

GREATER WHITE-FRONTED GOOSE

Anser albifrons

Subspecies:

Polytypic. Five subspecies have been described: the nominate form from northern Europe and Asia; *A. a. frontalis* from northeastern Siberia and northern Canada; *A. a. flavirostris* from Greenland, *A. a. gambelli* from the Mackenzie Basin region of Canada; and *A. a. elgasi* from the Anchorage region of Alaska. The validity of *elgasi* has been questioned.

Distribution:

Holarctic, breeding at high latitudes in northern Europe, Asia and North America, and wintering south to Mexico, southern Europe, the Middle East, China and Japan. Two subspecies occur in Western Eurasia, the nominate form breeds in the Arctic tundra from the Kanin Peninsula in European Russia east to the Kolyma River, and winters from western Europe east to India and China (rarely in small numbers to Egypt, and a vagrant elsewhere in Africa). *A. a. flavirostris* breeds exclusively in low Arctic areas of west Greenland from 63° to 72°N; it occurs on migration in southern and western Iceland, and winters exclusively in Britain and Ireland.

Movements:

Migratory, wintering at traditional sites mostly at temperate latitudes; occasionally further south during cold winters. Rogacheva (1992) suggests that virtually all of the western and central Siberian nesting birds migrate west to northwest and central Europe, while nearly all of the birds breeding in Taymyr migrate through Kazakhstan to the western Black Sea (and presumably also Turkey). The relatively small numbers of birds wintering in the Caspian region probably also originate from the Taymyr region.

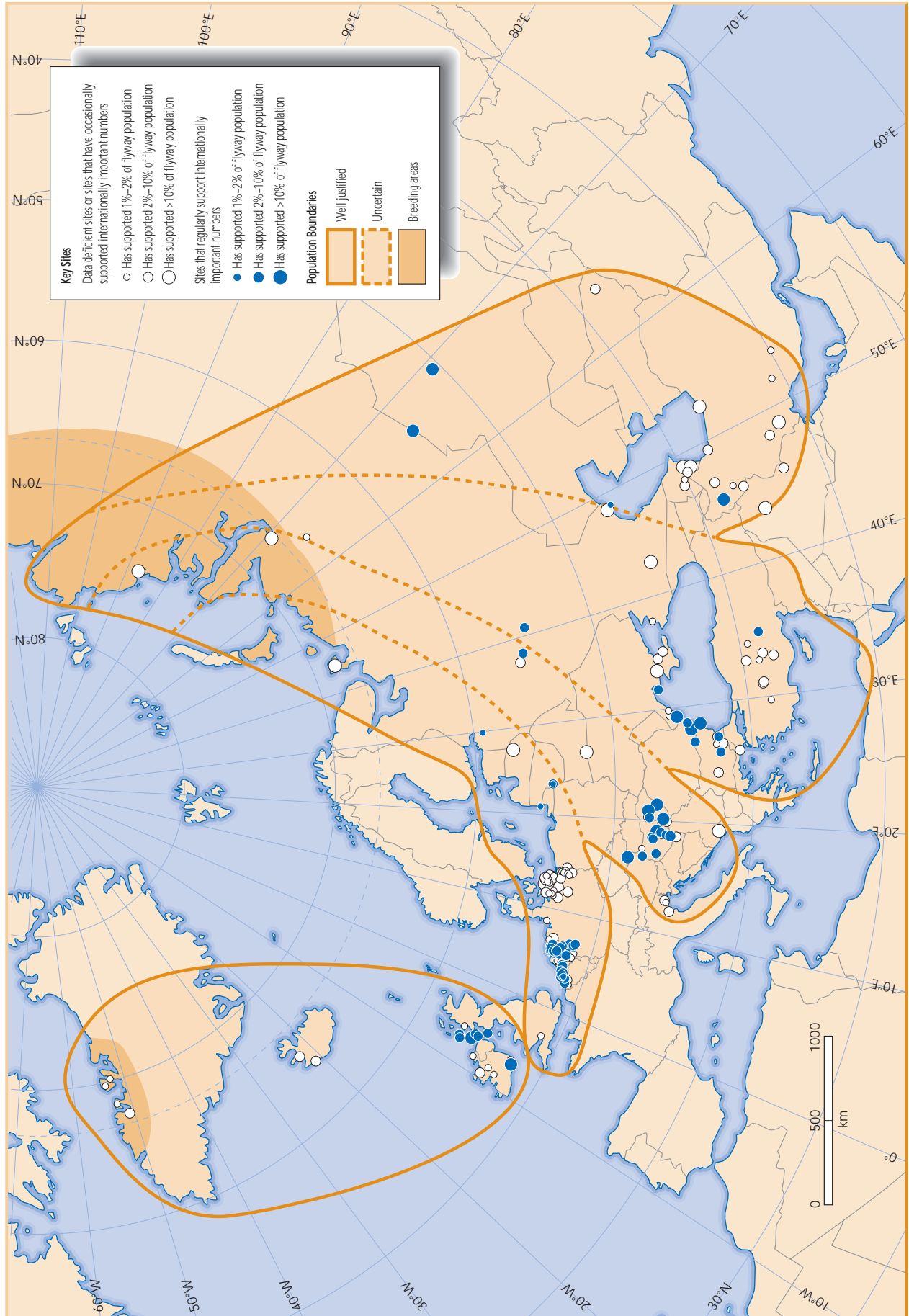
The movements of *A. a. flavirostris* and its major staging and wintering areas have been described by Stroud (1992). This subspecies stages in south and west Iceland in both spring and autumn, and some of the geese wintering in Ireland also stage in autumn in Scotland, mainly on Islay. Wilson *et al.* (1991) have shown that geese are extremely site-faithful in winter, with approximately 85% of the birds observed in successive winters returning to the same sites. Within the same winter, less than 1% of geese moved between sites, and most such movements were associated with autumnal staging en route to final destinations. Wilson *et al.* (1991) also found that dispersal from any one major summering area in Greenland is virtually throughout the winter range, implying that birds in one winter flock come from many different breeding areas.

Population limits:

Western populations of the nominate subspecies winter in four largely discrete wintering areas: in northwest Europe from Germany to France and Britain, with the major concentrations in the Netherlands; in central Europe; on the west coast of the Black Sea and in Turkey (south to Egypt); and in the Caspian region south to Iraq and east possibly as far as the Aral Sea. These four wintering groups are generally treated as separate populations, although as Madsen (1991) noted, the integrity of these populations and the rate of interchange of individuals between them have never been properly documented. The validity of a separate central European population, in particular, has been questioned (Mooij, 1996). However, although the divisions between the four populations may be difficult to justify on biological grounds, treatment of the major wintering groups as separate populations is favoured here for practical reasons. Ogilvie (1978) split the Black Sea/Turkey population into two, but apart from some geographical separation of the geese in mid-winter, there seems little justification for dividing the flocks in these regions into separate populations (Madsen, 1991). The entire population of *A. a. flavirostris* constitutes a fifth (and totally discrete) population.

Population size:

- Western and central Siberia/northeast and northwest Europe: 600,000 (Madsen *et al.*, 1996). 1% level 6,000.
- Western and central Siberia/central Europe: 100,000 (Pirot *et al.*, 1989). 1% level 1,000.



- **Northern Siberia/Black Sea and Turkey: 650,000 (Madsen *et al.*, 1996). 1% level 6,500.**

- **Northern Siberia/Caspian and Iraq: 15,000 (Rose & Scott, 1994). 1% level 150.**

Poorly known. Up to 10,000 have been recorded in the Volga Delta in mild winters (Krivonosov & Rusanov, 1990), and according to Tkachenko and Litvinova (1990) 6,000–15,000 winter in the Kirov Bays in Azerbaijan in wet years. Patrikeev (in prep.) suggests that the total wintering population in Azerbaijan varies between 5,000–6,000 in dry years and 20,000–30,000 in wet years. Between 2,500 and 5,000 birds formerly wintered in Iran, but the species is now scarce there.

- **Greenland/Ireland and UK (*flavirostris*): 30,000 (Madsen *et al.*, 1996). 1% level 300.**

Habitat/ecology:

Anser albifrons breeds in open tundra near marshes, lakes, pools and rivers, near coasts as well as inland, and winters in open country, on steppe and farmland, or on marshy plains. *A. a. flavirostris* is unusual amongst geese in still frequenting traditional haunts throughout much of its winter range, e.g. peatland roosting and feeding sites and wet grasslands such as callows and turloughs (Stroud, 1992). Nominate *albifrons* moult in large groups near their breeding grounds between about 25 July and 20 August, when they are flightless for about 25 days. The autumn migration begins in September, and birds reach Germany from early October. Arrival on the main winter quarters occurs in November and December, depending on the weather. Return passage begins in March, with birds reaching their breeding grounds at the end of May.

A. a. flavirostris moult in small flocks on the breeding grounds in late summer; these flocks consist of families and non-breeding birds, and generally do not exceed about 30 birds. The geese leave the breeding grounds in September and early October, some moving east over the ice cap and probably staging in east Greenland before continuing on to Iceland. Others fly south, crossing the Atlantic direct to Ireland, where the first birds arrive at the end of September. Birds staging in Iceland arrive in Ireland in late October or November. Most birds leave the wintering grounds between mid-April and the third week of May, and stage in Iceland until early May before crossing the ice-cap or travelling around Cape Farewell to their breeding areas in west Greenland. In comparison with many other Arctic breeding geese, *A. a. flavirostris* are highly dispersed in summer, with the exception of a few areas where relatively dense concentrations occur (e.g. Naternaq and Aqaajarua-Sullorsuaq). Other relatively dense concentrations occur on arrival in spring, when large flocks gather in a few, traditional, early thawing lowlands (Stroud, 1992).

Conservation status:

The population of *A. a. albifrons* wintering in northwest Europe has increased from about 60,000 birds in the 1960s to about 400,000 in the late 1980s and 600,000 in recent years (Madsen, 1991; Wetlands International Goose Specialist Group). The number of *albifrons* wintering in Austria and Hungary decreased during the 1970s and 1980s, and this was thought to be the case for the entire central European population (Dick, 1990). Between 1950 and 1980 there was also a contraction of the wintering range northwards (N. Baccetti, *in litt.*). It has been suggested that the rapid increase in numbers in northwest Europe during the past two decades may have been due in part to a shift in birds from wintering areas in central Europe, but this remains uncertain (Pirot & Fox, 1990).

Trends in the Black Sea/Turkey population are not visible. There is reported to have been an increase in the number of birds wintering in Bulgaria between 1977 and 1989. The situation in Turkey is uncertain, as the major wintering areas are not often counted, but numbers appear to have been relatively stable between 1967 and 1988 (Madsen, 1991).

The population wintering in Southwest Asia is thought to be decreasing (Perennou *et al.*, 1994). Enormous numbers are said to have wintered in Azerbaijan in the late 19th and early 20th centuries, but the numbers of this species and *A. erythropus* combined have not exceeded 20,000–30,000 in recent decades (Patrikeev, in prep.). The wintering population in Iran and Iraq has decreased dramatically since the 1960s, perhaps largely because of excessive hunting and associated disturbance on the winter quarters (Scott, 1976; Scott & Evans, 1993).

Numbers of *A. a. flavirostris* declined from 17,500–23,000 in the 1950s to 14,400–16,000 in the late 1970s, but then increased to 22,000–25,000 in 1985–87, and have since increased to an average of 30,000 in recent years (Madsen, 1991; Wetlands International Goose Specialist Group). This increase has been attributed to the introduction of conservation measures on the wintering grounds and in Greenland during the early 1980s, and several successful breeding seasons in recent years. An

International Conservation Plan has been prepared at the request of the National Parks and Wildlife Service in Ireland and Wetlands International (Stroud, 1992).

Network of key sites:

It is very difficult to identify key sites for *A. a. albifrons* outside winter because of the lack of information and the rapid convergence and overlap of the four populations just north of the wintering areas. There is evidence that large concentrations can be found throughout the year leading one to conclude that most key breeding, moulting and passage sites remain to be identified, and that the key sites that are known outside of winter need to be more accurately assigned to wintering groups. The spring departure and autumn arrival sites are better known for the Black Sea/east Mediterranean and especially the Central European wintering groups, but even these sites are totally unknown for the Caspian wintering group and very few are listed for the northwestern European wintering group. In winter, over 50 key sites are listed for the northwestern European wintering group, 23 for the Central European wintering group, 31 for the Black Sea/east Mediterranean wintering group and 17 for the Caspian wintering group. All *A. a. albifrons* populations are very mobile in winter moving between roosting sites and feeding sites on which they can be very widely dispersed. This behaviour is not entirely suited to the development of a key sites network approach but the extensive list of key wintering sites identified for all four populations nevertheless provides a valuable basis for any conservation efforts. In particular, with the exception of the northwestern European wintering group, all wintering groups can, in exceptional conditions, be found almost entirely on one or two key sites. For example, 130,000 at Hortobagy in Hungary in 1992; 350,000 at both the Danube Delta and the Dobrodja in Romania in 1989 and 15,000 at Kizil Agach in Azerbaijan.

The key sites for *A. a. flavirostris* at its staging areas in south and west Iceland and at its wintering areas in Britain and Ireland have been extensively listed by Stroud (1992) and form an excellent basis for an effective key sites network. Few breeding, moulting or staging areas in Greenland are known to exceed the threshold for inclusion as a key site probably due to a combination of little information and the very dispersed nature of the population.

Protection status of key sites:

Of the very few key sites known in Russia most are protected. For the Black Sea/east Mediterranean wintering group most known spring departure and autumn arrival sites are protected and the same is true for the Central European wintering group with the notable exception that Skadarsko Jezero on the Montenegro/Albania/Macedonia (former Yugoslav Republic of) border is unprotected and has been known to support 10,000 individuals in autumn. It is difficult to assess the protected status of the key wintering sites network in northwestern Europe as very little protected status information has been provided but in Central Europe most key wintering sites are protected. In the Black Sea/east Mediterranean many key wintering sites are not protected, especially in Turkey and Bulgaria and in the Caspian Basin 9 of 17 key wintering sites have some protected status. None of the main breeding areas of *A. a. flavirostris* are protected, and many of the staging and wintering areas are unprotected.

LESSER WHITE-FRONTED GOOSE

Anser erythropus

Subspecies:

Monotypic.

Distribution:

Palearctic, breeding across northern Eurasia from northern Scandinavia to northeastern Siberia, and wintering south to southeast Europe, the Middle East and China. In Western Eurasia, the species breeds from northern Scandinavia east to western Siberia (southern Taymyr), with the main concentration being in the region of the Yamal Peninsula and lower reaches of the Ob River; it winters in southeast Europe (Black Sea to Greece) and the Caspian region. The species was formerly a rare winter visitor in very small numbers to Egypt, but there have been no recent records.

Movements:

Migratory, wintering on low-lying plains at temperate latitudes. The staging areas and wintering grounds of the tiny Scandinavian group are poorly known. Small flocks are known to stage in west Finland in May, and in the early 1990s, 30–60 birds were found gathering in a post-moulting site in Porsanger Fiord in Norway (Madsen, 1995). There is unconfirmed information that staging areas exist in the Baltic Republics (Madsen, 1995), and satellite-tagged birds were found staging in autumn in eastern Germany in 1995. There are regular autumn and spring staging areas in Hungary, and from late autumn to early spring, small numbers of birds are present in Romania, Bulgaria and Greece. Further east, there is a major staging and moulting area on the Kanin Peninsula, and staging areas on the eastern coast of the Sea of Azov, in the Manych-Godilo and east Manych Lakes north of the Caucasus, in the middle Ob River valley, and in Kazakhstan. The main wintering grounds in the Caspian region now appear to be in Azerbaijan (Madsen, 1995). According to Vinogradov (1990), massive shifts in winter distribution have occurred in the Caspian region within the last three to four decades. The most important wintering site in Iran was abandoned in the late 1970s, and there have been few records of the species in Iraq since the 1960s.

Birds ringed in Sweden in the 1960s were recovered in Greece and the eastern Black Sea, and a bird ringed as a gosling on the breeding grounds in northern Finland in 1994 was recovered on the east side of the Sea of Azov (Lahti & Markkola, 1995). Four birds tagged on the breeding grounds in Norway in 1995 were tracked by satellite to the Kanin Peninsula in northern Russia. Two of these birds were subsequently tracked to eastern Germany, where one of the signals was lost, but the remaining bird continued on via Hungary and Bulgaria to the Evros Delta in Greece. Another bird tagged in Finland in 1995 also staged at the Kanin Peninsula, but then moved southeast to reach Kazakhstan by October (Anon, 1996). Birds ringed in European Russia have been recovered in Hungary, while a bird ringed on the breeding grounds in the southern Taymyr at 100°E was recovered in the southeast Caspian region of Iran (Cornwallis & Ferguson, 1970).

The re-introduction of captive-bred birds into a former breeding area in Sweden has resulted in the establishment of a small breeding population of about 20–30 individuals. A new wintering area for some of these geese has been established in the southern Netherlands near Strijen, and a spring and autumn staging and moulting area has been established near Hudiksvall, along the coastal region of mid-Sweden (Callaghan & Green, 1993).

Population limits:

Because of present uncertainties in migration routes and wintering areas, it has been proposed that all breeding and wintering groups in Western Eurasia be treated as belonging to a single population (Wetlands International Goose Specialist Group, *in litt.*), and this treatment is therefore adopted here. However, there is a possibility that there are two relatively discrete populations: a population breeding in northern Scandinavia and European Russia, and wintering in southeast Europe and the Black Sea region; and a population breeding east of the Urals to the Taymyr region and wintering in the Caspian region, mainly in Azerbaijan. There are very few confirmed records of the species in Turkey (only two records are listed by Kirwan and Martins, 1994), suggesting that there is a substantial gap between the population wintering in the western Black Sea and the population wintering in the Caspian region. Recent estimates for the European breeding population (1,000–2,500 pairs or 3,000–7,500 birds) agree reasonably well with

LESSER WHITE-FRONTED GOOSE *Anser erythropus*



recent counts from the staging and wintering areas in Belarus (some hundreds of birds), Hungary (1,200), Romania (900), Bulgaria (1,000) and Greece (140).

Population size:

- **Western Eurasia: 15,000–35,000. 1% level 250.**
- **Northeast Europe/Black Sea: 3,000–5,000. 1% level 40.**
- **Western Siberia/Caspian region: 10,000–30,000. 1% level 200.**

The world population of the *A. erythropus* was estimated at about 100,000 birds in the 1960s, with the majority wintering on the shores of the Caspian Sea. The population has now almost certainly declined to less than 50,000 individuals, with a few thousand wintering in Europe, possibly as many as 30,000 wintering in the Caspian region, and about 6,000 wintering in eastern Asia (Madsen, 1995; S. Pihl, *in litt.*).

The Fennoscandian breeding population was estimated at more than 10,000 individuals in the first half of this century, but since then the population has crashed, and by 1992 was estimated at only about 50 pairs. von Essen (1991) estimated the total number of breeding pairs in Sweden in 1984–88 at only 10 pairs, and the number of geese before breeding at less than 100 birds. Only small flocks (usually less than 50) are now seen at the staging areas in Finland, although in recent years, up to 97 have been observed on a pre-nesting staging area in Porsanger Fiord in northern Norway (Madsen, 1995). The breeding population in the European part of Russia is estimated at 1,000–2,500 pairs (J. Madsen, *in* Tucker & Heath, 1994), but this has to be regarded as a best guess only, and may be too high (Madsen, 1995). About 1,500 birds have been recorded during spring migration on the Kanin Peninsula in recent years (Krivenko, 1995), and most of these are presumably European breeding birds.

Up to 120,000 *A. erythropus* were thought to use the autumn staging areas in Hungary prior to the 1950s, but by the late 1960s, numbers had declined to approximately 5,000, and the decrease has continued since then so that in the late 1980s, only 200–600 individuals were observed annually. However, in the winters of 1992/93 and 1993/94, increasing numbers (up to 1,200) have been observed staging and/or wintering in Hungary (Madsen, 1995). In Romania and Bulgaria, usually less than 10 *Anser erythropus* are observed during the mid-January waterfowl censuses. However, in January 1992, a total of 900 was estimated in Romania, and generally the species is overlooked in the large flocks of wintering *A. albifrons*. An hitherto unknown wintering site with up to 1,000 *A. erythropus* has recently been reported in northern Bulgaria, but these figures need to be confirmed. In Greece, up to 1,600 geese were observed in the 1960s, but since then numbers have declined dramatically. In recent winters, a small but reportedly stable wintering population of up to 140 birds has been established in northeast Greece.

Based on surveys on the breeding grounds, Vinogradov (1990) estimated the total population in Russia to exceed 100,000 individuals. However, these figures have not been confirmed by recent winter counts. The only large concentrations of wintering *A. erythropus* in the Caspian region in recent years have been in Azerbaijan, where there have been reports of up to 30,000 birds in winter (Madsen, 1995), and as many as 11,000–25,000 at Kizil Agach alone. However, Patrikeev (*in prep.*) disputes these high figures, and believes that the total number of *A. erythropus* wintering in Azerbaijan varies between about 1,500 in wet winters and 6,000–7,000 in dry winters. Only about 1,100 were observed in Azerbaijan during a thorough survey in January 1996, but by this time most of the geese had moved on (D.B. Paynter, *pers. comm.*). Up to 10,000 *A. erythropus* are said to occur on migration at the Manych-Godilo and east Manych Lakes north of the Caucasus (Krivenko, 1995), but where these birds winter is unknown.

In the early 1970s, between 4,500 and 7,500 *A. erythropus* wintered in Iran, mainly in Miankaleh Protected Region (Scott, 1976). However, the Miankaleh birds disappeared suddenly in the late 1970s, and since then, only small flocks of *A. erythropus* have been observed in Iran. According to Patrikeev (*in prep.*), very few *A. erythropus* wintered in Azerbaijan during the period 1971–76, but numbers increased rapidly to some thousands in the late 1970s. It seems possible that these were the birds which had spent the early 1970s wintering in Iran. The decline in numbers at Miankaleh has been attributed to the sudden rise in the level of the Caspian Sea in the late 1970s, which flooded the main feeding area of the geese (Scott, 1995); the increase in Azerbaijan has been attributed to the planting of crops especially for the geese at the main wintering site in Kizil Agach Reserve.

It remains possible that there are important and hitherto unknown wintering areas east of the Caspian in northeastern Iran and Turkmenistan, but there have been few records from this area since a flock of 1,770 was found on the Turkoman Steppes north of Gomishan in Iran in January 1969 (Scott, 1995). It is also possible that some *A. erythropus* still winter in northern Iraq, but there have been no reports from this country since 1972, when 70 were present at Haur Al Shuwaija (Koning & Dijkens, 1973). It seems unlikely that *A. erythropus* winters in significant numbers in Turkey.

The above figures suggest that the total population of *A. erythropus* in Western Eurasia is very unlikely to exceed 35,000, and may now be as low as 15,000, with some 3,000–5,000 breeding west of the Urals and wintering mainly in the Black Sea region and the Balkans, and 10,000–30,000 breeding east of the Urals and wintering mainly in the Caspian region.

Habitat/ecology:

A. erythropus breeds in the taiga and tundra zones, especially in the scrub ecotone in areas dominated by dwarf birch *Betula nana*. In Scandinavia, the geese nest inland at relatively high altitude (up to 700 m) (Madsen, 1995). In winter, the species traditionally occurred in the steppe zone, foraging on short grassy, so-called sodic-pasture, vegetation (Madsen, 1995). Since the transformation of much of this habitat into agricultural land, the species now winters mainly on farmland. The birds arrive on the breeding grounds from late May to mid-June. In Siberia, non-breeding birds undertake a moult migration to areas north of the breeding range; in Fennoscandia, non-breeding birds moult at high altitudes. The moult takes place in July and August, during which the birds are flightless for about 25 days. Birds depart from the breeding areas from mid-August through to mid-September, and arrive on the wintering grounds in the south Caspian region as early as mid-October. In Azerbaijan, the main arrival occurs in late October and early November. However, further west, the arrival is later, with migration occurring in the Sea of Azov region until December. The wintering areas in the Caspian region are deserted by late March; in the Sea of Azov, the spring migration occurs in late April. Birds pass through the middle Ob Valley in the second half of May, and through the Kanin Peninsula in the last few days of May and early June.

Conservation status:

A declining and threatened species, listed as 'vulnerable' by Collar *et al.* (1994) and Green (1996). There has been a drastic decline in the world population of *A. erythropus* during the present century, accompanied by widespread contractions in breeding and wintering range. In Europe, the population size has probably been reduced by more than 90% since the 1940s. Reasons for the decline are virtually unknown; the combination of negative factors on the breeding grounds, e.g. habitat loss, disturbance, shooting and increased predation, is probably not sufficient to explain the rapid rate of decline that took place in the 1950s (Madsen, 1995). The most likely causes for the decline are deleterious factors on the staging areas and winter quarters, especially loss of feeding habitat and heavy hunting pressure. Large areas of former wintering habitat in the Caspian region and southeast Europe have been lost through the conversion of natural short-grass pastures to unsuitable agricultural land (e.g. cotton).

A project to re-introduce *A. erythropus* in Swedish Lapland commenced in 1979. Adult *Branta leucopsis* were used to foster *A. erythropus* goslings, and by 1989, 172 geese had been released. Released birds were first found breeding in Lapland in 1987; in winter, the birds have been found in the North Sea area, mainly in the Netherlands (von Essen, 1991; Madsen, 1995). A re-stocking project has also been in operation in Finland since 1988; by 1995, 121 geese had been re-introduced to northern Finnish Lapland near areas which are known to have naturally occurring populations (Lahti & Markkola, 1995). The status and conservation of *A. erythropus* in Europe have recently been summarized by J. Madsen (*in* Tucker & Heath, 1994) and van Vesseem (1994), and an Action Plan for *A. erythropus* in Europe has been compiled by Madsen (1995).

Network of key sites:

As for all globally threatened species, all sites regularly used by an appreciable number of individuals are of international importance. Outdated key site information should be discounted for *A. erythropus* because of its rapidly changing conservation status and because of the strong evidence for relatively recent shift in wintering range. Currently, the only appreciable numbers of this species regularly recorded are during spring and autumn staging in Hungary and it is likely that large moulting concentrations will soon be confirmed on the Kanin peninsula. Satellite tracking results are eagerly awaited to improve the much needed key sites network and to confirm the importance of many suspected key sites near the breeding areas, along the eastern Baltic, in Belarus, around the Sea of Azov, in Kazakhstan, around both the southwestern and eastern Caspian and probably in many other areas.

Protection status of key sites:

Many important breeding and moulting areas appear to be unprotected. Staging areas are poorly known, especially in the west where many of the geese are probably overlooked in large concentrations of other species. The main wintering area in Azerbaijan (Kizil Agach) is protected, as is the former most important wintering area in Iran (Miankaleh), but other important sites in the Caspian region are unprotected.

GREYLAG GOOSE

Anser anser

Subspecies:

Polytypic. Two subspecies have been described: the nominate form from west and northwest Europe and *A. a. rubrirostris* from southeast Europe and Asia. Birds in central and eastern Europe, which are somewhat intermediate, are usually lumped with the nominate form. In western Europe, interbreeding between wild *A. anser* and feral stocks (especially of *rubrirostris*) may be reducing the genetic purity of the wild stocks.

Distribution:

Palaearctic, breeding widely at boreal and temperate latitudes across Europe and Asia and wintering south to North Africa, the Middle East, India and southern China. Both subspecies occur in Western Eurasia. The nominate form breeds west of the Urals and winters throughout southern and western Europe south to North Africa (Morocco to Tunisia). *A. a. rubrirostris* breeds from the Urals, southeast Europe, the Pannonic region and Turkey east across Asia. Western populations of this subspecies winter in the Black Sea and Caspian regions south to southern Iran and Iraq, in Tunisia/Algeria and rarely to Egypt. Feral populations have been established from introduced birds in several parts of western Europe, and some of these populations (e.g. in Belgium) are *rubrirostris* type birds. The British population of wild *Anser anser* is now confined to the far northwest of Scotland and the Hebridean Islands off the west coast (Paterson, 1991).

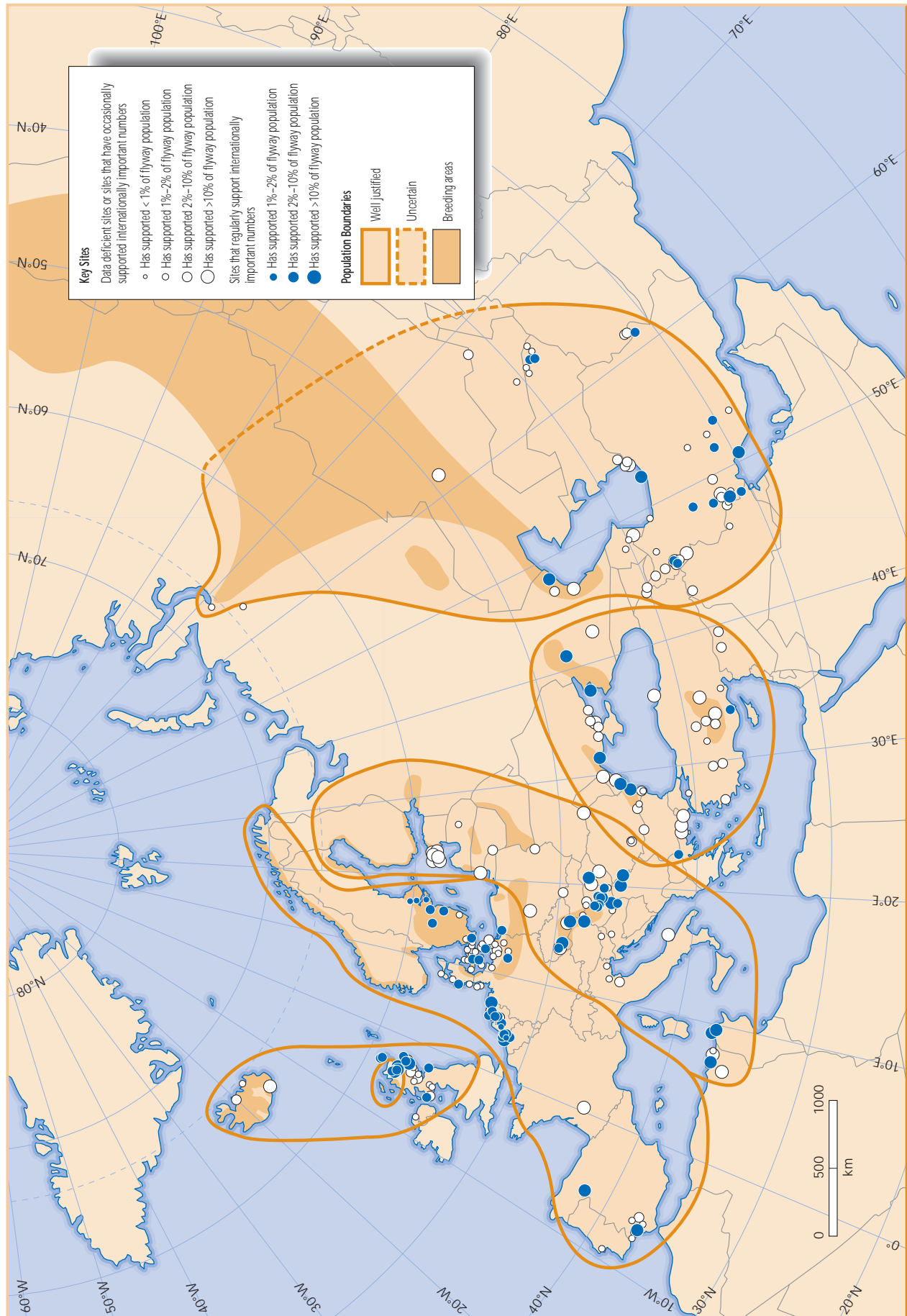
Movements:

A few populations are sedentary or locally dispersive (e.g. the birds breeding in northwest Scotland and many of the birds breeding in the Black Sea region and Turkey), but most birds move southwards to winter in traditional sites at lower latitudes. Birds breeding in Iceland winter almost exclusively in Scotland, with only small numbers reaching northern England and Ireland. Birds breeding in Norway, Sweden, Denmark and western Germany migrate through the Netherlands to winter mainly in Spain, although the number remaining throughout the winter in the delta region of the Netherlands has increased considerably in recent years (Nilsson & Persson, 1991). Much the most important wintering areas for this population are the Guadalquivir Marismas and Villafafila in western Spain. Birds breeding in the eastern Baltic, Poland, the Czech Republic, the Slovak Republic and Austria winter almost exclusively at just three sites in North Africa: Lake Ichkeul in Tunisia and Marais de Mekhada and Lake Fetzara in Algeria (Dick, 1993). Birds breeding in the Black Sea region and central Turkey (apparently *rubrirostris*) undertake only limited movements to wintering areas in coastal regions. *A. a. rubrirostris* breeding in the north Caspian and western Siberia winter mainly in the south Caspian, Iran and Iraq. The small number of birds breeding in extreme eastern Turkey and northwestern Iran vacate their breeding grounds in winter, and presumably join up with the much larger flocks of migrants from the north.

Population limits:

Six relatively discrete populations are recognized: (1) a population breeding in Iceland and wintering in Britain and Ireland; (2) a small resident population breeding in northwest Scotland and undertaking only local movements; (3) a population breeding in Norway, Sweden, Denmark and western Germany and wintering from the Netherlands to southern Spain and Morocco; (4) a population breeding in northeast Sweden, Finland, the Baltic States and central Europe and wintering in Tunisia and Algeria; (5) a population breeding in the Black Sea region and Turkey and wintering within that region; (6) a population breeding in western Siberia south to the Caspian region and wintering in the south Caspian, Iran and Iraq. The first five of these populations have been documented by Ogilvie (1978) and Madsen (1987).

The sedentary Scottish birds are treated as a separate population as there is no evidence that they mix extensively with Icelandic birds at any time, and indeed they may be morphologically distinct (Paterson, 1991). Recent work (Nordic Greylag Goose Project) has shown that the geese breeding in Norway and those breeding in southern Sweden and around the southwestern Baltic have markedly different migration and staging patterns, although they overlap extensively on their winter quarters



(L. Nilsson, *in litt.*). Further work is required to determine the extent of mixing between these two groups and whether or not they merit separate treatment.

Ringed recoveries have shown that there is some interchange between the western and central European populations. There have been 21 recoveries in Spain of birds ringed in the former Czechoslovakia and southwest Poland (Calderon *et al.*, 1991), and one recovery in Tunisia of a bird ringed in Sweden. One bird ringed in eastern Germany was observed in Tunisia in the winter of 1981/82 and in southwest Spain in the following winter (Dick *et al.*, 1991). Dick *et al.* (1991) concluded that the Atlantic and central European flyways are quite well separated, although the different populations may meet at pre-migratory assemblies, e.g. at the moulting places at Gotland in Sweden, or at the autumn gathering area at Lake Gulpe in eastern Germany. These authors thought that the border between the two populations ran southwards through the Baltic west of Finland and east of the former German Democratic Republic through Poland and southern Bohemia.

Some authors (e.g. Madsen, 1991) treat the feral birds in Britain and Ireland as a distinct population, currently numbering about 18,900 birds (Delany *et al.*, 1992) and still increasing. This 'population' (and all other introduced populations of Anatidae) are excluded from the present review.

Population size:

- **Iceland/UK and Ireland: 100,000 (Pirot *et al.*, 1989). 1% level 1,000.**

The Icelandic breeding population is currently estimated at 10,000–20,000 pairs (Koskimies, 1993).

- **Northwest Scotland: 5,250 (D.A. Stroud, *in litt.*). 1% level 50.**

In the late 1980s, the total population of native wild birds in Scotland was estimated at 500–700 pairs, with total post-breeding numbers at 2,500–3,000 individuals (A.J. Prater *in* Gibbons *et al.*, 1993). By the early 1990s, the population was estimated at 5,250 individuals, with 2,115 on the Uists, 110 on Colonsay, 1,390 on Tiree, 450 on Coll and 1,200 in Caithness and Sutherland (D.A. Stroud, *in litt.* to IWRB, February 1994).

- **Northwest Europe/southwest Europe: 200,000 (Madsen *et al.*, 1996). 1% level 2,000.**

- **Central Europe/North Africa: 20,000 (Pirot *et al.*, 1989). 1% level 200.**

This estimate may now be too low, as up to 16,000 have been recorded on passage in Estonia in August and September in recent years (A. Leito, *in litt.*).

- **Black Sea/Turkey: 25,000 (Pirot *et al.*, 1989). 1% level 250.**

This estimate may now be too low. Some 25,000 were counted during the 1992 census, and 32,000 were counted in coastal Ukraine alone in 1995.

- **Western Siberia/Caspian region/Iraq: 100,000 (Perennou *et al.*, 1994). 1% level 1,000.**

Habitat/ecology:

Anser anser breeds in a variety of wetland habitats, often with a fringe of vegetation or near grasslands; it winters on farmland in open country or in swamps, lakes, saltmarshes and coastal lagoons. During the wing moult, the geese are flightless for about one month. Non-breeding birds in Iceland moult in large groups in July and early August. Non-breeding birds in northwest and central Europe migrate in summer to moulting areas in the Netherlands, Denmark and Sweden. The Volga Delta is a major moulting area for birds in the Southwest Asian population, with up to 25,000 birds assembling there (Krivonosov, 1970). The main autumn migration of Icelandic birds is in October. Large concentrations occur in Scotland in October and November, with birds dispersing from there during the winter. The return migration to Iceland takes place from early March to April. The continental northwest European population begins its autumn migration in September; peak numbers occur in Denmark in September, and in the Netherlands in October and November. The main arrival in Spain occurs in December; numbers begin to decrease there as early as January, and the main spring migration in the Netherlands, Germany and Denmark takes place in March.

Geese in the central European population normally arrive at Lake Ichkeul in North Africa in early November, and build up rapidly to a peak in December. The autumn passage reaches a peak in Estonia in August and September (A. Leito, *in litt.*). In dry winters, the whole population probably passes most of the winter at Ichkeul; in a wet year, many of the birds move on to Garaet El Mekhada and Lake

Fetzara in Algeria (Dick *et al.*, 1991). The birds return to their breeding areas in central Europe and the Baltic by mid-March.

Conservation status:

The Icelandic breeding population of *A. anser* increased from about 25,000 individuals in 1952 to 110,000 in 1987, and has averaged about 100,000 in recent years (Madsen, 1991; Wetlands International Goose Specialist Group).

The small resident population in northwest Scotland has been increasing since the 1960s. Numbers more than doubled over the 20 year period from the late 1960s to late 1980s (A.J. Prater in Gibbons *et al.*, 1993), and has apparently almost doubled again since then.

The continental northwest European population increased from approximately 30,000 birds in 1967/68 to 120,000–130,000 in the 1980s, and has since increased to about 200,000 (Madsen, 1991; Wetlands International Goose Specialist Group). Numbers wintering in the Guadalquivir Marismas in southwest Spain increased from peaks of around 20,000 in the early 1970s to 75,000–80,000 by the mid-1980s (Calderon *et al.*, 1991), but have decreased somewhat since then. However, the numbers remaining throughout the winter in the Netherlands (Dutch Delta) have increased in recent years to over 45,000 in January 1994 (P.L. Meininger, *in litt.*).

The central European/North African population of about 20,000 birds appears to be relatively stable (Pirot & Fox, 1990; Madsen, 1991), although there have been some local increases, e.g. the small breeding population in Lithuania increased from nil in the 1970s to about 100 pairs in 1995 (S. Svazas, *in litt.*) and the wintering population in Italy (c. 1,000) is obviously increasing (N. Baccetti, *in litt.*).

Long-term trends in the Black Sea/Turkey population are unknown, although recent count data suggest that numbers are relatively stable. However, wetland drainage and severe hunting pressure are believed to have reduced the population in Turkey from 8,000 in the early 1970s to only 600 by the late 1980s (Pirot & Fox, 1990).

The population wintering in Southwest Asia is thought to be increasing, at least in some areas (Perennou *et al.*, 1994). Krivenko (1993) reports an increase in the numbers at the end of the breeding season in the middle regions of the former USSR.

Network of key sites:

The small resident population in the northwest of Scotland can form very large flocks in winter but these tend to roam over fairly wide areas rather than concentrate on key sites. Towards the south of its breeding range *A. anser* tends to breed in large colonies so is well accounted for by the six key breeding sites in Central Europe, the five key breeding sites around the Black Sea and Sea of Azov, and the Volga Delta and surrounds. The Central European and Volga Delta breeding *A. anser* are only parts of the larger Central Europe/North Africa and Caspian wintering groups respectively, but the Black Sea/east Mediterranean population is thought to breed almost exclusively at the five key sites listed. No key breeding sites are known for the Icelandic breeding population or for the Spain/northwest Europe wintering population which both breed further north.

Numerous key passage sites are identified for all populations except the northwest Scotland and Black Sea/east Mediterranean populations which are resident and short-distance migrants respectively. The key passage sites are least known for the Caspian wintering population, and for the northwest Europe/Spain wintering group only three key spring passage sites are identified. Key passage sites for the Icelandic breeding population are in the United Kingdom and they are well documented, but are not listed, as this analysis was conducted using mid-winter data alone. For the North Africa wintering population the network of key passage sites is very complete in both spring and autumn, and very major passage concentrations can occur in Estonia/Lithuania and in Central Europe. Most of the key moulting sites listed are probably important for non-breeding individuals. The only exception is the Caspian wintering population which seems to moult almost entirely at three sites.

In winter the key sites networks appear both extensive and complete for all 5 migratory populations. Three populations are fairly widely dispersed at many key wintering sites, occasionally occurring in enormous concentrations under particular conditions. The most dispersed population in winter appears to be the Icelandic breeding population which occurs on 42 key wintering sites in the United Kingdom of which a few regularly support over 10% of the individuals. Thirty-three key wintering sites are identified for the Black Sea east Mediterranean population of which 11 have supported over 10% of the population and the Danube Delta regularly supports over 50% of individuals. In the Caspian region 9 sites have supported over 10% of individuals and 55 key wintering sites are listed in Annex 2. In contrast, the northwest Europe/Spain and North Africa wintering populations are concentrated at a few sites. Two of

the seven key wintering sites in Spain, namely Marismas del Guadalquivir and Villafafila, support up to 60% of the Spain/northwest Europe wintering population the remainder wintering at key sites further north, the most important of which are in the Netherlands delta region. The North Africa wintering population can be found entirely at Lac Ichkeul in Tunisia but also occurs in major concentration earlier in the winter at many sites in Central Europe 13 of which can hold over 10% of individuals (e.g. sites in Hungary, Neusiedlersee in Austria and Vrsacki Rit in Yugoslavia).

Protection status of key sites:

Almost all the main wintering areas for the Icelandic population are protected, but most of the breeding and moulting areas are unprotected. Most of the breeding, moulting and wintering areas of the Spain/northwest European wintering population are protected. The main wintering area of the Central European population is protected, but other wintering areas and several of the most important staging areas are unprotected. Most of the important sites for the Black Sea population are unprotected, although important roosting sites are protected in the Danube Delta Biosphere Reserve in Romania and 2 of the 5 major breeding areas are protected. Only 11 of the key wintering sites for the Caspian wintering population are protected.

BARNACLE GOOSE

Branta leucopsis

Subspecies:

Monotypic.

Distribution:

Western Palearctic and Greenland, breeding in Greenland, Svalbard and northern Russia and wintering in northwest Europe (mainly Ireland, Britain, Germany and the Netherlands). The species has occurred as a vagrant in North Africa (Morocco and Egypt). *B. leucopsis* has bred on islands in the Baltic Sea in Sweden since 1971, in Estonia since 1981 and in Finland since 1983.

Movements:

Migratory, wintering at temperate latitudes and only rarely occurring further south. Birds breeding in Novaya Zemlaya and Vaigach Island winter in the Netherlands and stop over in spring in Denmark, Germany, Sweden and Estonia. Smaller number also stop over in Estonia in autumn. The largest breeding colony within the Baltic is situated on three small islands off the east coast of Gotland, Sweden. Birds from Novaya Zemlaya and Vaigach have used this area as a spring staging area for many years, and it is thought likely that the founders of the Baltic population originated from this population (Forslund & Larsson, 1991). The Svalbard population stages on the archipelagos of the Helgeland district of western Norway, up to 50 km out to sea. The entire population is believed to make the 1,500 km journey from the winter quarters in southern Scotland in a non-stop flight of 24 hours. The Greenland population winters in Britain and Ireland, and stages in spring and autumn in Iceland.

Population limits:

There are three almost entirely discrete populations of *Branta leucopsis*: one breeding in east Greenland and wintering mainly along the northern and western coasts of Ireland and on certain islands in northwest Scotland; one breeding in Svalbard and wintering in the Solway Firth in southwest Scotland; and one breeding in northern Russia (Novaya Zemlaya and Vaigach Island) and wintering mainly in Germany and the Netherlands. Ringing has shown that despite the proximity of the wintering ranges of the Greenland and Svalbard populations, there is only slight interchange of individuals between these two populations, and little contact between these and the Russian population (Madsen, 1991).

Population size:

- **East Greenland/Ireland/northwest Scotland: 32,000 (Pirot et al., 1989). 1% level 320.**
- **Svalbard/southwest Scotland: 12,000 (Pirot et al., 1989). 1% level 120.**
- **Russia/Germany/Netherlands: 176,000 (Madsen et al., 1996). 1% level 1,760.**

The breeding population in the Baltic had increased to over 2,000 pairs by 1994, with 1,730 of these at the largest and oldest colony at Laus Holmar off the eastern coast of Gotland, Sweden. Breeding occurred at 26 other localities in the Baltic in the 1990s (six in Sweden, six in Finland and 14 in Estonia), with these sites together holding over 500 pairs in recent years (Forslund & Larsson, 1991; Leito, 1993; A. Leito, *in litt.*).

Habitat/ecology:

Branta leucopsis breeds on islets or on crags and rocky outcrops in the Arctic tundra, preferably near water bodies; it winters on natural and cultivated grassland on islands and along sheltered coasts. In spring, birds shift from cultivated grassland to saltmarshes, but in the Baltic, Norway and Iceland, agricultural fields are now becoming increasingly important as feeding areas at this season (Tucker & Heath, 1994). This is particularly the case at the staging areas in Norway where, since 1980, an increasing number of the geese have ranged away from the maritime islands to feed on small agricultural fields on larger islands nearer the mainland. Here, and also in Ireland and Scotland, feeding conditions have deteriorated on the traditional islands used by the geese because of a reduction in grazing by livestock.



The geese moult their flight feathers near the breeding grounds between mid-July and mid-August; during this period they are flightless for three to four weeks. Birds breeding in Greenland leave for Iceland between the end of August and mid-September, and arrive on their winter quarters during the second half of October. Birds concentrate in large flocks in northern Britain from late March onwards, and the main departure for Iceland occurs during the second half of April and first half of May. The geese arrive on their breeding grounds in Greenland in late May to coincide with the thaw.

The Svalbard population leaves the breeding grounds during September, stages on islands along the Norwegian coast, and begins to arrive at the Solway Firth in Britain by the end of September. The main departure is in the second half of April, birds again staging on islands off the Norwegian coast and arriving on the breeding grounds at the end of May.

Birds breeding in Novaya Zemlya leave the breeding grounds at the end of August and in early September, and arrive in large numbers in the Netherlands in October. An increasing number of birds stop over in Estonia during the autumn migration between the end of September and the beginning on November. The geese leave the main wintering areas in the Netherlands during the second half of March, and move to the early spring staging areas in Denmark and Germany. In April and May, virtually the entire population is concentrated on Gotland (Sweden) and in Estonia, with mass arrivals occurring in Estonia in the second half of April. The birds leave these areas in the second half of May, and arrive on the breeding grounds during the last ten days of May.

Conservation status:

The Greenland population increased from only about 8,000 birds in 1959 to 25,000–32,000 in the 1980s, and since then has remained relatively stable at around 32,000 birds (Madsen, 1991; Madsen *et al.*, 1996). The Svalbard population increased rapidly from a low of perhaps as few as 550 birds in 1950 to 11,400 in 1987/88. Since then, the population has remained relatively stable at about 12,000 birds (13,000 in 1993) (Madsen, 1991; Wetlands International Goose Specialist Group). The Russian population has increased from about 20,000 birds in 1960/61 to about 50,000 in the 1970s, 120,000–130,000 in the late 1980s, and as many as 175,000 in recent years (Madsen, 1991; Madsen *et al.*, 1996). The numbers staging in western Estonia in spring increased from 15,000–20,000 in the early 1970s to 35,000–57,000 in the late 1980s (Leito, 1991). A total of 187,264 was recorded in the Netherlands in February 1995 (SOVON Ganzen- en Zwanenwerkgroep, 1996) and even more (188,761) in January 1994 (SOVON Ganzen- en Zwanenwerkgroep, 1995). The numbers staging in western Estonia in spring increased from 15,000–20,000 in the early 1970s to 80,000–100,000 in the beginning of the 1990s (A. Leito, *in litt.*). Some expansion in the breeding range in Russia has been reported (Filchagov & Leonovich, 1992).

The massive increase in numbers of *B. leucopsis* in all three populations since the 1950s has been attributed to increased habitat protection and greatly reduced hunting pressure almost throughout the species' range.

Network of key sites:

The Svalbard breeding population of *B. leucopsis* must have the most complete key sites network of any Anatidae population (Black, *in press*). Over 50% breed on 9 key sites on Svalbard, 25% moult on one of these sites, then the entire population migrates to winter on the Solway Estuary in the United Kingdom before returning en masse via the Helgeland Archipelago in Norway to Svalbard. The Greenland breeding population is also represented by a fairly complete key sites network although important breeding concentrations are not known. Up to 50% of the population can be found staging at Eyelendid in Iceland and >10 key wintering sites in Ireland and on the west coast Islands of Scotland account for virtually all of the population in winter (up to 95% on the island of Islay). In contrast to these two populations, the Russian and Baltic breeding population of *B. leucopsis* is poorly known outside of winter. Several major spring staging sites on the Swedish and Estonian Baltic islands are, however, known. In winter this population is also very concentrated on key sites in the Netherlands delta, the Wadden Sea (Dutch, German and Danish) and along the Elbe in Germany.

Protection status of key sites:

The main wintering areas of all three populations are at least partially protected. Important breeding areas are protected in the east Greenland National Park and on Svalbard, but many of the other breeding areas, especially in Russia are unprotected. Staging areas for the Greenland and Svalbard populations are unprotected but in Estonia, about 10% of the spring staging areas (holding about 30,000 birds) are protected.

BRENT GOOSE

Branta bernicla

Subspecies:

Polytypic. Four subspecies have been described: the nominate form from northern Siberia east to the Taymyr Peninsula, *orientalis* from northeastern Siberia, *nigricans* from northern Alaska and Canada east to the Perry River; and *hrota* from northeastern Canada, Greenland, Svalbard and Franz Joseph Land. The validity of *orientalis* has often been questioned, the northeast Siberian birds usually being lumped with *nigricans*.

Distribution:

Holarctic, breeding at high latitudes in North America and Eurasia, and wintering south along the Atlantic and Pacific coast to North Carolina (USA), France, Japan and Baja California (Mexico). Two subspecies occur in Western Eurasia: the nominate form and *hrota*. The former breeds in northern Russia east to the Taymyr Peninsula and winters along the coasts of northwest Europe south to France and occasionally Iberia. It is probably a regular visitor in very small numbers to the Atlantic coast of Morocco and Mauritania (Banc d'Arguin), and has occurred as a vagrant in Algeria, Tunisia, Libya and Egypt. *B. b. hrota* breeds in northeast Canada, Greenland, Svalbard and Franz Joseph Land, and winters mainly in Ireland, Britain and Denmark.

Movements:

Migratory, wintering at temperate latitudes; occasionally at more southern latitudes during very severe winters. *B. b. bernicla* migrates through the White Sea and Baltic to staging areas in the Dutch, German and Danish Wadden Sea and wintering areas mainly in England and France. *B. b. hrota* breeding in Svalbard and Franz Joseph Land migrate to and from Denmark via Bear Island and west Norway, although most birds apparently do not stop over in these areas. The number of birds crossing the North Sea to winter in northeast England is dependent on the severity of the weather. In very severe winters, small numbers (up to 200) also reach the Netherlands. The population of *B. b. hrota* breeding in northeast Greenland and northeast Canada migrates to and from the wintering areas in Ireland via staging areas in western Iceland. Large numbers stage in early autumn at Hjørsey-Straumfjörður in western Iceland, and over 75% of the population then stage at Strangford Lough in Ireland, before large-scale dispersal to sites around the coast. Some 300–400 *B. b. hrota* regularly overwinter in northwestern France, mainly along the west coast of the Cotentin Peninsula. It is not known for certain to which population these birds belong (Debout *et al.*, 1990), but it seems most likely that they are part of the Canada/Greenland population, as the migration dates match those of this population, and there has been a single recovery of a Canadian bird in northwest France.

The breeding range of the *B. b. hrota* wintering in Ireland lies close to that of birds wintering on the Atlantic seaboard of the USA. Ringing suggests that birds on Ellesmere and the Axel Heiberg Islands, and perhaps some of the smaller islands in the north and west of the Queen Elizabeth Archipelago, winter in Ireland, while birds breeding further south on Southampton Island and Baffin Island, and on some of the islands to the south of Melville Sound, winter on the Atlantic seaboard of the USA. Further west, birds breeding on Melville Islands and those on Prince Patrick Island probably all winter on the Pacific coast of North America, chiefly in the state of Washington (Boyd, 1979; Ogilvie, 1978). Of 557 *B. b. hrota* ringed on Bathurst Island in Canada between 1984 and 1986, 78% were subsequently observed in Ireland (up to 1987/88). Single birds ringed in the Canadian Arctic have also been recovered in France, the Netherlands, the Channel Islands and southwest England, but the numbers of birds using these areas are negligible (O'Briain & Healy, 1991).

Population limits:

There are three discrete populations of *B. bernicla* in Western Eurasia: the entire population of the nominate form and two discrete populations of *B. b. hrota*, one breeding in northeast Canada and Greenland and wintering mainly in Ireland, and one breeding in Svalbard and Franz Joseph Land and wintering in Denmark and northeast England (Ogilvie, 1978; Madsen, 1991). The Svalbard population of *hrota* is one of the smallest discrete populations of geese in the world.



Population size:

- **Entire population of *bernicla*: 300,000 (Madsen *et al.*, 1996). 1% level 3,000.**

Estimates from the breeding grounds in western and central Siberia almost exactly match wintering numbers.

- **Northeast Canada and Greenland/Ireland (*hrota*): 20,000 (Pirrot *et al.*, 1989). 1% level 200.**

- **Svalbard/Denmark and UK (*hrota*): 5,000 (Madsen *et al.*, 1996). 1% level 50.**

The numbers of this species are subject to large fluctuations from year to year because of the highly variable breeding success.

Habitat/ecology:

Branta bernicla breeds on lowland tundra in the high Arctic, generally near the coast and often in colonies on islets. The nesting success varies greatly from year to year, depending on the timing of the snow-melt and predation levels. In winter, the geese frequent estuaries and sandy shores; in autumn and winter, they feed mainly on algae and *Zostera* spp. growing on inter-tidal mudflats, while in spring they often move to saltmarshes. In recent years, *B. b. bernicla* has increasingly grazed on cultivated grassland and winter cereal fields near the coast, and has thus come into conflict with farming interests, e.g. in the Netherlands, Germany and Britain (Salmon & Fox, 1991; Tucker & Heath, 1994).

Branta bernicla moult near the breeding grounds from mid-July to mid-August; at this time the geese are flightless for about three weeks. *B. b. bernicla* leave their breeding grounds between mid-August and the end of the first week of September, and arrive in the Danish and German Wadden Sea in October. Peak numbers occur on the main wintering areas in France, Britain and the Netherlands in December. Most birds have left Britain and France again by mid-April. Almost the entire population gathers in the Wadden Sea in May, prior to the main spring migration, and then stages at just four or five sites in the White Sea. Birds return to the breeding grounds during the first half of June.

B. b. hrota breeding in Svalbard leave the breeding grounds in September and arrive in the Danish Wadden Sea at the end of the month. From there they move to eastern Jutland and, especially in severe winters, to Northumberland in Britain, where peak numbers occur in December and January. From March until the end of May, the entire population is concentrated in northwest Jutland. Birds arrive on the breeding grounds in late May or early June.

Birds breeding in Greenland and northeast Canada start to leave for Iceland in late August, and arrive on their winter quarters in Ireland during the second half of October. Strangford Lough is used as a staging area for 6–8 weeks in autumn, with peak numbers occurring in mid-October (O'Briain & Healy, 1991). The spring migration begins in early April, with the peak occurring in the second half of the month. From late April to mid-May, most of the population is concentrated on the west coast of Iceland. From there, the birds cross the ice cap of Greenland to reach their breeding grounds in the first week of June.

Conservation status:

During the early 1930s, the population of *B. b. bernicla* decreased to about 10% of its former levels, probably because of a disease affecting the main food plant, *Zostera marina*. There has been a rapid recovery in the population since the 1950s, with numbers increasing from about 16,500 in 1955 to 30,000 in 1960, 40,000 in the late 1960s, 80,000 in the 1973/74, generally between 100,000 and 200,000 during the 1980s, and an average of about 300,000 in recent years (Madsen, 1991; Wetlands International Goose Specialist Group). *B. bernicla* was removed from the UK quarry list in 1954. The numbers wintering and/or staging in Denmark, Germany, the Netherlands, Britain and France have all shown significant increases and are apparently still increasing (Pirrot & Fox, 1990; Mitchell *et al.*, 1994). Some expansion in the breeding range in Russia has been reported in recent years (Filchagov & Leonovich, 1992).

The population of *B. b. hrota* breeding in northeastern Canada and Greenland and wintering in Ireland increased from a relatively stable level of 8,000–13,000 birds in the 1960s and 1970s to some 18,000–24,000 birds in the late 1980s, and has now apparently stabilized at about 20,000 birds (Madsen, 1991; Wetlands International Goose Specialist Group).

The Svalbard population of *B. b. hrota* declined from about 40,000–50,000 individuals in the early part of this century to as few as 2,000 in the late 1960s. This decline was attributed to the reduction in food supply following the effects of the disease on *Zostera marina* and shooting pressure (Madsen, 1991). Since then, the population has shown some recovery, with numbers increasing to 3,000–4,000 in the 1970s, and ranging between 4,000 and 5,000 during the late 1980s (Madsen, 1991). The population

may now have stabilized at about 5,000 birds (Wetlands International Goose Specialist Group). The fact that numbers have not returned to their former levels is considered due to increased competition on the breeding grounds with the expanding *Branta leucopsis* population and to predation there (Pirot & Fox, 1990).

Network of key sites:

Breeding densities tend not to be high enough for many key breeding sites to be identified. A site on Svalbard where over 30% of this population breed is a notable exception. Almost all of the northeast Canada/Greenland population stage at 4 key sites on Iceland, and a large number of *Branta b. bernicla* stage on the Kanin peninsula but not many other staging sites are known, apart from the autumn arrival sites relatively close to wintering areas. In winter the northeast Canada/Greenland population winters on key sites in Ireland that account for virtually all individuals. The Svalbard breeding population winters almost entirely on key sites in Denmark and on the Island of Lindisfarne in northeast England. *Branta b. bernicla* stages in late autumn in the Wadden Sea and then disperses to winter predominantly on 34 key sites in the Wadden Sea, Netherlands delta region and North Sea/Channel sites in the United Kingdom and France. These account for most of the wintering population of *B. b. bernicla*.

Protection status of key sites:

Most of the important staging and wintering areas of *B. b. bernicla* and the Svalbard population of *B. b. hrota* are protected, while almost all of the important breeding and wintering areas for the northeast Canada/Greenland population are unprotected. However, two of the three most important staging areas in Iceland (Breidafjörður and Grunnafjörður) are now protected.

RED-BREASTED GOOSE

Branta ruficollis

Subspecies:

Monotypic.

Distribution:

Palearctic, breeding in the Taymyr, Gydan and Yamal peninsulas of northern Russia (between 70°E and 110°E) and migrating southwest to winter in southeast Europe, mainly in Romania and Bulgaria. Seventy per cent of the population are said to breed in the Taymyr. The species formerly wintered in large numbers in the south Caspian region, but now appears to be only an occasional visitor or vagrant in this area. Some birds winter irregularly in Hungary, Greece and Turkey, and formerly also in Egypt and Iraq.

Movements:

Migratory; the species formerly wintered mainly in the south Caspian region south to Iraq and also near the Aral Sea. A major change occurred in the migration route between 1940 and 1970, with birds taking a more southwesterly route to winter in the Black Sea region. Prior to the late 1960s, the main wintering areas were on the southern coasts of the Caspian Sea, particularly in Azerbaijan. Some 60,000 were said to winter in the south Caspian region in the mid-1950s, and almost 24,000 were present at Kizil Agach Reserve in Azerbaijan in January 1967. However, counts in 1968 indicated that at least half of the wintering population had shifted to the west coast of the Black Sea (some 1,800 km west of the Caspian). The species was not recorded wintering in Romania until 1940, but 25,000 were counted there in 1968/69. Since then, counts in the south Caspian region have not exceeded 1,000–2,000. Only a few hundred birds were found on the main wintering grounds in Azerbaijan the 1970s, only a few tens of birds in the early 1980s, and only a few individuals since then (Patrikeev, in prep.). The current wintering areas on the Black Sea coast are the Shabla and Durankulak lakes of Bulgaria, the Razelm-Sinoe lagoon complex and the Danube Delta in Romania, and the Dobrudja plateau which lies between the River Danube and the coast between Bulgaria and Romania (Hunter & Black, 1995). A few birds may still occasionally visit the south Caspian region (Azerbaijan, Turkmenistan and Iran), and small flocks occasionally reach Hungary, Turkey and Greece.

The migration route and staging areas of *Branta ruficollis* have been summarized by Hunter and Black (1995). Almost all of the geese migrate down the eastern side of the Ural Mountains, pass through the Turgay lowlands between the southern end of the Urals and the Kazakh uplands, turn southwest over the northern Caspian, and then continue on towards the western Black Sea coast. Staging sites are thought to be the same for both spring and autumn migrations. There appear to be four major staging areas: the Ob floodplains on the Arctic circle; the Middle Ob near Khanty-Mansiysk in Russia; the Tobol-Ishim forest-steppe and the watersheds of the Ubagan, Ulkayak and Irgizin rivers in the Kazakh uplands; and the Manych Valley in Russia. Some birds may also stage on the Sea of Azov, and may remain to winter on the northern Black Sea coast.

Population limits:

Only one population is recognized, viz. the entire population of the species.

Population size:

- **Entire population: 70,000 (Madsen et al., 1996). 1% level 700.**

Hunter and Black (1995) suggest that the world population is currently in the region of 70,000 to 74,000 birds, although it is thought that there may be as many as 80,000 birds in total (J. Hunter, *in litt.*). A conservative estimate of 70,000 is adopted here, on the recommendation of the Wetlands International Goose Specialist Group.

Based on aerial surveys during the post-hatching period in 1978–79, Vinokurov (1982) estimated the total population at 22,000–27,000 birds. Counts in the 1970s and 1980s in Romania and Bulgaria suggested a population of about 25,000 birds, but estimates from the breeding grounds in the 1980s suggested that the population had increased somewhat to around 35,000 birds (Vinokurov, 1990; Madsen, 1991). Counts in the winter of 1991/92 found 26,000 in Romania and an estimated 42,000 in Bulgaria, suggesting a minimum population of 68,000 for the two countries (Owen, 1992). Some 74,000–75,000

RED-BREASTED GOOSE *Branta ruficollis*



were counted in Bulgaria and Romania in the winter of 1992/93 (with 59,000 at the Shabla-Durankulak lakes in Bulgaria). This probably represents the entire population. (No young birds were observed, indicating a complete breeding failure in 1992).

Habitat/ecology:

Branta ruficollis breeds on dry shrub- and lichen-covered tundra not far from water, and often in small groups near nests of *Buteo lagopus* and *Falco peregrinus*. Steppe habitats are apparently used on migration. The species formerly wintered on steppic grasslands, mainly in the south Caspian region, but now winters almost exclusively on agricultural land dominated by cereal crops and grassland around lakes and lagoons on the west coast of the Black Sea. On their winter quarters, the geese roost in remote parts of wetlands, in the middle of large lakes, and, if it is calm, on the Black Sea. The proximity of drinking and roosting sites to feeding areas may influence winter distribution (Hunter & Black, 1995).

The birds moult on or near the breeding grounds between mid-July and late August; during the wing moult, birds are flightless for 15–20 days. The autumn migration begins in mid-September, birds reaching Kazakhstan by the end of September, and arriving on their winter quarters in Bulgaria and Romania in October and November. The spring migration begins in March, and the geese arrive on the breeding grounds in early June.

Conservation status:

Branta ruficollis is a threatened species, listed as 'vulnerable' by Collar *et al.* (1994) and Green (1996). Population trends are uncertain, because of inadequacies in the previous population estimates. There is believed to have been a dramatic decline in numbers in the middle of this century, from an estimated 60,000 birds in the mid-1950s to only about 25,000 in the 1960s and 1970s, and perhaps as few as 20,000 (6,000 pairs) in the 1980s. However, high counts in southeast Europe in the late 1980s suggested a somewhat higher population of 35,000 birds, and with the discovery of some 70,000 birds in Romania and Bulgaria in the early 1990s, the earlier population estimates have come under considerable doubt (Callaghan & Green, 1993; Hunter & Black, 1995).

The disappearance of the wintering flocks from the south Caspian region has been attributed to the widespread conversion of natural grasslands and cereal crops to cotton fields and vineyards. A decline in numbers in the 1960s may also have been due to a decline in *Falco peregrinus*, which are thought to protect nesting geese from Arctic Foxes (Hunter & Black, 1995). *B. ruficollis* continues to suffer hunting pressure on the breeding, moulting and wintering grounds, and is now especially vulnerable to changes in land use and disturbance on its winter quarters because almost the entire population concentrates at only three or four apparently fixed roosts (Tucker & Heath, 1994). Other potential threats to the species include deliberate and accidental poisoning on the main wintering grounds in Bulgaria and Romania, and oil exploration on the breeding grounds in Russia (Hunter & Black, 1995).

The status and conservation of *B. ruficollis* have recently been summarized by J. Madsen (*in* Tucker & Heath, 1994) and J. Hunter and J. Black (*in* van Vessem, 1994), and an Action Plan for *B. ruficollis* has been compiled by Hunter and Black (1995) for BirdLife International.

Network of key sites:

As for all globally threatened species, all sites regularly used by an appreciable number of individuals are of international importance. In recent years, 90% of the population have had winter roosts on only three or four sites in Bulgaria and Romania, but feeding areas are not included in these sites. Many of the key sites listed around the Black Sea represent historic wintering sites only. Some very major staging areas are known at the Mouth of the Ob river, Manych Godilo Lakes/Velvskeye Reservoir in the Caucasus and the Ukrainian coast.

Protection status of key sites:

Most major roosting sites in Bulgaria and Romania are protected to some extent, but most of the other wintering areas around the Black Sea are unprotected. The main staging areas are poorly known, but most identified are apparently protected.

BLUE-WINGED GOOSE

Cyanochen cyanopterus

Subspecies:

Monotypic.

Distribution:

Afrotropical; the species is almost confined to the highlands of Ethiopia above about 1,800 m, although it has straggled to extreme northern Kenya.

Movements:

Cyanochen cyanopterus is mainly sedentary, undertaking only small-scale movements, generally related to altitudinal shifts, with birds deserting the breeding grounds at high elevations and congregating at lakes to moult during the rainy season (Urban, 1991). Pairs remain constantly together, and are probably territorial (Brown *et al.*, 1982).

Population limits:

Only one population is recognized, *viz.* the entire population of the species.

Population size:

- **Entire population: 5,000–15,000. Provisional numerical criterion 100.**

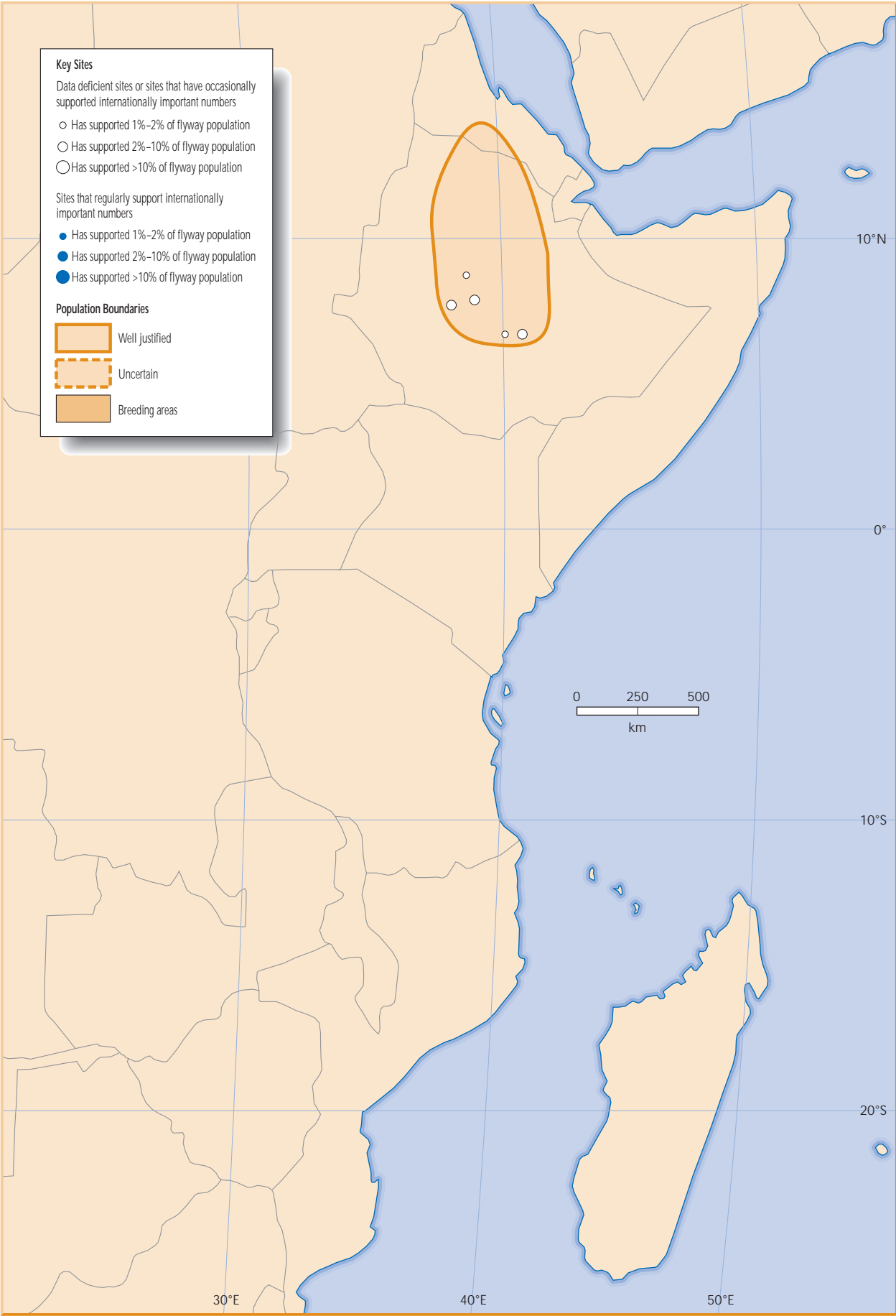
Callaghan and Green (1993) state that the total population seems certain to exceed 5,000 individuals. It is reported to be fairly common (Brown *et al.*, 1982) or frequent to locally abundant (Urban & Brown, 1971). It is fairly common in the Web Valley marshes; 30 pairs were seen in a 40 km stretch in 1966, and the population in the entire valley was estimated at possibly 200–300 birds (Brown *et al.*, 1982). Important concentrations occur on the Sululta Plain area during the rains and post-rains period, with 240 birds recorded in July 1992, and over 350 in October 1992. Up to 190 have been recorded during the rainy season at Gaferssa Reservoir; the species is present year-round at this site, but average monthly totals fluctuate from less than 10 between December and March to a peak of 154 in August (Urban, 1991). A concentration of over 500 at a reservoir in the highlands north of Hosaina in February 1994 was recorded on the only occasion this locality has been visited (P.O. Syvertsen, *in litt.*), so the importance of this site could be high but remains to be determined.

Habitat/ecology:

Cyanochen cyanopterus is restricted to the vicinity of ponds and streams on the open uplands of Ethiopia, above about 1,800 m. The reason for the species' limited range is clear, as it is a grazer on short grass, both as a gosling and when adult, and permanent grassland of this kind is found practically nowhere else in Africa (Snow, 1978). These and other highland habitats in Ethiopia support a great diversity of other endemic animal populations, such as the Simian Fox *Canis simensis*. The globally threatened White-winged Flufftail *Sarothrura ayresi*, which also occurs in far southern Africa, has recently been rediscovered in these Ethiopian highland habitats and Rudd's Lark *Heteromirafra ruddi* is also endemic to this habitat type in Ethiopia and far southern Africa. In the Bali and Arussi Mountains, it inhabits marshes, bog pools, swamps and streams with abundant grassland surroundings; it also occurs in Afro-alpine moorland up to 4,500 m or more. In most suitable breeding habitat, it occurs sparsely in pairs, less often in small groups. It nests during the dry season, and then moves downwards several hundred metres in elevation to highland lakes where it congregates in flocks of 50–100 or more and undergoes the moult at the peak of the big rains in August (Brown *et al.*, 1982; Urban, 1991). Egg-laying has been reported in March–June and in September.

Conservation status:

The population is apparently stable, and there has been no evidence so far of any changes in distribution or decline in numbers (Callaghan & Green, 1993). The species is said not to be threatened by hunting, as it is not eaten for religious reasons (Brown *et al.*, 1982). It is, however, almost certainly now under pressure from the rapidly expanding human population and resulting



degradation of grasslands and increased levels of disturbance. Agricultural intensification and droughts are also possible threats.

Network of key sites:

Too little is known about this species to determine whether an effective key sites network is potentially possible or not. Key concentrations have been seen at most times of year, and one site (Sululta Plain) supported large numbers throughout most of 1992.

Protection status of key sites:

Important breeding areas in the Bale Mountains National Park are protected.

EGYPTIAN GOOSE

Alopochen aegyptiacus

Subspecies:

Monotypic.

Distribution:

Mainly Afrotropical; now confined to the continent of Africa, but formerly bred in Palestine (until the 1930s) and in the Danube Valley until the early 18th century. The species occurs widely in Africa south of the Sahara and also in lower Egypt. In West Africa, it is rare south of 10°N. There are no recent records from Burkina Faso south of 12°N, no 20th century records from Togo, and very few recent records from Ghana and Ivory Coast (J.F. Walsh, *in litt.*). It breeds along the length of the Nile Valley north to Aswan at 24°N, and occasionally reaches Algeria and Tunisia as a migrant from the south. It has been introduced in Britain and the Netherlands.

Movements:

The species appears to be at least partially migratory over much of its range, but its movements are poorly understood. Ringing has shown that individual movements of up to 1,100 km are regular in southern Africa, and even longer movements may occur in West Africa, where there is some evidence of trans-Saharan migrations to Tunisia and Algeria during the wet season. In Chad, some birds move north into the Sahel zone, even to Tibesti, with the summer rains, and may breed there (Salvan, 1967). In Nigeria, it breeds only on the northern savanna, and there is a big influx into Lake Chad in the latter half of the dry season as inland pools dry out. The population in the upper Nile Valley appears to be mainly resident, and there is no evidence of long-distance movements from there, although a portion of the large breeding population at Lake Nasser moves north outside the breeding season into the Nile Valley almost as far north as Cairo (Goodman & Meininger, 1989). However, very few birds now reach the Nile Delta, the most recent record being in 1974.

Population limits:

The species is very widely distributed over Africa south of the Sahara, and there do not appear to be any major gaps in its distribution except in the lowland forested areas of Cameroon and Gabon and in the deserts of the southwest. Because of the extent of movements shown by the species in Africa, the entire African population is probably best treated, biologically, as a single, very large population. However, for practical reasons it is proposed that the West African birds (east to Chad) be treated as a separate population, although it is acknowledged that there may be a considerable amount of interchange between this population and birds in central and eastern Africa. Thus two populations are recognized: a West African population and an eastern and southern African population (including the Nile Valley birds).

Population size:

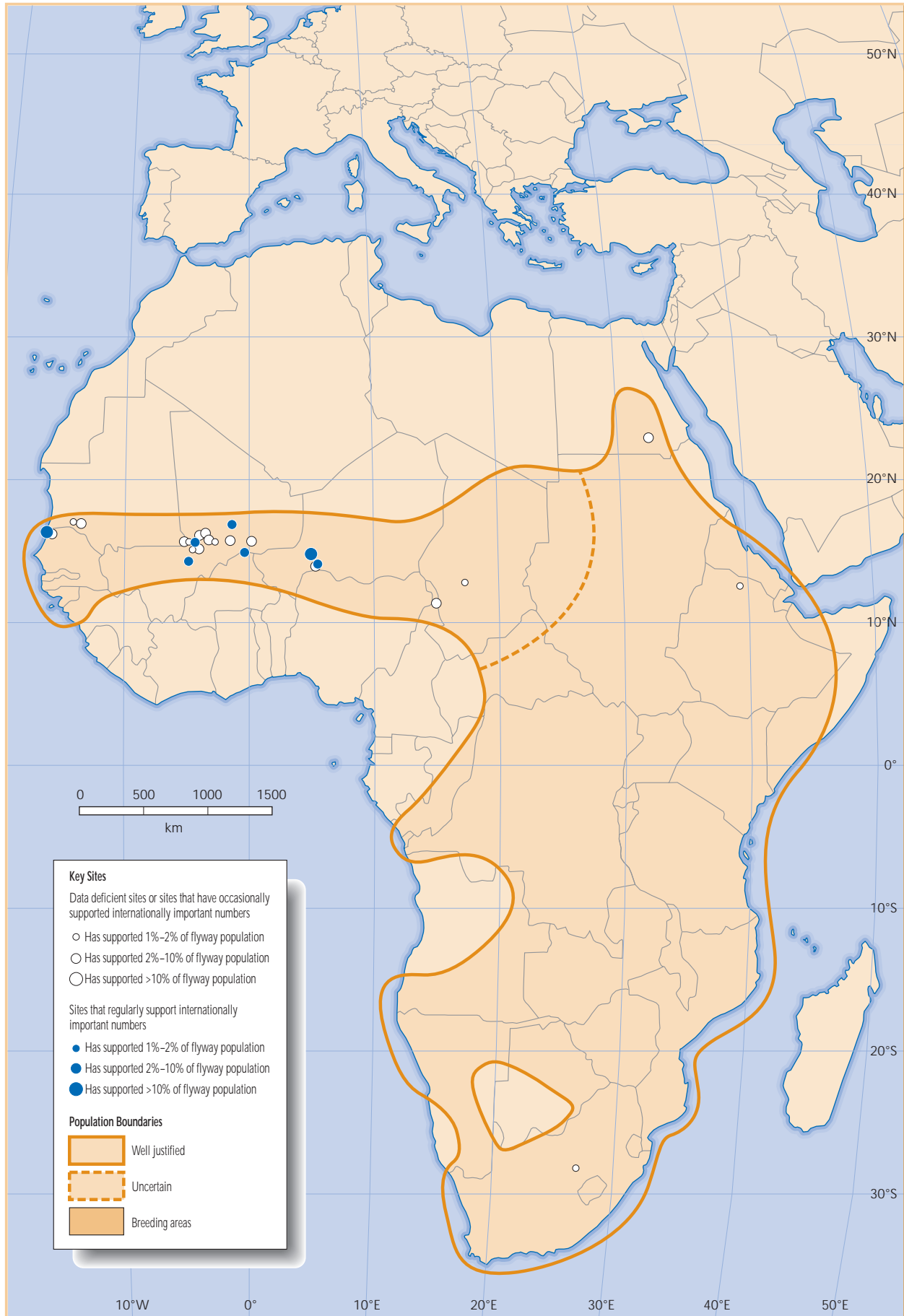
- **West Africa: 10,000–25,000. Provisional numerical criterion 175.**

The West African population has been estimated at 5,000 birds (Perennou, 1991a, 1991b), but up to 4,828 have been counted in a single mid-winter census (1978). High counts have included up to 2,660 in Djoudj National Park in the Senegal Delta (P. Yésou, *in litt.*), and up to 1,600 in the Central Niger Delta (January 1972). During the African Waterfowl Censuses of 1991–1994, the sum of the maximum national totals was 4,679, i.e. 94% of the population estimate. The sum of maximum national totals for all other species for which an estimate of population size is available (except *Anas clypeata*) was between 11% and 26% of the population estimate. This suggests that the estimate of 5,000 for *A. aegyptiacus* is far too low. The real figure seems certain to exceed 10,000, and may be as high as 25,000. A provisional 1% level of 175 is recommended.

- **Eastern and southern Africa: 200,000–500,000. Provisional numerical criterion 3,500.**

Common to locally abundant, especially in the south and east; said to be a fairly common and widespread visitor in Somalia (Ash & Miskell, 1983), locally common in Eritrea, although rare on the coast (Smith, 1957), common to abundant in Ethiopia (Urban & Brown, 1971), widespread and common in Kenya, Tanzania and Uganda (Britton, 1980), widespread but very uncommon in Malawi (Benson & Benson, 1977), very common in parts of Zambia, e.g. the Luangwa Valley (Benson *et al.*, 1971), common to very

EGYPTIAN GOOSE *Alopochen aegyptiacus*



common in the Okavango, Linyati, Chobe, Shashe and Limpopo areas of Botswana (Penry, 1994), and very common throughout southern Africa (Sinclair *et al.*, 1993). There are thought to be thousands of birds nesting at Lake Nasser in Egypt; flocks of up to 2,000 occur along the banks of the Nile between late September and late March, and as many as 11,000 were observed in the Nile Valley south of Sohag in February 1976 (Goodman & Meininger, 1989). High counts in eastern Africa have included 4,420 at Lake Ashange, Ethiopia, in December 1993 (L. Dijkzen, *in litt.*), 1,525 at Gaferssa Reservoir, Ethiopia, in February 1965 (Urban, 1991), and 1,740 birds at Lake Turkana, Kenya, in 1987. A total of 3,873 was recorded in Tanzania during very extensive waterfowl counts in January 1995. Up to 1,500 have been recorded at Kafue Flats in Zambia (July 1994), 1,600 at Aiselby Sewage Pools in Zimbabwe (July 1994), and 480 at Lake St Lucia in South Africa. In Zimbabwe, *A. aegyptiacus* is commonest at Lake Kariba where there are an estimated 2.3 individuals per kilometre of shoreline (D. Rockingham-Gill, *in litt.*). During the African Waterfowl Census (1991–94), the highest count in eastern and southern Africa was 25,766 in 1994.

A. aegyptiacus is one of the commonest and most widespread species of Anatidae in Africa. Brown *et al.* (1982) describe it as “common to locally abundant” over much of its range, which covers about 15 million square kilometres. *A. aegyptiacus* is badly covered by waterfowl counts, as it often occurs in small groups far from water, and yet over 25,000 were observed during the 1994 African Waterfowl Census. The total population seems certain to exceed 200,000 individuals, and may well exceed 500,000.

Habitat/ecology:

Alopochen aegyptiacus is a versatile, adaptable species, frequenting all kinds of fresh waters and ranging well away from open water to forage, especially at night, on crop residue. Originally a bird of large rivers and floodplains, it has taken readily to man-made lakes of all sizes. It is tolerant of a wide range of altitudes (up to 4,000 m in Ethiopia), and is generally distributed throughout Africa except for the most arid areas and densely forested areas. It generally occurs in small family parties on small waters, but flocks of up to 100 or more often occur on large waters, especially outside the breeding season, when the birds are undergoing their wing moult. The post-nuptial moult occurs throughout the year, and is apparently related to the timing of breeding and local wet seasons, both of which vary geographically.

Conservation status:

The species has shown a marked increase in South Africa during the present century as a result of the construction of dams and irrigation schemes, but there has been some retraction of range in the north. It is said to be decreasing in Gambia (Gore, 1981) and Nigeria (Elgood, 1982; Elgood *et al.*, 1994), and in Egypt, where it was once common along the entire Nile, it is now largely confined to the south where it is still fairly common (Brown *et al.*, 1982).

Network of key sites:

A fairly comprehensive network of 26 key sites is listed for West Africa in December–February but almost no information is available for other times of year. These key sites could potentially support the whole population but due to the large year to year fluctuation in water regime, it is difficult to know what proportion of the population they support annually. For the southern and eastern Africa population only three key sites are listed and too little is known of the population’s distribution and movements to confirm whether *A. aegyptiacus* occurs commonly in key concentrations in this area or not. It could be that wetlands are generally not large enough to support the number of birds necessary to qualify as a key site for this population. This is not however supported by the size of the few key sites selected, perhaps with the exception of Lake Nasser.

Protection status of key sites:

Only five of the 26 key sites in West Africa are known to be protected and the two sites that regularly support the largest numbers are not protected. Both of these sites are in Niger.

RUDDY SHELDUCK

Tadorna ferruginea

Subspecies:

Monotypic.

Distribution:

Mainly Palearctic, with a wide breeding distribution from southeast Europe through the Middle East and central Asia to the region of Lake Baikal and Mongolia. Western populations winter south to the Nile Delta (where now rare) and southern Iran. There are also isolated populations in northwest Africa (Morocco, Algeria and Tunisia) and the Ethiopian highlands (first discovered in the Bale Mountains, Ethiopia, in February 1967 and found breeding on the Saneti Plateau in the mid-1970s). The species has occurred as a vagrant in Eritrea and Kenya (two records), most probably from the Ethiopian highlands.

Movements:

Most Asian populations (except in the extreme southwest) are largely migratory, moving south to winter at lower latitudes and altitudes. Two birds ringed at the Kurgaldzhin Reserve, Tselinograd (70°E) were recovered in northwestern Iran (Cornwallis & Ferguson, 1970). Birds breeding in southeast Europe and Turkey are chiefly sedentary or dispersive, with movements linked to the availability of suitable water. *T. ferruginea* was formerly a common winter visitor to the Nile Delta, presumably from Turkey, but has become scarce and irregular in Egypt, with a maximum count in recent years of only six birds (Goodman & Meininger, 1989). Northwest African birds are sedentary or nomadic, undertaking only short-distance movements from the mountains to the coastal plain; some of these birds formerly wintered in the Guadalquivir Delta in southern Spain. Concentrations in the Moulouya Delta, Morocco, in July–September are presumably moulting birds. The breeding population in the Ethiopian highlands is apparently resident (Urban, 1993) and virtually restricted to the Bale Mountains National Park. Brown *et al.* (1982) thought that numbers in Ethiopia were augmented in some years by non-breeding visitors from further north, but the scarcity of the species in Egypt in recent years and lack of records in Sudan since 1955 suggest that few if any birds now reach Ethiopia from the east Mediterranean or Southwest Asian populations.

Population limits:

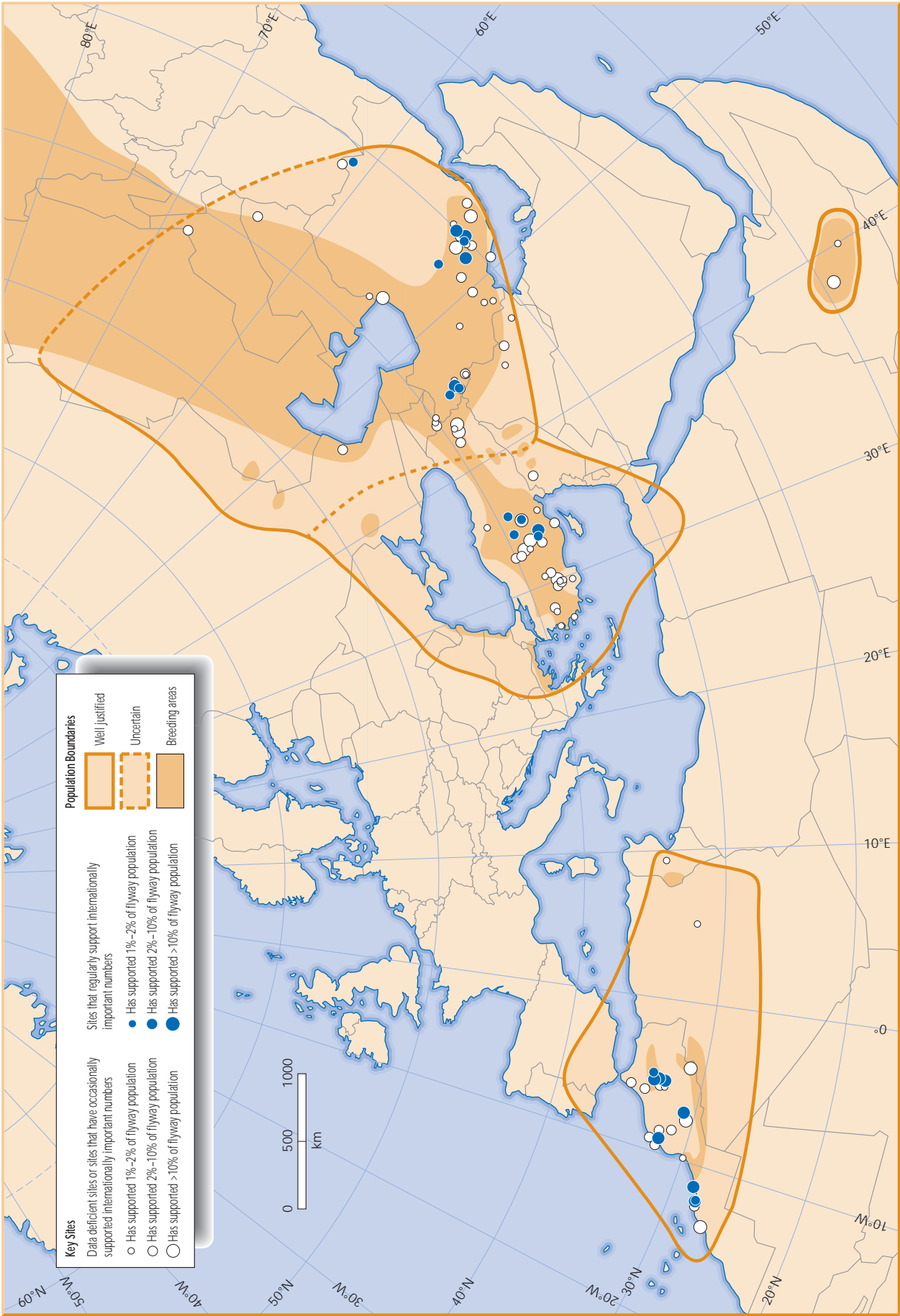
Four main groups are recognized: (1) a discrete, mainly sedentary population of 200–500 birds in Ethiopia; (2) a discrete population of about 2,500 birds in northwest Africa; this population is mainly dispersive or nomadic, with up to 200 birds formerly occurring in southern Spain in winter; (3) a population which breeds in Greece, west and central Turkey and the Black Sea area, and winters in the east Mediterranean south in small numbers to the Nile Delta; (4) a large southwest and central Asian population which breeds from eastern Turkey to Afghanistan and the central Asian republics and winters mainly in Iran and Iraq.

The separation between the Black Sea/east Mediterranean population and the Southwest Asian population is at best poorly defined, with the dividing line following the default boundaries used for many other Anatidae populations in this region, and therefore cutting through the breeding ranges of the species in eastern Turkey. However, the two groups of birds are widely separated in winter, and there has been no evidence of any east-west migration of the birds from the Caspian region to the Black Sea. Birds breeding and occurring on passage in the Van Golu area of eastern Turkey are probably linked to the large breeding population in northwestern Iran, and thus best treated as part of the Southwest Asian population.

Population size:

- **Ethiopia: 200–500 (Urban, 1993). 1% level 4.**

Urban (1993) has estimated the total population in Ethiopia at 200–500 birds, or about 100–200 pairs. (The estimate of 250–600 birds given by Rose & Scott (1994) erroneously included an estimated 50–100 thought by Urban (1993) to winter in Egypt). There have been observations of one or two birds from Asmara in the north, Dubte and Bahadu in the east, Akaki and Gaferssa in the central west Highlands, and Lake Abiata in the Rift Valley (lowest elevation at Dubte, at 380 metres above sea level).



- **Northwest Africa (west Mediterranean): 2,500. 1% level 25.**

In the 1960s, there were thought to be about 1,000–1,500 pairs in northwest Africa, with as many as 1,000 pairs in the Atlas Mountains, several hundred pairs in the southern Sahara (Algeria) and about 50 pairs at Iriki, Morocco (Vieillard, 1970; Brown *et al.*, 1982). However, Monval & Pirot (1989) thought that the population was almost confined to Morocco, and estimated the total at only 1,500 birds (although 2,030 were recorded in Morocco in 1983). Recent reports from Algeria and Morocco indicate that the species extends at least as far south as Dakhla Bay (Morocco) in winter, and is common at the mid-Saharan chotts and sebkhas in southern Algeria, where it is possibly a resident breeding bird. Two hundred were counted in Algeria during the mid-winter census in 1994. The estimate of Monval & Pirot (1989) (repeated by Rose & Scott, 1994) is therefore considered to be too low, and a minimum population estimate of 2,500 individuals is now considered to be more appropriate. A pair was found breeding in central Tunisia in 1995, the first definite breeding record of this species in Tunisia since the late 1950s or early 1960s (Yésou & South, 1995) and subsequently two more pairs have been found (Yésou, 1995).

- **Black Sea/east Mediterranean: 20,000 (Monval & Pirot, 1989). 1% level 200.**

Monval & Pirot (1989) estimated the wintering population in the Black Sea/Mediterranean region at 20,000 birds, and this figure was repeated by Rose & Scott (1994). The current European breeding population of at least 6,000 pairs is consistent with this estimate, although there is some evidence from mid-winter counts to suggest that a decline has occurred in the population since the 1980s (Tucker & Heath, 1994).

- **West-central Asia/Caspian/Iran and Iraq: 35,000. 1% level 350.**

Perennou *et al.* (1994) estimated the Southwest Asian population at over 30,000 birds. However, over 33,500 were counted during the mid-winter census of 1994, suggesting a minimum population size of 35,000.

Habitat/ecology:

Tadorna ferruginea occurs at a wide variety of brackish to saline wetlands, generally in open country, but also on sparsely forested elevated ground in the Asian part of its range. In southeast Europe and Southwest Asia, it is primarily a bird of shallow, sparsely vegetated brackish marshes and lakes in semi-arid regions. In Ethiopia, it occurs on tarns and marshes mainly between 2,000 and 3,700 m above sea level (Urban & Brown, 1971). The species depends much less on water bodies for resting and feeding than do most other Anatidae, often occurring a considerable distance from water during the breeding season (Tucker & Heath, 1994). Although normally occurring in small flocks outside the breeding season, concentrations of several hundreds of birds can occur in favoured localities, especially in Southwest Asia.

The moult takes place between mid-July and September, usually on large areas of open water on or near the breeding grounds. During the wing moult, the birds are flightless for about four weeks. In the Caspian region, autumn migration takes place until November, with birds returning to the breeding grounds from early March to early April.

Conservation status:

No information is available on trends in the small Ethiopian population. *T. ferruginea* has declined markedly at the western extremity of its range in North Africa and Europe, but the Asian populations appear to be relatively stable or increasing. The species was formerly common and widespread in North Africa, but is now extinct as a breeding species in many areas, and no longer occurs as a winter visitor to the Guadalquivir Delta in southern Spain. In southeast Europe, major decreases were recorded during the early part of the present century in Bulgaria, Romania and the western parts of the former USSR, but recent trends do not show a consistent pattern, with increases being reported in Bulgaria and Russia, and further declines reported in Ukraine and Romania (Tucker & Heath, 1994). It was once fairly common as a winter visitor to the Nile Delta and Nile Valley south to northern Sudan (Brown *et al.*, 1982), but is now scarce in Egypt and very rare in Sudan. Recent mid-winter counts in northwest Africa and the east Mediterranean have shown very large year to year fluctuations that obscure any population trends, although there is a suggestion of a rapid decline in the east Mediterranean (Rose, 1995). Recent mid-winter counts in Turkey suggest that the Turkish population has undergone a rapid decline since the late 1980s, but this has still to be confirmed. Further east, however, Krivenko (1993) reports an increase in the numbers of birds at the end of the breeding season in Kazakhstan and the Caspian region.

between 1972 and 1989, while the wintering population in Iran has increased dramatically in the last 15–20 years, the mid-winter waterfowl counts suggesting that a five- or six-fold increase has occurred (Perennou *et al.*, 1994).

The most likely causes for the decreases in Europe are the widespread drainage of shallow marshes and lakes and excessive hunting. In Turkey, the species is threatened by heavy hunting pressure, over-grazing, increasing salt extraction and most importantly decreasing water supply to seasonal and semi-permanent wetlands as a result of upstream irrigation systems (Tucker & Heath, 1994).

Network of key sites:

In winter *T. ferruginea* occasionally occurs in very large concentrations but only a few wetlands support such large numbers regularly. The Black Sea/east Mediterranean population, concentrated in Turkey, has the most complete key sites network of all four populations. Only three breeding sites exceed key site qualifying criteria, but Burdur Golu has up to 25% of the entire breeding population. Sodah Golu and Ericek Golu provide the moulting sites for the population which disperses in autumn to Kulu Golu and Sultansazligi at which over 50% of the population has been counted. In winter 27 sites are recorded as having held internationally important numbers. The very large breeding, autumn and moulting concentrations recently discovered for this population imply that similar sites could exist for the other three populations. The North Africa/Spain population winters at 26 key sites but only one (Lagune de Layoune) supports very large numbers (over 20% of the population regularly). No information is available for this population in other seasons. The Ethiopian population is virtually restricted to the Bale Mountains NP where up to 200 birds are thought to breed at Lake Deemt. Of all four populations, the Caspian wintering group is by far the most migratory and must rely heavily on major staging and moulting sites which urgently need to be identified. Twenty-seven key wintering sites are listed in Annex 2.

Protection status of key sites:

Protected status information was not supplied for most key sites in North Africa and Spain. The population in Ethiopia is probably well protected due to its dependence on the Bale Mountains National Park. The network of sites for the Caspian wintering population has many protected areas but it is noticeable that some of the major sites such as Harm Karion in Iran are not protected. The protected status is worse for the Black Sea/east Mediterranean population where Burdur Golu and Sultansazligi are the only two sites protected from the network of five extremely important breeding, moulting and autumn staging sites and only four of 37 key wintering sites are protected.

SOUTH AFRICAN SHELDUCK

Tadorna cana

Subspecies:

Monotypic.

Distribution:

Afrotropical; the species is confined to southern Africa south of 19°S (South Africa, Lesotho, Namibia and Botswana), and is most abundant in arid Orange Free State and southern Cape Province, South Africa. It has been seen once in 1973 in Zimbabwe.

Movements:

In some areas, the species is mainly sedentary, but over much of its range it is at least partially migratory, with substantial numbers of birds undertaking seasonal movements related to the moult and to the availability of water. In Botswana, the largest numbers occur during the breeding season (May–September), although some birds are resident year-round in the southeast (Penry, 1994). Individual movements of up to 1,000 km have been reported. Moulting migrations (to the northeast) occur in November and December, with birds returning to their breeding areas after the moult.

Population limits:

Only one population is recognized, *viz.* the entire population of the species.

Population size:

- **Entire population: 42,000 (Brown *et al.*, 1982). 1% level 420.**

A common resident throughout South Africa, Swaziland and much of Namibia (Sinclair *et al.*, 1993); an uncommon and localized resident and dry season visitor to southern Botswana (Newman, 1989). The total population was estimated at about 42,000 birds in 1981 (Brown *et al.*, 1982). Up to 30,000 birds, or about 70% of the total population, have been recorded at the known moulting areas, with 25,000 of these in Orange Free State. The highest count during the African Waterfowl Census (1991–94) was 5,676 in 1994.

Habitat/ecology:

Tadorna cana frequents shallow fresh waters and brackish wetlands in open country with nearby grassland. In western Orange Free State, it shows a preference for seasonal brackish pans, if filled by summer rains. The species is dependent on mammal burrows for nest sites. For the wing moult, birds move northeast in November and December to large, fresh, deep-water lakes and dams (17 sites in Orange Free State, three in Transvaal and three in Cape Province). At these times, the species forms flocks of a few hundred to as many as 5,000 moulting and first-year birds. After moulting, the majority of birds move southwest to seasonal, shallow, brackish pans (Brown *et al.*, 1982).

Conservation status:

Brown *et al.* (1982), quoting Geldenhuys (1981), state that the numbers are stable. However, the species is potentially vulnerable because of its small population size, its dependence on very few localities where it concentrates in large numbers to moult, its dependence on mammal burrows for nest sites, and the elimination of the jackal *Canis mesomelas* which normally kills the small predators which take its eggs (del Hoyo *et al.*, 1992).

Network of key sites:

Only one key site is listed and too little relevant information is available to ascertain if a more extensive key sites network could ever be established.

