

# The Whooper Swan

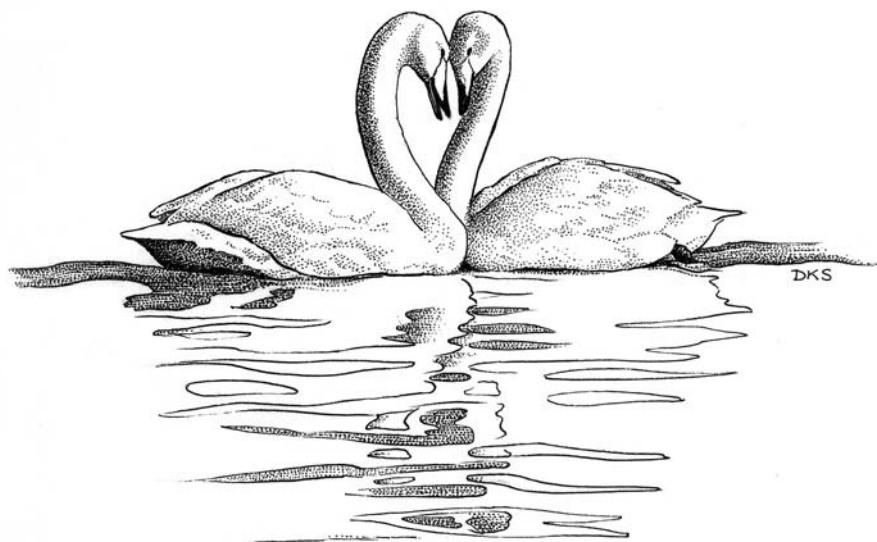


MARK BRAZIL

# THE WHOOPER SWAN

For Dennis and Mavis

# THE WHOOOPER SWAN



MARK BRAZIL

Illustrated with line drawings  
and colour plates by  
DAFILA SCOTT

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## The Wild Swans At Coole

The trees are in their autumn beauty,  
The woodland paths are dry,  
Under the October twilight the water  
Mirrors a still sky;  
Upon the brimming water among the stones  
Are nine-and-fifty Swans.

The nineteenth autumn has come upon me  
Since I first made my count;  
I saw, before I had well finished,  
All suddenly mount  
And scatter wheeling in great broken rings  
Upon their clamorous wings.

I have looked upon those brilliant creatures,  
And now my heart is sore.  
All's changed since I, hearing at twilight,  
The first time on this shore,  
The bell-beat of their wings above my head,  
Trode with a lighter tread.

Unwearied still, lover by lover,  
They paddle in the cold  
Companionable streams or climb the air;  
Their hearts have not grown old;  
Passion or conquest, wander where they will,  
Attend upon them still.

But now they drift on the still water,  
Mysterious, beautiful;  
Among what rushes will they build,  
By what lake's edge or pool  
Delight men's eyes when I awake some day  
To find they have flown away?

W. B. Yeats (1865–1939)



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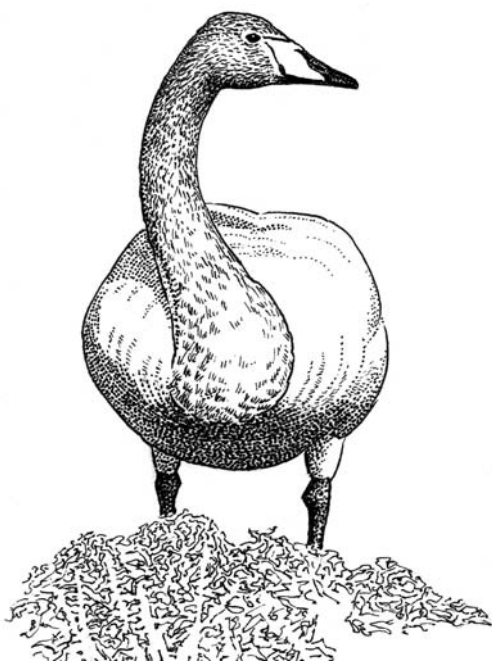
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## Preface

Variously known as one of the great heralds of winter in the west, and even as the angel of winter in the Far East, the Whooper Swan is a beautiful, inspiring, and fascinating bird. It is a bird that I have been fortunate to have a long association with across its range, and one that I have enjoyed following from its wintering grounds to its breeding haunts. Wide-ranging, it has, as we shall see, the most extensive and most expansive natural range of any of the swans, from as far west as Iceland in the North Atlantic, and Fennoscandia, right across the Russian subarctic, east to the Kamchatka Peninsula facing the Bering Sea and the Pacific Ocean.

A journey that begins and ends in two of the most densely populated countries on Earth, Japan and the Netherlands, takes one across almost all of the Whooper Swan's range, over the drainages of the Bikin and Amur rivers, across Yakutia, the Lena, the Yenisei, the Ob, the Urals, the Pechora, and from northwestern Russia to southern Finland, Sweden and Denmark. That same journey also traces and re-traces two of the great routes of Whooper Swan migration, those from parts east of the Urals reaching east Asia and northern Japan and those west of the Urals heading westwards via the Beloye More, the Gulf of Finland and the Baltic, to southern

Scandinavia, Poland, Germany and the Netherlands in winter. Even at speeds in excess of 900 km/h, such a journey by modern aircraft takes more than ten hours and, on occasions when breaks in the cloud cover permit, one may gaze from more than 10,000 m on one of the largest and least populated regions on Earth—Siberia, the vast expanse of tundra and taiga that comprise the contiguous domains of Whooper and Bewick's Swans.

I have been fortunate to have crisscrossed Russia repeatedly by plane at each season. During the brief days of winter, even late into spring, for hours one passes over frozen wastes, white barrens, crystal deserts, meandering rivers of ice, snow-covered taiga forest and mountains. Only in early summer do the rivers break free of ice and the whiteness of the vast landscapes turn to green, then within a few months rusts, reds and browns return. Even at the height of summer, in the endless days of mid June, pack ice lingers close to the northern coast and by mid September the mountains are, once more, powdered white and the rivers freezing again. Into the heart of this enormous wilderness come the bugling flocks of Whooper Swans intent on reaching ancient traditional breeding grounds as soon as they thaw, to nest in remote territories amid the taiga before fleeing from winter's freeze with their young, returning again to the more heavily populated parts of Europe and Asia.

In a volume of this scope it is impossible to address equally research from all parts of this vast range and accessing materials in some languages has proven difficult and exceedingly time-consuming, thus my approach is, of necessity, a biased one. Having spent many years studying and watching Whooper Swans, my initial bias is inevitably towards regions at the extremes of their range where I know them best: England, Scotland, Iceland, Sweden and Finland in the west, and South Korea and Japan in the east. There is further bias in that far more detailed research has been undertaken in Europe on this species than elsewhere in its range—so most of the literature I have accessed pertains to this small portion, amounting to less than a quarter, of its range. I have addressed rather more fully than is perhaps usual in a book of this kind the vagrancy aspect of the species' natural history. So often ignored by ornithologists (though the life-blood of birders), today's vagrants may represent the pioneers of future range extension. The Whooper Swan's population and range has been undergoing considerable change over the last century making such analysis of particular interest for the future. Finally, I have deliberately included much that is speculative and conjecture in the hope that this will stimulate further research. I hope that readers and researchers will either forgive the extent of my bias or endeavour to help me balance it should a later edition be possible.

Mark Brazil  
Ebetsu, Hokkaido, Japan, 2003

# Acknowledgements

This book is the culmination of many years rather varied experience, initially as a field biologist and latterly as a natural history writer and photographer. It presents me with the pleasant dilemma as to just where should I address my thanks, as so many different people have contributed to my pleasure in studying, watching and photographing swans.

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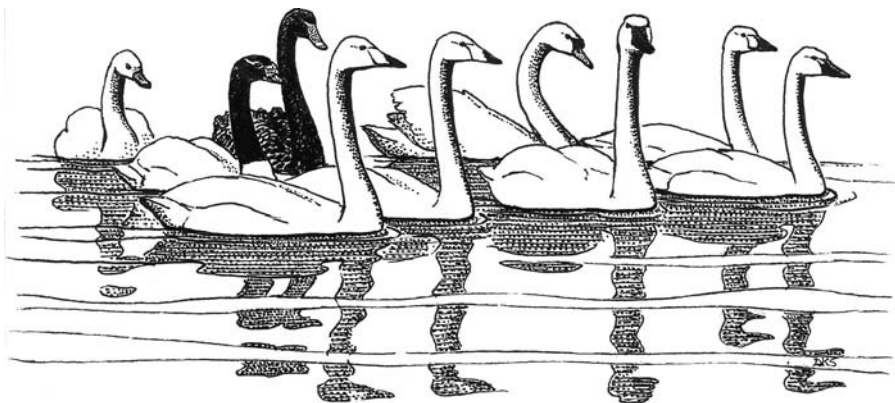
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## CHAPTER 1

# A swan's world

## INTRODUCTION

Among the world's nearly 10,000 bird species, swans number a mere seven<sup>1</sup> yet their ranges span over half the globe, making their success more than worthy of our attention. Swans occur across an enormous geographical area—North and South America, Europe, Asia, Australia and New Zealand, only Africa and Antarctica lack indigenous swans, but even in southern Africa Mute Swan has been introduced and Black-necked Swan has reached the sub-Antarctic Islands. Swans occur in a fascinating diversity of habitats. In the Northern Hemisphere they range from the high-latitude Arctic tundra of northern Russia to temperate lakes, rivers and marshes, and even visit the warm climes of the Mediterranean region. In the Southern Hemisphere they occur from the swampy pampas to the semi-desert plains of southern South America, to the remote Falklands and from the seasonal wetlands of arid Australia to the coastal bays and lagoons of New Zealand. One swan above all others has the largest range—the Whooper.

Whooper and Bewick's Swans range across the largest landmass of all, Eurasia and its associated islands. They occur from Iceland, Ireland, Britain and Scandinavia in the west to Chukotka, Kamchatka, China, Korea, and Japan in the east. The Mute Swan, so long domesticated and frequently introduced as an

ornamental species that tracing its native range has become difficult, certainly occurs naturally across much of south and central Eurasia, and can now be found well beyond that region, in Japan and North America. I was surprised by an encounter with a party of Mute Swans in the coastal saltmarshes just south of Vancouver, British Columbia, seen from a whale-watching boat. Unlike the introduced Mute Swan, the Bewick's Swan's conspecific relative, the Whistling Swan, and the Whooper's close relative, the Trumpeter Swan, both range naturally across northern North America, from the Pacific coast of Alaska to the eastern part of Hudson Bay, Canada, in the case of the former, and from western Alaska southeast across Canada to the great plains in the latter. In a broad belt across the southern parts of South America, from the wetlands of south Brazil to rugged Tierra del Fuego, the Black-necked and Coscoroba Swans can be found. Their larger relative, the Black Swan is abundant in Australia and, after introduction over a century ago, also thrives in New Zealand. In fact, as I began writing this chapter a wintering party of Black Swans was cruising the shallows of Portobello Bay, outside my window.

In thinking of swans, I immediately imagine a flurry of powerful images: the dawn stillness and calm reflections of autumnal Scottish lochs; the lush summer greenness and stark volcanic rocks of Iceland; condensing mist rising over thermal springs amid frigid icy wastes in northern Japan (Fig. 1.1); enormous reed-fringed lagoons in Romania's Danube Delta; the vastness of wide open skies condensed and reflected in shallow lagoons in Patagonia; wind-torn peaty pools in the Falklands, and the sun-glinting shallow coastal lagoons of South Island, New Zealand. These are by no means the only haunts of swans, nor perhaps where they are most conspicuous or most regularly seen. In many parts of the western and eastern world the 'feral' Mute Swan graces town and city parks. Introduced Black Swans swim regally around the Imperial Palace moat in downtown Tokyo, but even the wildest of wild swans occasionally occurs in close proximity to people, for example, Whooper Swans can be seen at close quarters on Tjornin pond in the Icelandic capital of Reykjavik, and there are many other sites used by swans within urban habitats. In colonial Buenos Aires, Black-necked Swans breed at Costanera Sur right in the city, passed by hordes of loafers and joggers, and in over-populated Japan, man and swan are at their closest at innumerable sites in northern Honshu and Hokkaido, where clamouring hordes of Whooper Swans are fed, not merely by reserve wardens and sanctuary managers, but by the public, by hand!

Swans have a special place in the human psyche, long entrenched in legend and myth, but not all have been the subject of special scrutiny. Of the world's seven species only four, Mute, Black, Tundra and Trumpeter have, over a period of decades, been extensively studied during the breeding season. Mute Swan, because of its wide distribution and popularity around man, Bewick's Swan (a subspecies of the Tundra) because of pioneering work done by Sir Peter Scott and the then Wildfowl Trust, Whistling Swan (the other subspecies) because of its abundance, Trumpeter Swan due to its rarity in North America, and Black Swan in the Antipodes because its abundance was a threat to agriculture, have all attracted much interest and research since the mid 20th century. The Coscoroba and



*Figure 1.1. Amidst morning mist beside a hotspring.*

Black-necked Swans have received least attention, not because they are any less interesting, but simply because of the relative scarcity of ornithologists within their ranges. They are still relatively little studied despite a recent increase in efforts. For political and logistical reasons it has proven rather difficult for Western scientists to study Bewick's Swan extensively on its breeding grounds<sup>2</sup>. The Whooper Swan too, although a northern swan, and notwithstanding it being the most wide-ranging and abundant was, until the 1970s, surprisingly poorly known. It, however, has been readily accessible in the western part of its range yet, in spite of this, only in Finland had it been studied extensively on the breeding grounds until detailed studies commenced in northern Iceland in 1978, encouraged by Prof Arnthor Gardarsson, with broader research continued by him and his colleagues into the 1980s and 1990s. In recent decades, the Whooper Swan has begun to receive the attention it deserves, with significant collaborative work in Iceland between the Icelandic Institute of Natural History and the Wildfowl & Wetlands Trust (WWT), and in Ireland with the development of the Irish Whooper Swan Study Group making three-way collaborative monitoring of the population throughout its migratory range possible. Meanwhile, in continental Europe, Bjarke Laubek has made considerable efforts to develop studies of the species. I hope that this book will encourage a further generation of naturalists and ornithologists to take an interest in this magnificent bird.

Despite its wide distribution, its conspicuousness and beauty, and its appearance in the folklore and mythology of many regions the Whooper Swan had, by the 1970s, when it first caught my interest, only been studied in detail in Scandinavia. Very little had then been published about the species in English,

other than brief descriptive accounts, the most widely known of which were those on the Whooper Swans of Shetland by Venables & Venables (1950) and of the Lake District by Airey (1955). A paper by Boyd & Eltringham (1962) on the species' status and distribution in the British Isles was a turning point in our developing knowledge, since for the first time information on population size, distribution and composition were collected in an accessible form.

The first detailed field studies in the UK were those of Hewson (1964, 1973) and Henty (1977); the former concerned mainly with flock composition and the latter with diurnal movements. Apart from these few descriptions of the species in its wintering haunts in Britain, the most important observations had been in Finland, where three landmark publications by Haapanen *et al.* (1973a,b, 1977) presented the results of the only previous major study and provided almost all that was then known of the species on its breeding grounds. The last of these three described the summer behaviour of wild-breeding Whooper Swans from incubation to fledging and, as the only paper on those aspects at the time it formed the background to my own work on breeding biology and behaviour (Brazil 1981b, 1981c).

Even by the late 1970s, vast parts of the Whooper Swan's ecology and behaviour remained unstudied. Virtually nothing was then known, for example, about migration or moult. Very little was known of its daily or seasonal movements, its wintering ecology, its feeding ecology or flocking behaviour, and less still of the effect increased use of agricultural land was having on feeding behaviour. No data were available on the ecology of non-breeding birds and very little information was then available from the Icelandic population, which from a UK perspective was *the* most important population, as the source of 'our' wintering birds. I wanted to help redress the balance.

Life rarely runs smoothly, however. Prior to my arrival in Scotland, Whooper Swans in the Stirling area in the late 1970s had shown an interesting pattern of movement, with several small flocks each utilising several fields during a single day. Initially, I planned a detailed examination of this situation and of the factors affecting habitat selection. On my arrival, however, my preliminary observations soon revealed that, for reasons unknown, the pattern of usage had changed to a rather more regular system. Often a single flock would utilise a single field, often for several days, thus virtually eliminating the phenomenon I had planned to study!

Equally as quickly, I began to realise just how widespread our ignorance was of this magnificent bird. Wherever I turned for answers the literature merely left me with more questions. Rapidly altering my focus, I set out to provide a wider description of its wintering behaviour and ecology. The breadth of my research was increased when it became possible to make prolonged visits to the breeding grounds in Iceland in three consecutive summers in the late 1970s and early 1980s and, further, by my opportunities first to visit and then live in Japan during the 1980s, and to return there annually ever since. Increasing the breadth of study inevitably meant reducing its depth, although a general theme of interest in feeding behaviour and ecology was central. Along the way I was sidetracked into studies of geographical variation in bill patterns, of morphology, and of migration and movements.

I took a primarily descriptive and broad approach to the Whooper Swan's annual cycle, from its wintering behaviour and ecology in Britain, to its migration, and its breeding ecology and behaviour in Iceland, in order to extend, as much as possible, our understanding of the species. As with other studies in behavioural ecology, my dominant concern was behaviour as an ecological factor affecting the distribution and/or abundance of individuals (see Krebs 1972), for example habitat selection, temporal distribution of behaviours, group or flock composition and dynamics, territoriality and parental care. I was also concerned with the interactive effect between such factors and environmental factors such as habitat availability and weather. Meanwhile, much work in behavioural ecology, especially on waterfowl, was already concentrating on the fine details of social behaviour (e.g. of Bewick's Swans; see Scott 1980a,b,c,d), or feeding ecology (e.g. of geese; see Owen 1980), but such detailed studies were only relevant in the context of the wider knowledge of the species in question.

Since my own more general study of behaviour and ecology, many more detailed studies have been made of specific aspects of Whooper Swan biology. Similarly, while my own experience is limited to extreme western Europe and eastern Asia, much work has been done over the last 20 years in the vast regions in between. In this book, I have done my best to bring together my own experience with that of others, and to weave this detail into a broad account of the life history of one of my favourite birds, while also trying to bring out at least some of the excitement and pleasure gained from studying not just the Whooper Swan, but also the wild places in which it breeds and to which it migrates.

The visible grace and the mysterious movements of the swans, of the Northern Hemisphere in particular, have inspired poets, artists and storytellers down the ages, and latterly they have provided inspiration for the photographer. These aspects are described in more detail in Chapter Two. Though I have travelled widely to watch each of the world's swans, it is the Whooper that has provided me with my most deeply impressive wild memories, and endless inspiration as the subject of this book. But it cannot be viewed in isolation. Just where do each of the swans belong, how are they related, and how do they differ?

## SWAN CLASSIFICATION

Given that so few species are involved, swan taxonomy has been surprisingly controversial. In form there are resemblances between certain species. Black-necked Swan of South America, Mute Swan of Eurasia and Black Swan of the Antipodes share similarities in structure, form and deportment. Differing fundamentally from these three, the 'northern swans', the Trumpeter and Whistling Swans of North America and the Whooper and Bewick's Swans of Eurasia have many features in common, as a close-knit evolutionary complex (Johnsgard 1974), that they have

variously been considered by naturalists and taxonomists as four, three, two or merely one species.

Studies of parasitology, especially those of some of their external parasites<sup>3</sup> indicate an ancient separation between these two major groups of 'northern' and 'southern' swans (Timmerman 1963), nevertheless, the extent of more recent divergence among the 'northern swans' has remained confusing.

The 'northern swans' can be excused for suffering crises of identity, as ornithologists have repeatedly split and lumped them. Delacour & Mayr (1945), for example, considered them to be just two polytypic species, one larger (Trumpeter and Whooper) and one smaller (Bewick's and Whistling). That position was followed until as recently as the early 1970s, although in the year that Wilmore (1974) still plumped for two, Johnsgard (1974) took the most radical, and now outmoded, view, that all four forms belonged to a single quadri-typic species, while simultaneously acknowledging that the degree of tracheal convolution within the sternum differed between Whooper and Trumpeter, which argued against their conspecificity. Meanwhile, and at the opposite extreme, Whooper, Trumpeter, Whistling and Bewick's were considered to be four species (see Boyd 1972).

Given the various possible relationships between these four taxa, two theories of origin are imaginable. In the first, an ancestral Holarctic 'northern swan' may have diverged along north/south lines into two species: one occupying broad arctic-tundra habitats and the other subarctic/northern temperate ranges. In the second, an ancestral form may have become separated between east and west, i.e. Eurasia and North America, then split further into two taxa adapted ecologically, one to tundra and the other to taiga-like habitats (Johnsgard 1974, 1978). Of the two possibilities, however, the former seems the far more likely.

The two largest and most magnificent of the 'northern swans', Trumpeter and Whooper, differ markedly and have been isolated so long that their distinctiveness is undeniable (Palmer 1976), whereas the smaller Whistling and Bewick's are less readily distinguished. These are now considered not as species but as two closely related subspecies, collectively known as Tundra Swan, showing a cline in certain characteristics across their enormous range.

In what was the first modern attempt to list all of the world's birds in a comprehensive single volume for the layman, Gruson (1976) recognised just six extant swans (as had Boyd 1972), lumping Whistling with Bewick's, and Whooper with Trumpeter. Gruson's rationale was followed by Todd (1979) in his book on the wild-fowl of the world, who pointed out that the 'northern swans' can hybridise, with even Trumpeter and Whistling being crossed in collections. However, that stance would lead to gross lumping as crossing between swans and geese has also been recorded in captivity.

Illustrative of the disagreement over swan taxonomy is that Walters (1980), reviewing the world's post-Pleistocene period (since the last ice age), included ten species of swans. He split not only all four northern taxa as species, but also recognised David's Swan of China (*Coscoroba davidi*), and Chatham Swan of New Zealand (*Cygnus chathamicus*) as recently extinct species. In the same year, Howard



& Moore (1991), taking a more conservative approach, listed just six extant species (as had Gruson 1976), lumping *cygnus* and *islandicus* with *buccinator* (Trumpeter), and *bewickii* and *jankowskii* with *columbianus* (Tundra).

More recently, Madge & Burn (1988), Clements (1991), Dunning (1993), Monroe & Sibley (1993) and Clements (2000) have all listed seven extant swan species, accepting the separation of *buccinator* from *cygnus*, but including *bewickii* with *columbianus*. Surprisingly Madge & Burn (1988) included all three 'northern swans' in the genus *Olor*, rather than in *Cygnus*, whereas Monroe & Sibley (1993) retained all swans, with the exception of the Coscoroba, in the genus *Cygnus*. The bizarre Coscoroba Swan stands alone, resembling what one might imagine as an identikit put together by someone unsure of the differences between adult shelducks, geese and swans, while its cygnets share resemblances with young tree ducks.

### WHOOPER SWAN *CYGNUS CYGNUS* (LINNAEUS, 1758)

The Whooper Swan was the swan species described first by the famous codifier of taxonomy Carl von Linné in 1758 (as *Anas cygnus*) and it is therefore the type species of all the swans, though Linné considered Mute Swan to belong to the same species, distinguishing only between the wild (Whooper) or *ferus* and the tame (Mute) *mansuetus* forms (Scott & The Wildfowl Trust 1972) (Plate A). It was later reassigned to the new genus *Cygnus*, as *Cygnus islandicus*, by Brehm in 1831 (Vaurie 1965), only later being treated as *Cygnus cygnus*. Not only is it the type species of swan taxonomically but also genetic research indicates that the Whooper Swan diverged slightly earlier than either the Tundra or Trumpeter Swans (Harvey 1998).

The 140–165 cm long Whooper Swan is rather similar to its North American cousin the Trumpeter Swan *C. buccinator*, from which the Whooper differs most noticeably in its bill pattern, which is predominantly yellow, rather than black, and in its voice. Whooper Swans are large, and among the heaviest of all long-distance migrant birds. Male Whoopers average larger and heavier than females, 9.8 kg in summer in Iceland, 10.7 kg in summer in Finland, 10.2 kg in winter in Britain and 11.0 kg in winter in Denmark. The heaviest individual recorded was a male that weighed 15.5 kg in winter in Denmark. Females are somewhat lighter, averaging 8.2 kg in Iceland, 8.9 kg in Finland, 9.0 kg in Denmark and 9.2 kg in Britain (Rees *et al.* 1997a; see also Appendix 2).

Though now generally considered monotypic, early measurements suggested that Icelandic and particularly Greenland<sup>4</sup> Whooper Swans were, on average, smaller than European specimens, and it was even suggested that they represented a distinct smaller subspecies, *C. cygnus islandicus* (Schioler 1925). This position could not be upheld because it proved difficult to assign specimens consistently to either race (Witherby *et al.* 1940; Hørring & Salomonsen 1941; Howard & Moore 1991).

Whooper Swan is essentially a trans-Palearctic species breeding disjunctly across an enormous range of the forested boreal zone of Eurasia, from Iceland (here in

tundra-like habitat), Norway, Sweden and Finland, across northern Russia to the Okhotsk Sea and Sakhalin, the Bering Sea and Kamchatka, and even on the outer Aleutians (USA), generally at 50–55°N to 64–71°N, but also south to *c.*47°N in the eastern Palearctic. Whooper Swans breed mainly in the taiga zone, but are locally extending north into forested tundra and true tundra, and south where there is suitable habitat into steppe. Its northern extremity is generally that of the limit of the taiga, although in some regions it ranges north into forested tundra and the willow scrub zone. At its southern extent it breeds to the southern limit of the taiga throughout most of its range, and, though more sporadically, at wetlands on the steppes of Central Asia. Increasingly, in the west at least, it has been colonising northern temperate regions. It breeds south to the Caspian Sea, Mongolia and northern China. In winter it ranges south across western Europe, to Ireland, Britain, Denmark and Germany, and mainly in cold winters further south. It also winters on the Black and Caspian Seas. In eastern Asia it winters in coastal eastern China, the Korean Peninsula, Japan and Kamchatka (e.g. Vaurie 1965; Dement'ev & Gladkov 1967; Brazil 1991).

A bird of northern pools and shallow lakes, where it favours reedbeds, occasionally slow-flowing rivers, and bogs in the taiga, it breeds during the northern summer in May–August. It winters along coasts, on freshwater lakes, marshes and low-lying agricultural land. In late July–early September flightless moulting birds congregate near the breeding grounds. From mid to late September, depending on the region and severity of the season, they leave their breeding grounds moving mainly southwest or southeast to reach their wintering grounds in October–November. Cold weather can force them south, well beyond their normal wintering range. They may remain on the wintering grounds until March–early May, then migrate northeast or northwest to arrive on the breeding grounds during May. Overall, the species appears to have been re-expanding its range and its population during the 1980s and 1990s.

Within its normal range from Ireland to Japan, it is likely to be confused only with the smaller Bewick's race of Tundra Swan, though Whooper has a longer, more distinguished profile. Whooper's bill usually has such a large yellow patch on the lores, extending in a point to or beyond the nostrils (Boyd 1972), that it appears as if it is yellow with a black tip, whereas that of Bewick's appears black with a yellow patch. In proportion Bewick's Swan's bill is shorter and commonly shows a pinkish line along the side of the lower mandible (Alström & Olsson 1989), which Whooper always lacks. Adult Whooper has a variable amount of yellow on its black bill, though the extent increases across the Palearctic from west to east (Brazil 1981d). It is also polymorphic in eye colour. The irides, though typically brown, like those of Trumpeter and Tundra Swans, exhibit a range of variation from various shades of brown to grey and pale blue.

Although the plumage of adults is pure white, heads and necks often become stained quite strongly orange by iron in the water of their breeding grounds or, in some regions, of the wintering grounds. This orange iron staining (found on other 'northern swans' too) fades or is lost during moult of neck and head feathers in

winter (page 13; Plate 5). Cygnets are mostly dusky grey-brown in their first autumn but become steadily paler throughout their first winter and noticeably whiter towards spring (Plate 10). Over the same period, their bills turn gradually from pinkish to whitish with a yellow wash. Whereas the adult's legs and feet are black, those of cygnets are flesh-grey at first, darkening during the first winter to black.

The Whooper Swan is an extremely sociable species outside the breeding season, when it is commonly found in flocks, often of considerable size. It is highly vocal both during the breeding season when on territory and in non-breeding or wintering flocks where it gives a range of different calls for contact and in display. The voice ranges from soft to loud whooping notes, and is often described as having trumpet- or bugle-like qualities (e.g. Todd 1979). Usually double-noted, the second is higher pitched than the first, and it is these calls that afford the species its English name. When alarmed, vocalisation is generally confined to single loud harsher *whoops*, whereas for contact it uses softer, quieter notes. In flight the call is a deep, resonant *hoop-hoop*.

The Whooper numbers among the most abundant swans, along with Mute and Black each is estimated to have populations totalling c.500,000 by Sladen (1991), though in the case of Whooper Swan this may be more likely between 150,000 and 200,000 based on current estimates. Its breeding range is virtually contiguous with its more northerly, tundra-breeding relative, Bewick's Swan. It also breeds, or has bred less commonly, as far south as southern Sweden, Poland, Germany, Scotland, Ireland, the Aral Sea, Mongolia, and Lake Khanka. It has also bred in North America, in the outer Aleutians.

In comparison with Bewick's Swan (which is restricted to tundra), Whooper breeds in a greater range of habitats and at more varying altitudes. On migration and in winter it readily uses brackish and saltwater sites as well as fresh water and farmland habitats. As a result of its considerable weight, it needs a clear 'runway' for take-off, limiting the minimum size of pools it may occupy. It runs, on land or on water, while flapping in order to obtain sufficient speed and lift for flight.

In spring, Whooper flocks commonly arrive at staging posts near their breeding grounds in April–May. Its breeding range encompasses cool northern temperate areas and subarctic taiga, where it nests at a wide range of shallow fresh waters from steppe lakes and pools to marshes and riversides, and also locally by coastal inlets and estuaries. In Iceland, the breeding range spans the boreal lowlands (now treeless through human activity, but originally with birch forest) to the arctic–alpine tundra<sup>5</sup> above 300–500 m (Gardarsson *in litt.* 2001). Young of the previous year disassociate themselves from their parents or are driven off by the adults, which occupy large well-spaced territories, with one pair per waterbody, where they build a bulky nest mound close to water or on an island. The typical clutch of 3–7 eggs is incubated solely by the female, for 35–42 days (Rees *et al.* 1997a). Generally, the colder tundra zone of the Palearctic is inhabited by the smaller bodied Bewick's Swan, because its more condensed breeding cycle enables it to breed successfully there. Body size and related parameters influence the length of the breeding cycle, while latitude limits the ice-free period available. Bewick's, like Whistling Swan,

which has an incubation constancy<sup>6</sup> of 97–99% (Cooper 1979), can condense its breeding cycle into the shorter Arctic summer because of its smaller size and because males incubate during female absences, thus shortening the incubation period.

Non-breeding Whoopers spend the summer in moulting flocks and moult earlier than breeding birds. Moulting occurs during or after breeding among breeders and failed breeders. Thereafter small flocks of non-breeders, failed breeders and successful parents with their families begin to move away from the breeding range during September, gathering into larger flocks that fly in lines or V formation and arrive in their wintering quarters mainly in October–November. These gatherings may be of several hundreds or even thousands, especially at migratory staging posts.

The Whooper Swan's wintering range is almost equally as vast as its breeding range, spanning coastal lowlands of western Europe to lakes, estuaries and bays of eastern Asia and innumerable scattered localities between (Plate 3). In the west it typically winters inland at lakes and on floodplains, but also on open lowland farmland, usually in coastal regions. Only less commonly does it occur on salt or brackish water, mainly in Scandinavia. Some of the Icelandic population remain there throughout the winter, merely moving to coastal regions or spring-fed waters. In the Far East, it is typically found in winter on large bodies of freshwater, rivers or lakes, where these remain ice-free, or at coastal sites ranging from estuaries to shallow coastal lagoons, where not excluded by sea-ice (Fig. 1.2).

For British and Irish readers, it is the Icelandic population that is most significant as the vast majority of birds wintering in Britain and Ireland breed or summer



*Figure 1.2. As long as there is access to food and open water Whooper Swans can survive severe northern winters.*

in Iceland. Ringing has revealed that there is interchange with those on the continental mainland, with some from Iceland wintering on the continent and some continental birds wintering in Britain, but this is relatively limited (Brazil 1983a; Black & Rees 1984, Gardarsson 1991; Rees *et al.* 1991a; Laubek 1998).

The Scandinavian and west Russian population winters on Baltic and Norwegian coasts and southern coasts of the North Sea. A smaller proportion continues further south into western and southern Europe, with numbers in southern regions apparently strongly dependent on the severity of the winter. Coastal lowlands of the Black and Caspian Seas represent another major wintering area, and smaller numbers, perhaps from the same population, winter south to southeast Europe and from Turkey east to the Aral Sea. The eastern Russian population migrates southeast to coastal east Asia, on the Chinese coast and Korean Peninsula, but particularly in Japan. Very small numbers move east to the Aleutians and Pribilofs of Alaska (Sladen 1991). Extralimital movements have brought vagrants to western mainland Alaska (where they have even bred and moulted), California and New England (LeValley & Rosenberg 1983; Sladen 1991; Mitchell 1998). Northbound migrants in Europe have overshot to Bear Island, Svalbard and Jan Mayen Island; and they have wandered as far south in winter as North Africa and the northern Indian subcontinent (Madge & Burn 1988).

The enormous breeding range makes estimating the population difficult. Though large, and currently common, Whooper Swan is nonetheless susceptible to hunting and loss of its essential wetland habitats, and historical declines have occurred. The Scandinavian population was greatly reduced by hunting, though it is now recovering. In parts of Siberia it has suffered from considerable habitat loss, and impacts on populations elsewhere mean that its range is more fragmented than it appears. The apparent Greenland population was seemingly exterminated by killing of adults and young during the flightless period.

Counts and estimates are made of certain populations, thus some figures are available. The Icelandic population, after increasing to 16,700 in January 1986 and just over 18,000 in January 1991, was thought to have stabilised at c.16,000 in 1995. However, the most recent coordinated count, in January 2000, revealed a record total of 20,645 (Cranswick *et al.* 2002). Other counts of wintering birds in northwest Europe suggest that there were c.45,000 in January 1995 (a trebling since 1974) and that the population from Fennoscandia and northwest Russia wintering in the North Sea/Baltic regions has increased further to 59,000, with c.17,000 in the Caspian/Black Sea regions (Salmon & Black 1986; Kirby *et al.* 1992; Cranswick *et al.* 1996; Rees *et al.* 1997a; Delany *et al.* 1999; Laubek *et al.* 1999). Data from Asia are few, though some 31,000 winter in Japan (Fig. 1.3) and 2,000–3,500 in Korea (Won 1981; EAJ 1999; Miyabayashi & Mundkur 1999; Cho *in litt.*). The numbers using large areas of the species' range are unknown, but whereas a world estimate of as many as 100,000 appeared reasonable in 1980 (Brazil 1981c; Madge & Burn 1988), the considerable increase in the Icelandic and northwest European populations and the scale of the 'guesstimates' from Russia indicate a far larger overall population, perhaps even as many as 200,000,



Figure 1.3. *Kussharo-ko, a regular winter haunt in northern Japan.*

though presumably not the 500,000 estimated by Sladen (1991) and various Russian authors.

Whooper Swans are generally regarded to show little regional variation, but Ma & Cai (2000) cite evidence that the karyotype of Whooper Swans in China is  $2n = 78$ , whereas in Japan  $2n = 80$  has been reported, indicating that there may be cryptic differences, and Albertsen *et al.* (2002) suggest that there may be slight morphometric differences between east Asian (Japanese wintering) and European Whoopers.

#### TRUMPETER SWAN *CYGNUS BUCCINATOR* RICHARDSON, 1832

At 150–180 cm in length and with wings of 60.5–68.0 cm, the Nearctic Trumpeter Swan is the largest, though not the heaviest, of the extant swans (Plate A). Surprisingly, it was the last of the seven to be described. Males are usually larger, 11.9 kg, whereas females average 9.4 kg, with wingspans of 1.8–2.4 m (Bellrose 1976) and along with the similarly sized, though slightly smaller, Whooper and Mute Swans, the Trumpeter is one of the largest and heaviest flying birds.

Like the Whooper Swan, the adult Trumpeter is pure-white, however, unlike the Whooper it has an all-dark bill with a reddish streak along the cutting edge of the lower mandible. Very rarely it has a small yellow or greenish-yellow loreal spot (Banko 1960). Trumpeter Swan cygnets are greyish-brown, somewhat darker on the crown and hindneck than on the underparts. They gain full-adult plumage by their second winter, though their tails and wings whiten much earlier. Cygnets have

flesh-pink bills rimmed with black at the base, the tip and sides of the lower mandible. The adults' legs and feet are black, while those of the immature are greyish-flesh coloured. The iris is dark brown. From 1.8% to 13% of cygnets are leucistic, being entirely white on hatching and having yellow feet and tarsi, and an entirely pink bill (Mitchell 1994).

Though similar in general appearance to Whistling Swan, the Trumpeter is both larger and proportionately longer necked, with a longer, thicker bill, which is both large and deep. The black facial skin tapers to a broad point at the eye, thus the eye is not distinct from the bill (Lockman *et al.* 1990) while the profile is straight in an even slope from forehead to bill tip, its forehead is flatter than the Whistling Swan's, giving it a more imperious profile. The length from the eye to the nostril equals the distance from the nostril to the bill tip (Boyd 1972). The feathering on the adult's forehead extends in a broad wedge (whereas it is straighter or slightly rounded in Whistling Swan), although there is some variation in profiles where the forehead feathers meet the upper bill, with some having an inverted triangle or V, a U or a squared shape (Mitchell *in litt.* 2001). When relaxed, a Trumpeter tends to drape its neck so that the kink appears to rise from the forepart of the back, and the breast protrudes forwards. In contrast, Whistling Swan, like Bewick's Swan, carries its neck more erect from the base.

Quite readily distinguished by voice, Trumpeter utters a deep single or double-bugling honk *ko-hoh*, quite different from Whooper Swan or the higher pitched, more barking call of Whistling Swan.

The former breeding range is believed to have been extensive, stretching from central Alaska east through central Yukon and southwest Northwest Territories, north Saskatchewan and Manitoba to Hudson Bay. It also bred in Ontario, Québec and east to Nova Scotia, New Brunswick and Newfoundland. To the south it bred in the Carolinas, west Tennessee, northwest Mississippi, east Arkansas and Missouri, and in the west to south Nebraska, Wyoming, north Utah, south Idaho, northeast Oregon and possibly California. It formerly wintered from southern Alaska along the Pacific coast to southern California and possibly east through Arizona, New Mexico to the lower Rio Grande Valley and the Gulf coast of Texas. Before being decimated, Rocky Mountain Trumpeter Swans very likely wintered in the Great Salt Lake marshes of north Utah. On the Atlantic coast it wintered from the southern ice limit to Florida (Bellrose 1976; Mitchell 1994; Mitchell *in litt.*).

Once widespread and abundant across northern North America below c.800 m, Trumpeters are greatly reduced in numbers, having been widely hunted by settlers for food, and slaughtered commercially for their meat, feathers and their quills (1600s–1800s). Some measure of the slaughter can be seen from the fact that a single company marketed over 108,000 skins in 1820–1880 (although this figure probably included some Whistling Swans). Numbers had already fallen drastically by the 1870s, and by 1935 a mere 69 were thought to survive in the only known population of the contiguous states (Todd 1979; Mitchell 1994). For a while there was concern that it might have become extinct, but a

tiny remnant population was then discovered in Yellowstone National Park (Montana, Idaho and Wyoming).

Translocation of some of the survivors to additional sites enabled a slow recovery, and thereafter a previously unknown Alaskan population was discovered. Though increasing once more as a result of strict protection, Trumpeter Swans are still primarily restricted to Alaska, north-western Canada and other north-western states, where they occur on freshwater and brackish lakes, ponds and marshes. Most of those in the northern USA are derived from reintroduction programmes. The increase in numbers since the 1930s has been spectacular, and is lauded as a conservation success, being the result of intentional translocations, natural increase given suitable habitat and protection, and general wetland conservation (which restored many once-degraded or lost wetlands now used by swans, and other waterfowl). The Trumpeter is gradually re-expanding its range, both naturally and by reintroduction, into some of its former breeding areas.

Its current natural breeding range includes much of central and southern Alaska south of the Brooks Range and east of the Yukon-Kuskokwim Delta, locally south from south Yukon and Northwest Territories east to south Saskatchewan, south to north-central Nebraska, western South Dakota, northwest Wyoming, east Idaho, south Montana, central Nevada and south-central Oregon. Its natural wintering range now includes south Alaska, west and south-central British Columbia, west Washington, south to west Oregon, east Nevada, west Utah, south Montana, east Idaho, northwest Wyoming and southwest Dakota (Mitchell 1994). In addition, it has been reintroduced and become re-established locally in north, northeast and southeast Michigan, east and northwest Minnesota, north and central Wisconsin, south Ontario and east Saskatchewan (Mitchell 1994; see Fig. 1.4).

Trumpeter Swan population estimates indicate that it increased steadily during the 1970s and 1980s. By 1995 numbers had reached *c.*16,300 along the Pacific coast, 2,500 in the Rockies, and *c.*900 in the interior (Caithamer 1995), with many interior birds presumed to be from reintroduction attempts. These increases have continued, with the total population increasing by *c.*3,900 (20%) since 1995 and by 20,000 (>500%) since 1968. Regionally, numbers increased between 1995 and 2001 from 16,300 to 17,551 (8%) along the Pacific Coast, from *c.*2,500 to 3,666 (46%) in the Rockies, and from *c.*900 to 2,430 (150%) in the interior (Caithamer 1995, 2001). In Alaska alone the population increased from 1,924 in 1968 to 13,934 in 2000 (Conant *et al.* 2002).

Some Trumpeters are non-migratory and these may commence territory defence as early as February, with copulation and nest building occurring from March (Banko 1960; Mitchell *in litt.* 2001). Others, however, particularly those from Alaska, are migratory and do not commence breeding until late April or May. Trumpeter Swans occupy large territories and, like other 'northern swans', build large nest mounds near water or on small islands. The clutch of 5–8 eggs is usually incubated by the female alone for 33–40 days, in a nest often built atop a Muskrat den. The cygnets grow rather rapidly, fledging in *c.*100 days (Walters 1980;



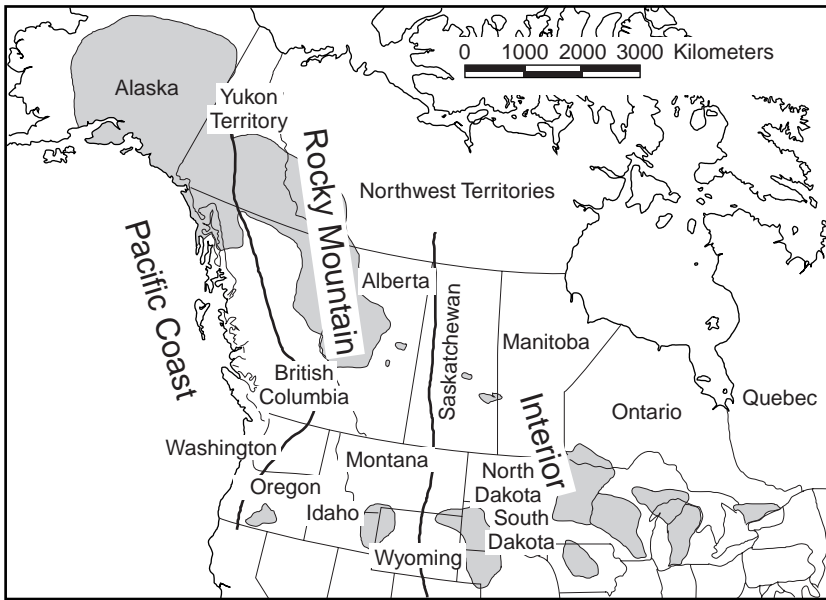


Figure 1.4. Current breeding range of the Trumpeter Swan shown as shaded areas (after Hawkings et al. 2002).

Mitchell 1994). They usually forage in shallow water and feed on common vegetation available depending on the season in such habitats, including eelgrass, sedges, grasses, pondweeds, water buttercup, water lily (*Nuphar* spp.), bulrushes and arrowleaf (*Sagittaria* spp.).

The species' scarcity has perhaps precluded vagrancy much beyond its normal range; however, it has strayed as far south as Mexico, in Chihuahua and Tamaulipas (Drewien & Benning 1997), and even to Kanchlan Bay, Russia, and northern Honshu, Japan, where one wintered twice in the early 1990s (OSJ 2000; Syroechkovski 2002).

#### TUNDRA SWAN *CYGNUS COLUMBIANUS* (ORD, 1815)

Tundra Swan is the specific name given to both the Nearctic and Palearctic populations of Whistling and Bewick's Swans by those modern taxonomists who currently regard them as conspecific.

#### WHISTLING SWAN *CYGNUS COLUMBIANUS COLUMBIANUS*

The inappropriately named Whistling Swan (it does not whistle!) of the New World was the last but one to be described, by Ord in 1815 (Plate A). It has been

renamed the Tundra Swan in North America because that population consists of the nominate subspecies (e.g. National Geographic 1999). Here, however, I have retained the older name because it is helpful in easily distinguishing the Old World Bewick's Swan *C. c. bewickii* and New World Whistling Swan *C. c. columbianus*.

At 120–150 cm, Whistling Swan is slightly larger than Bewick's Swan, although measurements do overlap. Nevertheless, it is still a rather small delicate 'northern swan' with a more slender bill, a far more rounded head than either Trumpeter or Whooper Swans, and a slightly concave bill profile.

The only reliable field characteristic distinguishing Whistling from Bewick's is the former's black beak and essentially black facial skin. This extends back in a point to the eye and across the forehead. At the base of the bill, close to the eye, there is often a small teardrop spot of yellow which is variable in size, but always very small in proportion to the black. The yellow is also significantly smaller than even the smallest yellow patch on Bewick's; it may even be absent or appear so at a distance. Whistling Swans have, on average, just 3% of the bill yellow, whereas Bewick's have 31% (Boyd 1972; Evans & Sladen 1980). In comparison with its larger and confusingly similar Nearctic relative, the Trumpeter Swan, Whistling Swan has a more slender bill, a slighter forehead, a concave profile, the eye is distinct from the base of the bill, it has a proportionately shorter neck, and the distance from the eye to the nostril is longer than that from the nostril to the bill tip (Boyd 1972; Lockman *et al.* 1990).

The voice includes a high-pitched whooping, and a range of honking, clanging calls recalling those of Canada Goose or even American Wigeon. Its yelping flight call is a musical, trisyllabic *wow-wow-wow* and it is equally vocal on the water where, in winter, it is highly sociable and excitable, engaging enthusiastically in noisy greeting ceremonies as individuals join and leave flocks.

Whistling Swans breed across the Arctic, from coastal Alaska east across northern Canada to Baffin Island, usually below 300 m. It arrives on its coastal tundra and river valley breeding grounds in the latter half of May. It nests close to water on the banks of ponds or lakes, sometimes on small islands, laying a clutch of usually 3–7 eggs incubated by the female alone for 30–40 days. Fledging is rapid, taking only 60–75 days (Walters 1980; Ma & Cai 2000). Rapid breeding and growth appear possible in part because of the relatively high proportion of animal matter (insect larvae, fairy shrimps and molluscs) in the diet.

After the breeders have moulted they start southward migration during October. Like other 'northern swans', migratory flocks form wavering lines or V formations, maintaining contact between flock members quite noisily. They follow specific traditional migration routes and use several stopovers, arriving on their wintering grounds in November–December and remaining there usually into at least March.

In winter, Whistling Swan favours coastal brackish and freshwater marshes where it feeds mainly in shallow water, although it has adopted a relatively new habit of foraging over farmland, especially on arable crops and winter cereals. The Whistler's quicker feeding action helps distinguish it from Trumpeter Swan.

Whistling Swans winter in two main regions. Those breeding in western Alaska follow the Pacific coast to California and also occur at several inland wetlands, east to Idaho and Utah, but are concentrated mainly in the valleys of central California. Birds breeding in much of the rest of the range migrate through the Canadian Northwest Territories south to the west of the Great Lakes, then east across north-eastern USA to winter at Atlantic coastal marshes from Maryland to North Carolina, with some travelling up to 3,250 km (Todd 1979). Although the sizes of the catchment areas for wintering birds vary enormously between east and west, the wintering numbers are almost equally divided, with perhaps slightly larger numbers on the Atlantic coast.

In the west, Whistlers winter primarily from southwest British Columbia south to central California along the coast, and inland in northern and central California, southernmost Oregon, northern Utah and northern Nevada. They are rare as far south as southern Arizona and southern California. In the east, they winter primarily from southeast Pennsylvania and northern Maryland to North Carolina.

Whistling Swan is not confined to North America. In common with a number of other waterfowl and shorebirds strongly identified with the Nearctic, its range actually extends west across the Bering Strait into northeast Asia. In Asia, it has been expanding west and south in recent decades, and now occurs along c.500 km of the north Chukotka coast, with 600–1,000 estimated to be summering there (Syroechkovski 2002).

Vagrants have wandered in winter to north and central Florida (40–50 records all 16 November–12 March; Stevenson & Anderson 1994), Texas (where it is rare throughout; Texas Ornithological Society 1995) and northern Mexico where it is irregular and rare (December–February) south to Baja California Sur, Durango and Tamaulipas, but with most records from Chihuahua (Howell & Webb 1995; Drewien & Benning 1997). It has also straggled in winter to Bermuda, Cuba, Puerto Rico, St Thomas (Virgin Islands) and Antigua (AOU 1998; Raffaele *et al.* 1998). Whistling Swan is accidental in Newfoundland and east across the Atlantic to Ireland, Britain and Sweden, and west across the Pacific to Hawaii (Midway and Maui) (Madge & Burn 1988). It is an annual, albeit rare, winter visitor to Japan where hybrids between Whistling and Bewick's Swans have also been reported (Mikami 1989; Brazil 1991).

Whistling Swan is likely to have always been more abundant than Trumpeter. An estimate made in the early 1970s put its population at c.146,000. As with Bewick's Swan, however, total numbers are highly dependent on recent breeding success. A 1996 estimate of the North American population indicated that it had increased but was now relatively stable, with as many as 166,000; 86,300 in the east and 80,400 in the west (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1996). The eastern population subsequently increased further and now exceeds 100,000 (Serie *et al.* 2002). Alaska is the single most significant breeding area being home to c.60% of breeders, with the greatest density in western coastal areas, and the majority migrating to California to winter. This sizeable population is well protected, but supports limited hunting and harvesting by

indigenous peoples. A highly recommended review is that by Limpert & Earnst (1994).

BEWICK'S SWAN *CYGNUS COLUMBIANUS BEWICKII* (YARRELL, 1830)

At just 115–140 cm, Bewick's Swan is the smallest of the 'northern swans' (Plate A). It is smaller, relatively shorter necked and shorter bodied than Whooper Swan, with which it often occurs in winter, and has a more distinctively rounded head, shorter bill with a slightly concave profile giving it a cuter, retroussé look, and smaller, rounded or square-ended yellow bill patch not usually reaching the nostrils (Boyd 1972). Their superficial similarity in the pre-binocular era led to confusion, and the smaller Palearctic 'northern swan' species was only first separated from Whooper Swan in 1830. It was named in memory and honour of the consummate wood engraver and famous illustrator of birds, Thomas Bewick (1753–1828).

As with all 'northern swans', adult Bewick's are pure white, while cygnets are grey-brown. Although most of the cygnets' duskier feathers are lost by their first spring migration and first summer, they retain some greyish feathers about the head and neck, making it possible to age them well into their second winter. Young are difficult to separate from young Whoopers, except on structure. In flight, however, Bewick's have quicker wingbeats and are more agile on take-off and landing than Whoopers.

The bill pattern is typically black with a yellow area at the base of the bill. This does not, however, extend as far along the bill sides as it does in Whooper. Although showing less yellow overall than Whooper, the bill pattern is so variable that individual identification by trained observers is possible, and such methods have been used in long-term studies of the species in Britain. Unlike adults, cygnets have pink bills, only the tip and cutting edge are black. The bill becomes steadily duskier in spring as adult-like bill pattern develops. The legs and feet of adults are black, those of cygnets flesh-grey. The iris of both adults and young is normally dark brown, but can be pale brown or occasionally blue.

Bewick's Swan is even more vociferous than Whooper. It gives a range of honking and yelping calls, which are both higher pitched and delivered more rapidly than those of Whooper, although there is some overlap. The calls are usually softer, faster, more yelping and less bugling than in Whooper, and have been described as *hoo-hoo-hoo*.

It is a very wide-ranging subspecies, breeding across almost the entire Palearctic or Old World Arctic, from the Kanin Peninsula to Chukotka. Its breeding range lies north of the Whooper's in a narrower band, as it is restricted to nesting locally in low-lying areas of open grass or swamp with scattered pools, lakes and rivers in the tundra. Territorial, it arrives on its breeding grounds between mid May and early June, and nests on dry hummocks, either in open coastal tundra or beside lakes, rivers and estuaries, often in loose, well-scattered colonies. The clutch, often 2–5 eggs (range 1–6) is incubated mainly by the female for 29–30 days (Rees *et al.* 1997c).

Like Whistling Swan, Bewick's consumes considerable animal matter as well as vegetable matter in the breeding season, although it is almost exclusively vegetarian in winter. The shortness of the ice-free summer at the high latitudes where it nests dictates that the breeding season is condensed. It remains on the breeding grounds only until September or early October, by which time the cygnets must be fledged and capable of migrating south or they will be caught by the early-autumn freeze. Family parties join others en route, forming large flocks which remain together over the winter.

Bewick's Swan is a long-distance migrant. The western population, breeding from the Taimyr Peninsula west, migrates southwest through the White and Baltic Seas to the coastal lowlands of northwest Europe. There they inhabit low-lying wet or flooded grasslands, and nearby crop fields, particularly those of winter cereals. They also occur on lakes, reservoirs, coastal bays and estuaries, perhaps more so on migration than in winter, feeding by grazing, dabbling, dipping or upending, for terrestrial and aquatic vegetation. Particularly numerous in Denmark, the Netherlands, England and Ireland, smaller numbers occur in Belgium and France, even south to the Camargue (Rees *et al.* 1997c). Some, of uncertain origin, winter along the southern Caspian Sea in Iran and in the former southern Soviet Union. Eastern birds, from the Taimyr Peninsula east, winter in similar habitats in eastern Asia, but are more often found on inland and coastal waters than crop fields (though they do visit rice fields), with large numbers in the Korean Peninsula and, especially, Japan, and scattered south on the Chinese coast to Guangdong Province, and occasionally Taiwan.

They typically arrive on the wintering grounds from mid October after a relatively rapid journey, stopping briefly en route (more time is spent at stopover sites in spring). Stopover sites may be occupied for days or weeks until they are forced to continue their migration by falling temperatures. Thus, the most distant wintering sites may only be used in midwinter, with birds leaving as early as mid February and returning again via various prolonged stopovers along their north-bound route. Very sociable and vocal, winter flocks are typically rather noisy as members maintain an almost constant babbling and indulge in demonstrative greeting and aggressive displays as families or groups join or depart the main flock. Families not only remain together during their first winter, as in Whooper Swan, but may re-unite during second and even subsequent winters.

Migrants occasionally reach Mongolia and inland northern China, and vagrants have been recorded from as far from their usual breeding and wintering areas as Iceland, Bear Island, Svalbard, most of southern Europe, Algeria, Libya, Israel, Iraq, Pakistan, northwest India, Nepal, the Ogasawara Islands, Alaska, British Columbia and Saskatchewan in Canada, and Oregon and California in the western USA (Brazil 1980; Madge & Burn 1988; OSJ 2000; McKelvey *in litt.*).

The population size varies according to annual breeding success. Western populations, which are counted annually on their European wintering grounds, have increased from 16,000–17,000 birds in the mid 1980s (Dirksen & Beekman 1991) to 29,227 in 1995 (Beekman 1997). Eastern populations are less well known, but

must considerably exceed 35,000 individuals, as 26,684 wintered in Japan in January 1999, a decrease from the peak of 31,198 in 1996 (EAJ 1999; Albertsen & Kanazawa 2002). Some ornithologists have, in the past, considered the eastern birds as a separate race, Jankowskii's Swan *C. c. jankowskii* Alpheraky, 1904, which allegedly has a larger bill, higher at the base and broader near the tip. There is considerable overlap in measurements, apparent intermediates between Bewick's and Jankowskii's Swans exist, and as they cannot be clearly distinguished on morphology or range, there is no justification for recognising *jankowskii*. This taxon is not, on the whole, accepted (e.g. Cramp & Simmons 1977; Rees *et al.* 1997c; Clements 2000); although the OSJ (2000) retain it, they do not provide data for its separation. Several *columbianus/bewickii* hybrids, with intermediate amounts of yellow on the bill have been reported in the wild, and mixed pairings between Bewick's and Whistling Swans are known from Japan and Russia (Evans & Sladen 1980; Mikami 1989; Murase 1990, 1991; Syroechkovski 2002). Furthermore, it has been suggested that there is a cline in bill patterns (with decreasing yellow from west to east) and there may be regular gene flow between *C. c. bewickii* and *C. c. columbianus* across the Bering Strait (Scott 1981) even further weakening any argument for *jankowskii* being distinct.

#### MUTE SWAN *CYGNUS OLOR* (GMELIN, 1789)

The Mute Swan is one of the world's heaviest flying birds, reaching weights in excess of 15 kg and ranking alongside Trumpeter Swan as the largest of the waterfowl (Todd 1979) (Plate B). Its specific identity was not recognised until 1789, although Linnaeus appears to have been aware of its existence three decades earlier (albeit mistakenly considering it a domesticated form of Whooper). Though originally a breeding bird of steppe lakes in Central Asia, the inappropriately named Mute Swan (it is not silent) is perhaps now the most familiar of all swans worldwide. It occurs on lowland waters, ponds, lakes, reservoirs, streams and rivers with plentiful vegetation, and also on brackish or saltwater in sheltered coastal bays, estuaries or lagoons, particularly in winter (Madge & Burn 1988). It has been widely introduced outside its native range, from Canada to South Africa and Japan, and is a tame and confiding component of city park lake avifaunas, even in the heart of some of the busiest cities such as London and Tokyo. It feeds primarily by dipping or upending, using its long neck to access deeply submerged vegetation, though it also dabbles and, in some regions, quite commonly grazes on land. Its favoured foods include the various parts of aquatic vegetation (roots, stems, leaves, seeds) particularly of eelgrass, pondweed, milfoil and algae.

Now, as a feral breeding bird of more or less domesticated origin, semi-wild or wild, it is generally resident across much of temperate Europe from southern Scandinavia to Austria and east through Russia, China and Mongolia, though it is absent from much of the far north and far south. It nests on banks or islets in swamps, laying 4–7 eggs (rarely up to 12), which are incubated by the female for

35–38 days (Walters 1980). Fledging is prolonged, at 120–150 days (Todd 1979), and thus it is unable to breed in subarctic boreal or tundra regions occupied by Whooper and Bewick's Swans. Eurasian Mute Swans share with Black-necked Swans the common habit of carrying their cygnets on their back between the wings, behaviour not observed in Whooper Swan.

Mute Swan has a scattered distribution across central regions of Asia to northern China and northern Japan, with some birds of domesticated or feral origin, though it is no longer possible to distinguish these. Those that breed in the north of the range, in southern Scandinavia in the west, and in Hokkaido, Japan, in the east, are migratory, with Scandinavian birds wintering in Baltic coastal regions, and north Japanese birds wintering in central Honshu. Most of the remainder are resident. Mute Swans winter along the shores of the Black and Caspian Seas, on Turkish coasts, in lowland China, and Honshu, Japan (Madge & Burn 1988).

It has been introduced by man more widely than all of the other swans together and now occurs in western Europe, eastern North America, South Africa, Australia and New Zealand. Vagrants have occurred to the south of the normal range, in the Azores, Algeria, Egypt, Israel, Jordan, Iraq, Afghanistan, Pakistan, northern India and southern Japan (Madge & Burn 1988).

Mute Swan is readily distinguished from the other white swans of the Northern Hemisphere by its bright reddish-orange bill, which is black at the base and has a black knob, and because of its habit of swimming with its wing feathers raised in a strong arch, like sails, and its neck curving gracefully in an S. Adults are, like 'northern swans', entirely white. Young are dark greyish-brown and have grey-pink bills with a black-base, although the albino form, known as 'Polish', is all white, even as a cygnet, and has pinkish-grey legs and feet unlike the adults which have black, and normal juveniles, which have grey legs and feet.

By no means silent; Mute Swan is only mute in comparison with the other northern species, which have haunting, whooping and bugling calls. It has its own repertoire of hisses, snorts and grunts. Furthermore, whereas the wingbeats of other swans are silent or merely make a quiet whooshing audible only at close range, like the wings of other large heavy birds, the beating wings in Mute Swan make a highly audible, distinctive, throbbing *waou, waou, waou*. And, whereas other swans, tend to be highly vocal in flight, the Mute Swan's most noticeable noises are the thrumming sounds of its reverberating pinions, and a few grunting notes. While the four 'northern swans' have rather short tails (in flight their feet reach just to the end of the tail), Mute Swan has a longer, pointed tail that extends well beyond its feet.

In its native range it is shy and unapproachable, but it has long been domesticated (by the Greeks and Romans, and later in Britain) as a bird for the table, and becomes extremely tame, readily feeding from the hand, especially in winter. Holloway (1996) considered it likely that the Mute Swan was an indigenous British species, breeding wild in and around East Anglia until hunted to near extinction by the 10th century; it was saved from extinction there by its being bred in a semi-captive state from at least 966.

Throughout most of its range it is strongly and aggressively territorial while breeding. Males, on the water, raise their inner wing feathers in an arch, and hiss aggressively with their beaks open, or may rest the neck on the shoulders and swim powerfully and jerkily to intimidate and drive away intruders. On land, with the neck feathers raised and beating their wings vigorously, territorially aggressive males are most alarming and easily capable of driving dogs and even people away from their nests. Breeding begins in April when huge nest mounds consisting of vegetation are built near water, often among reeds or other tall growth. At some localities, e.g. Abbotsbury Swannery in Dorset, on the south coast of England, and in parts of Denmark, large numbers breed in colonies. Large numbers also gather in post-breeding moult concentrations.

European populations are considered to be increasing, though locally there have been serious declines through poisoning caused by ingesting spent lead gunshot or by swallowing lead weights lost or discarded by anglers. Asian populations are far less well known, being widely scattered and almost relict in distribution. Some of these populations, like other waterfowl of the region, are clearly threatened to an unknown extent by hunting and habitat destruction (Madge & Burn 1988). The world total may be around 500,000, with *c.*180,000 in western and central Europe, *c.*300,000 in Russia and adjacent states and 8,000 in North America (Ma & Cai 2000).

#### BLACK SWAN *CYGNUS ATRATUS* (LATHAM, 1790)

The Black Swan is like a photographic negative image of the Mute (Plate B). It has a relatively restricted range, but is highly successful and abundant. It was once symbolic of extreme rarity when, in fable form, tales of it reached 17th-century Europe. When swimming it appears entirely sooty black, but it has in fact bright white primary feathers, which are concealed at rest; however, they flash in bold contrast when stretching its wings or in flight. In general, it is similar to the Mute Swan though it is less heavy and has an even longer neck, which is more slender just below the head, and has a more steeply peaked forecrown. Its wings are not merely highly distinctive because of the white flight feathers contrasting with black wing-coverts, but are made further remarkable by the broad crinkly edges to its black greater coverts, giving it the appearance of wearing a windblown cloak. Juveniles are greyer than adults and considerably darker, and less brown, than cygnets of other species, and in flight they show dusky tips to their flight feathers.

The bill and bare skin between the bill and eye varies from scarlet to a deep waxy wine red or crimson, and, in adults, there is a white subterminal band and a pink nail. Cygnets have a dark grey bill with an entirely grey tip. The iris is white or reddish in adults but brown in young, while the legs and feet are dark grey in young birds, becoming black in adults.

Black Swan is a sociable species and very much more vocal than Mute Swan. It uses a range of soft conversational contact calls, and a somewhat musical



high-pitched bugling note, although this does not carry far except in calm conditions. It is, nevertheless, less vocal than the 'northern swans'.

Prolific and abundant, it occurs as a native across the western part of Western Australia, over southeastern Australia and Tasmania, and widely throughout New Zealand. Its large population is difficult to estimate, but given that *c.*50,000 occurred on the Coorong, South Australia, in 1957, it can be, locally at least, extremely abundant, with perhaps 300,000 in Australia and 100,000 in New Zealand (Sladen 1991). Though essentially protected by law throughout Australia its large local concentrations do cause problems in agricultural areas and, in response to considerable crop damage, a short hunting season has been introduced in Victoria and Tasmania.

The species was introduced into New Zealand in 1864, but wild individuals may have crossed the Tasman Sea and colonised naturally. It is now widespread and common on both main islands and has even reached the remote Chathams, where it presumably occupies the same ecological niche once occupied by the long-extinct swan of New Zealand. The New Zealand population of Black Swan has been estimated at *c.*60,000 (Madge & Burn 1988), though this is considerably lower than in the recent past. So common was it in some regions that eggs were collected commercially and certain undesired colonies were deliberately disturbed. Prior to the devastating storm 'Wahine' in 1968, the population of South Island's coastal Lake Ellesmere alone exceeded 100,000 birds (Todd 1979).

This highly gregarious bird, of both fresh and brackish water, shallow (<1 m) lakes, bays and lagoons, feeds commonly on pondweed, wild celery and Elodea. It prefers to nest beside large, relatively shallow lakes. Nests are built near water within screening vegetation or on small islands. The least territorial of all the swans, it regularly nests in colonies, so dense that nests are built as close together as a neck-reach apart, and at densities quite unknown among other swans. The clutch of 4–8 eggs is incubated by both sexes for 34–45 days, and notably, not only do males participate in incubation, but may even do so longer than their mates. Cygnet growth is prolonged, with fledging taking up to 180 days, during which time the cygnets may gather in a crèche (Walters 1980; Williams 1981; Ma & Cai 2000). Outside the breeding season, and away from nesting areas, it may occur on flooded agricultural land, coastal lagoons, estuaries and sheltered coastal bays. It feeds on aquatic vegetation mainly by dipping (submerging its head and neck) and dabbling, though it sometimes upends in deeper water, and will also graze on waterside pastures.

The timing of breeding varies locally and, when conditions permit, it may nest at any time of year. Typical breeding seasons are, however, February–May in northeast Queensland, June–August in Western Australia, and June–December in New Zealand.

Classifying the status of the Australian population is extraordinarily difficult as it consists of a confusing mixture of resident, dispersing and even nomadic birds. Following the breeding 'season', it gathers into large moulting flocks. Considerable post-breeding dispersal also occurs, as a result of which the species has occurred throughout Australia and most of New Zealand. In Australia, such

extreme and long-range dispersive movements may be connected with the search for new breeding areas following the continent's local and highly irregular rains.

BLACK-NECKED SWAN *CYGNUS MELANOCORYPHUS* (MOLINA, 1782)

Like a diminutive Mute Swan in form, the South American Black-necked Swan measures just 102–124 cm (Plate B). Although it is the second smallest of the swans, it is South America's largest waterfowl. First described by Molina in the same year that he described the Coscoroba; they were the first swans to be described to science after Linnaeus' description of the Whooper Swan.

This white-bodied bird has entirely white wings, and a strikingly contrasting velvety black neck and head, with a fine white line curving back from above the eye. The large red caruncle over the bill base also serves to lend it a superficial resemblance to Mute Swan. Young are similar to the adults, but are brownish-grey where the adults are black. Birds attain adult plumage by the end of their first year, though they do not develop a full frontal knob until 3–4 years old. The bill and caruncle are contrasting in adults. The former is blue-grey, with a pinkish-white nail, while the bare facial skin and large frontal knob are bright red. Juveniles have grey, dull reddish-based bills and lack the frontal knob. Whereas the skin of both the legs and feet of other swans are black, those of the Black-necked are pink in adults and grey in cygnets. Young have a pale brown iris, becoming dark brown in adults.

Black-necked Swan occurs on shallow freshwater lakes, brackish marshes and saltwater coastal lagoons, estuaries and sheltered bays. It appears equally at home in remote wetlands as in densely inhabited areas. It feeds mainly on aquatic vegetation in shallow water by dabbling and dipping, and is rarely seen on land, where it moves awkwardly. Unlike the only other South American swan, the long-legged Coscoroba, Black-necked has relatively short legs and a long body, with the legs positioned well to the rear, making walking awkward, and take-off and landing clumsier than other swans, although swimming is powerful.

It ranges widely in southern South America, breeding from Cape Horn and the Falklands north to central Chile, extending north into Paraguay and extreme southern Brazil; it is particularly common in Argentina, Chile and Uruguay.

The breeding season varies regionally and with latitude, thus in central Chile and Argentina it breeds in July–August, while farther south, e.g. in the Falklands, it nests from early August to mid September. Aggressive and strongly territorial when breeding (although several nests have been reported in close proximity in parts of the range), males chase almost any intruders from the vicinity of the nest. They do not, however, use the arched-wing threat posture typical of both Mute and Black Swans. They are only weakly vocal and the main call is a wheezy whistle that fails to carry.

Nest mounds are usually constructed in dense vegetation near water, on small islands or even partly floating. However, where aquatic vegetation is sparse, I have

found nests as far as 100 m or more from water in the Falklands. The clutch of 4–7 eggs is incubated by the female alone for 34–36 days (Walters 1980), the male defending the territory. Black-necked Swans carry their cygnets on their backs more frequently than other swans, and may continue to do so even when quite large. This form of brooding is a habit presumably well suited to their extremely aquatic lifestyle.

Black-necked Swan is most gregarious when not breeding. Large concentrations gather to moult and these may reach 5,000–6,000 birds. While populations in warmer temperate and subtropical areas are essentially resident, many southern mainland birds disperse north from cooler temperate regions in March–April for the winter, and may reach northern Paraguay. Vagrants have reached the Juan Fernández Islands off Chile and even the South Shetlands just north of the Antarctic Peninsula!

The overall population of this little-studied species is poorly known, but seasonal variation in food supply apparently causes significant fluctuations. There may be around 100,000 individuals, with about half in Argentina, up to 20,000 each in Chile and Uruguay, and 2,000–3,000 in Brazil (Schlatter *et al.* 1991). Though widespread and reasonably common, local drainage of lowland wetlands for agriculture has doubtless adversely affected its population in some regions. In contrast, in Chile at least, it is now reported to be increasing following a decline in numbers resulting from persecution.

#### COSCOROBA SWAN *COSCOROBA COSCOROBA* (MOLINA, 1782)

The smallest and most unusual of the seven swans, the Coscoroba is sometimes considered to be related to whistling ducks (particularly because of its clearly patterned downy young), but has until very recently been generally accepted as a true swan, albeit with distinctly goose-like affinities and a duck-like bill (Scott & The Wildfowl Trust 1972; Wilmore 1974; Todd 1979; Madge & Burn 1988) (Plate B). Recent work by Zimmer *et al.* (1994), however, pointed to it being just as likely to have separated prior to the divergence of geese and swans, as to there being a sister group relationship between *Coscoroba* and *Cygnus*. Further work, by Harvey (1998, 1999) who sequenced the mitochondrial cytochrome *b* gene, helped further clarify the Coscoroba's position as a relative neither of swans *Cygnus* spp. or geese *Anser/Branta* spp., but of the Cape Barren Goose *Cereopsis novaehollandiae* of Australia, thus we may soon become familiar with regarding the Coscoroba as a non-swan, despite its name, thereby reducing the world's complement of swans to just six.

Coscoroba Swan takes its strange name from its equally bizarre, and unswan-like, voice. It emits a rather loud toy-trumpet-like *cos-cos-oo*, of which the first syllable is longer and higher pitched.

At just 90–115 cm, and with a wing length of 42.7–48.0 cm, Coscoroba Swan is even smaller than a Bewick's, and it feeds like a large duck by dabbling

in shallow waters or grazing on land. All white, with black-tipped wings, it has a rounded goose-like head but a duck-like bright waxy red bill with a paler nail. Unlike other swans, the entire bill base is feathered and lacks any form of basal knob or caruncle. As a consequence, the face has a quite different, softer, even more comical expression than any other swan. The legs and feet are bright rosy pink, and because they are relatively longer than in other swans, it is the only one capable of taking off without a run. Also unlike other swans, the eye is not typically dark but ranges from yellowish to reddish-orange. The sexes are essentially similar, although males are typically larger and heavier (males average 4.6 kg and females 3.8 kg). Cygnets are whitish, but have patchy greyish-brown feathering on the crown, back and wings, rather like shelducks or Cape Barren Geese, and have blue-grey, rather than red or pink, legs and bill. They become whiter during their first winter, but do not gain adult plumage until the second autumn.

Coscoroba Swan is a partly sociable species that occurs in small flocks rarely exceeding 100. It occurs at wetlands throughout southern South America, from Cape Horn north to  $c.45^{\circ}\text{S}$ , particularly in Chile and Argentina, though its range also reaches north to Uruguay, Paraguay and southern Brazil, especially during post-breeding dispersal.

It breeds alone or in small colonies at wetlands that are widely scattered, isolated and threatened. The breeding season varies regionally and with latitude, October–December in Chile, but June–November in Argentina. They build bulky nests, typically near shallow water or on small islands. The 4–9 eggs are laid in a ground or floating nest and incubated by the female for  $c.35$  days (Walters 1980). Though it has a wide range, the total population probably does not exceed a few thousand individuals. Its poorly understood migrations are further confused by regional variation in the breeding season, followed by dispersal and moult gatherings. This is the most unusual and least known of the extant swans.

Although almost universally considered a monotypic genus, Walters (1980) included the supposedly extinct species, David's Swan of China, within the same genus, as *Coscoroba davidii* (though see below).

## EXTINCT SWAN RELATIVES

While seven species (eight forms) are currently extant, other recognisable swans have existed in the not-distant past, and other species are also attested to (though their identification and taxonomic distinctness are problematical). Two, *Cygnus equitum* and *C. falconeri* (the latter about one-third larger than a Mute Swan) are considered probably to have arisen from the same stock as Whooper Swan (Northcote 1982, 1988) with which they must have co-existed. They are both thought to have become extinct during or after the Pleistocene (Wilmore 1974).

*C. equitum* was abundant on Malta from the Ipswichian Interglacial (c.125,000 before present). It was a broad-bodied dwarf swan with some goose-like features, closest to Whooper and Bewick's Swans. Northcote (1988) considered it not only to be flightless, but that it walked well and unlike other swans may have habitually taken off and alighted on land. It may have used both fresh and brackish water, feeding on high-calorie food plants in largely terrestrial habitats. Morphologically distinct from both Whooper Swan and the giant, flightless, extinct *C. falconeri*, it would have co-existed with both. The Giant Maltese Swan *C. falconeri* was, according to Northcote (1982), a giant land-feeding swan, resembling a large Whooper weighing c.16 kg. Despite having a c.3 m wingspan it was well adapted for walking, but it seemingly had little or no flight capability.

Tracing other extinct species has proven difficult and I have come across few references and these only fortuitously, thus no doubt other swans have been described that I have not traced. Of those to which I found reference: *C. bilineatus* occurred during the Tertiary (66.4–1.6 million years ago) and has been found in the Czech Republic (Mlikovsky & Svec 1989), *C. harranthalsi* in the Pliocene (between 2–13 million years ago) and known only from a toe bone found in Belgium, while *C. hibbardi* (a relative of Whistling Swan) and *C. paleoregonus* (a relative of the Mute Swan) occurred in the Americas, and *C. lacustris* and *C. nanus* were both relatives of Black Swan from Australia's Pleistocene (1.6 million years to 10,000 bp) (Wilmore 1974; Price 1994). The most recently described species (from a bone fragment) is *C. verae* of the early Pliocene, found in Bulgaria in 1995 (Boev 2000). More recently lost was the Chatham Islands Swan, or 'Poua', *C. sumnerensis* Forbes, later reclassified as *C. chathamicus* by Oliver (1955), which was slightly larger than the otherwise similar Black Swan, and is presumed to have become extinct between 1590 and 1690 through hunting (Williams 1964; Scarlett 1972; Wilmore 1974; Walters 1980).

Truly lost, and even more recently, is the extraordinary David's Swan of China, which was described by Swinhoe (1870) from a single specimen as an all-white swan smaller than a Bewick's, with feathering between the bill and eye. The bill was vermilion with a black nail, while the legs and feet were orange-yellow. So poorly known is it that even its identity is questionable, the specimen having been lost, and some authors consider it probably a hybrid goose/swan (Jabouille 1936; Germiny 1937; Boettischer 1943; Grote 1943). Others accept its identity, with Walters (1980) even placing it with Coscoroba Swan as *Coscoroba davidii* (Swinhoe), although Scott & The Wildfowl Trust (1972) and Evans & Lebreton (1973) considered it probably a genetic anomaly such as a leucistic juvenile Bewick's Swan, as the original description resembles that of young leucistic Trumpeter and Bewick's Swans, and of 'Polish' Mute Swans.

Thankfully, the inclusion last century of Trumpeter Swan among the list of extinct swans was narrowly averted, and now all surviving species seem secure, although local populations may be threatened.