orinoco & Amazon basins
Radjah Shelduck	<i>Tadorna radjah</i>	N Australia, New Guinea
Comb Duck	<i>Sarkidiornis melanotos</i>	S America, Africa, India
Cotton Pygmy Goose	<i>Nettapus coromandelianus</i>	India, S China, NW Indonesia, NE Australia
Brown Teal	<i>Anas aucklandica</i>	New Zealand
Laysan Duck	<i>Anas (platyrhynchos) laysanensis</i>	Laysan Island
Florida Duck	<i>Anas (p.) fulvigula</i>	SE USA
American Black Duck	<i>Anas rubripes</i>	NE North America to SE USA
Philippine Duck	<i>Anas luzonica</i>	Philippine Islands
Bronze-winged Duck	<i>Anas specularis</i>	S Chile, S Argentina

Yellow-billed Pintail	<i>Anas georgica</i>	S America
Australian Shoveler	<i>Anas rhynchos</i>	Australia, New Zealand
Canvasback	<i>Aythya valisneria</i>	N America
Redhead	<i>Aythya americana</i>	N America
Baer's Pochard	<i>Aythya baeri</i>	NE Asia
Scaup	<i>Aythya marila</i>	N Holarctic, NW India, Bering Islands
Harlequin	<i>Histrionicus histrionicus</i>	E Asia, N America, Iceland
Eider	<i>Somateria mollissima</i>	Northern Holarctic, NW Europe
Smew	<i>Mergellus albellus</i>	N Europe, N Asia
Red-breasted Merganser	<i>Mergus serrator</i>	N Holarctic, some mid-Holarctic
Goosander	<i>Mergus merganser</i>	Mid-, N Holarctic, C Asia, Himalayas
Black-headed Duck	<i>Heteronetta atricapilla</i>	Southern S America
Peruvian Thick-knee	<i>Burhinus superciliosus</i>	Ecuador, Peru
Spur-winged Plover	<i>Hoplopterus spinosus</i>	SE Europe, C & E Africa
Blacksmith Plover	<i>Hoplopterus armatus</i>	Africa
Snowy Sheathbill	<i>Chionis alba</i>	Antarctic
Silver Gull	<i>Larus novaehollandiae</i>	Australia, New Zealand, SA Cape Province