Migration and morphometrics of the Red-breasted Merganser *Mergus serrator* in northern Eurasia and the implications for conservation of this species in Britain and Ireland.

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Red-breasted Merganser *Mergus serrator*
drawn by Amanda Bradbury, WWT

Criterion 3c of the Ramsar Convention on wetlands of international importance suggests that a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of a species or subspecies of waterfowl. A review of the status of Red-breasted Merganser Mergus serrator populations in Europe was conducted to investigate how the 1% threshold for this species should be determined for the UK. Four discrete breeding populations of the nominate race of the Red-breasted Merganser have been identified in northern Eurasia. Ringing recoveries indicate that some birds from the Iceland, east Greenland, Britain and Ireland group are dispersive within their own countries in the non-breeding season whereas others move to coastal waters around Iceland, Britain and Ireland. There is a small amount of evidence, from ringing recoveries and systematic counts, of interchange between birds from this group and those from the rest of north-west Europe. For the designation/identification of 1% thresholds in the UK, the evidence available at present suggests that the north-west and central European population should not be considered separate from those birds which breed in Iceland, east Greenland, Britain and Ireland. However, caution should be taken when interpreting these data and further studies are urgently required to clarify this matter.

Keywords: Red-breasted Merganser, Populations, Conservation

A waterfowl population can be defined as a distinct assemblage of individuals which does not experience significant immigration or emigration (typically by one successful migrant individual or gamete per year or less; IUCN 1994). Therefore, the size of such a population should fluctuate according to intrinsic and extrinsic factors, but not by the influence of other populations of the same species (Rose & Scott 1997). The Ramsar Convention 1971 (Convention on Wetlands of International Importance especially as Waterfowl Habitat) uses a set of criteria by which internationally important wetlands can be identified for designation. Criterion 3c of the Convention suggests that a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of a species or subspecies of waterfowl (Ramsar Convention Bureau 1990), a criterion also adopted by the EC Directive 79/409 on the conservation of wild birds for the designation of Special Protection Areas (SPAs). Population definition therefore has considerable consequences for conservation policy and action.

The Red-breasted Merganser *Mergus serrator* is a medium-sized duck which breeds across northern Eurasia, southern Greenland and North America mostly above 50°N (Scott & Rose 1997). In Europe, it is most abundant in Iceland, Ireland, north-western Britain, Fennoscandia, Estonia and northern Russia but breeds regularly as far south as The Netherlands, the Czech Republic and Ukraine (Hagemeijer & Blair 1997). The breeding range of this species has remained largely unchanged in Europe although there has been an expansion southwards in Britain and Ireland (Gibbons *et al.* 1993, Hagemeijer & Blair 1997). Although some birds migrate, moving

Figure 1. Estimated population ranges of Red-breasted Mergansers of 1. the race *schioleri*, 2. the east Greenland, Iceland, Britain and Ireland group and 3. the north-western and central Europe group. The dotted line refers to the proposed boundary between the east Greenland, Iceland, Britain and Ireland group and the rest of the north-west and central European population (see Scott & Rose 1996). Note that this map is not to scale.

south from northerly breeding grounds to temperate latitudes in the autumn, many may be only partially migratory and move short distances to their wintering sites which are generally coastal (Cramp & Simmons 1977, Scott & Rose 1996).

A recent review (Scott & Rose 1996) described five populations of Red-breasted Merganser breeding in northern Eurasia: a population of the subspecies *schioleri* breeding in west Greenland (see **Figure 1**) and four groups of the nominate race wintering in western Eurasia:

i) North-east Europe/Black Sea/ Mediterranean region (estimated population size:50,000)

ii) North-west and central Europe (125,000; see **Figure 1**)

iii) East Greenland/Iceland/Britain and Ireland (15,000-25,000; see **Figure 1**)

iv) Western Siberia/South-west Asia (10,000)

Prior to this, the Red-breasted Mergansers from the east Greenland, Iceland, Britain and Ireland group were not considered different to the rest of the birds in north-west and central Europe and the 1% threshold for international importance in Britain and Ireland was 1,250 birds. Rose & Scott (1997) recommended that the threshold should be 200 birds in view of the population split. It is imperative that this 1% threshold is set correctly because a large proportion of the proposed east Greenland, Iceland, Britain and Ireland group are thought to overwinter in Britain and Ireland (Scott & Rose 1996). However, very little information has been presented to justify the proposed population split.

This paper assesses the validity of viewing the east Greenland, Iceland, Britain and Ireland population as being discrete from birds in the rest of north-west and central Europe based on a review of movements (ringing recoveries, sightings of wing tagged birds marked in north-east England and tentative information from co-ordinated counts) and morphology, and gives direction for further research.

Methods

In this review, ringing recovery data from national ringing schemes were used to identify the wintering areas of Red-breasted Mergansers from known breeding locations throughout northern Eurasia. In general, recoveries refer to birds caught over c.10 km from their place of ringing. Although this definition varies between schemes, all recoveries refer to relatively long-distance movements. Although recoveries of birds ringed when fully-grown are referred to in this paper, movements of birds ringed as pulli are of most interest as the origin of these birds is certain. The results of a wing-tagging study in north-east England also provided some further information on movements and site-fidelity. A number of recognised experts throughout Europe provided supplemental information and the few morphological data presented were taken from published accounts.

Results

Movements

i. *Shioleri* race. Birds of the race *schioleri* are thought to be resident in Greenland, breeding in west Greenland, and wintering along the south-western coast (Scott & Rose 1996). However, there are no ringing data to support this claim.

ii. North-east Europe/Black Sea/Mediterranean group. Red-breasted Mergansers wintering in the Black Sea region south to Romania, Greece and Turkey are thought to originate from north-east European Russia and western Siberia although no ringing recoveries yet support this (Monval & Pirot 1989).

iii. Western Siberia/South-west Asia group. Birds wintering in the Caspian region south to the Gulf are presumed to be from breeding areas further east in western and central Siberia, but evidence from ringing data is again lacking (Scott & Rose 1996).

iv. North-west and central Europe group. The movements of the north-west and central European group appear to be more complicated and are better documented. Birds breeding in eastern Europe, ie Finland, north-west Russia, Lithuania, Latvia and Estonia, are highly migratory, wintering in north-west Europe, especially in the Baltic Sea, but also in smaller numbers along the northern coast of the Mediterranean (Monval & Pirot 1989), the eastern coast of the Atlantic and in some central European countries; individuals ringed in Russia and Finland have been recovered subsequently in The Netherlands, France, Spain, Greece, Czechoslovakia, Italy, Hungary and Bulgaria. The distances (>1,500 km) and directions of migratory flights made by eastern European birds suggest that they are capable of migrating to Britain and Ireland during the winter months even though no birds have been recovered there as yet.

Most of the breeding birds from the north-western European countries, ie Denmark, Germany, Sweden and Norway, are thought to be relatively sedentary, joining eastern European birds in the Baltic Sea during the winter (Cramp & Simmons 1977). During mild conditions, it has been estimated that c. 44% of the north-west and central European population spends the winter in the western parts of the Baltic Sea (Pihl *et al.* 1995). However, from the evidence of ringing recoveries, some north-western and central European birds leave the Baltic in autumn and move down the Atlantic coastline from The Netherlands to Portugal (Scott & Rose 1996). For example, ringing recovery data from Sweden shows that of 13 ringed pulli subsequently recovered, one has been in Britain and another has been recovered in The Netherlands whilst of 23 fully grown birds recovered, two each have been in The Netherlands and France.

Lack (1986) suggested that most of the birds that winter along the southern and eastern coasts of England, south of the Wash, originate from the continent as do those occurring inland during harsh winters. Evidence for this comes from one adult ringed in Denmark subsequently recovered in Kent and a pullus ringed in Sweden subsequently recovered in Suffolk (**Table 1**). Chandler (1981) suggested that many Baltic, Russian and Scandinavian birds moved into Britain during the severe winter of 1978/79. During that winter there were larger numbers of birds along the eastern coast of Britain and many more records of birds at inland sites throughout southern England (especially below a line drawn between The Wash and the Severn), and to a lesser extent in northern England, Scotland, Wales and Ireland. Unfortunately, no ringing records are available to determine the origin of these birds.

From an analysis of systematic counts across Europe, it has also been suggested that many of the c. 10,500 Red-breasted

Table 1 Recoveries of foreign-ringed Red-breasted Mergansers within Britain and Ireland 1909-1997.

Ringing Country	Year	Month	Sex	Age*	Recovery place	Age at recovery**	Distance moved (km)
Iceland	1930	July	?	Y	Highland, Scotland	1st winter	1130
Iceland	1930	Aug	?	Y	Highland, Scotland	1st winter	1089
Iceland	1933	Sept	?	?	Tayside, Scotland	?winter	1267
Iceland	1935	July	F	F.G.	Donegal, Eire	?winter	1269
Iceland	1936	June	?	F.G.	Highland, Scotland	?winter	1111
Iceland	1941	June	F	F.G.	Shetland, Scotland	?winter	979
Sweden	1945	July	?	Y	Suffolk, England	2nd winter	1535
Iceland	1956	Sept	?	Y	Western Isles, Scotland	1st winter	985
Iceland	1962	June	F	F.G.	Mayo, Eire	?winter	1328
Denmark	1967	June	F	?	Kent, England	?winter	794
Iceland	1982	June	?	F.G.	Western Isles, Scotland	?winter	1124

*Ringing Age: Y = pulli (young of the year); F.G. = fully grown bird of unknown age
** Finding age: winter, = October-March; summer = May-July; autumn = July-August

Mergansers present at Limfjorden, Denmark in November move to Scotland during December and January (Stefan Pihl *pers. com.*). Although there is no evidence for this movement from ringing recoveries, these counts indicate that large numbers of continental birds probably move to northern, as well as southern, parts of Britain and Ireland during the non-breeding season.

v. East Greenland, Iceland, Britain and Ireland group. Red-breasted Mergansers have a wide but predominantly northern and western maritime breeding distribution in Britain (Gibbons *et al.* 1993). Although the breeding population is relatively large (approximately 2,850 pairs; Gibbons *et al.* 1993), very few birds have been ringed in the UK (196 had been ringed up until the end of 1997 of which only 29 were pulli), and only 16 birds have been recovered, of which three were ringed as pulli (Toms *et al.* 1999; **Table 2**). It should be noted that those birds which are recovered less than 5 km from their ringing place are not included in this total. Approximately 11,000 Red-breasted Mergansers spend the winter in Britain and Ireland (Kirby *et al.* 1993). Most British and Irish bred birds are thought to be relatively sedentary, moving to nearby coasts to moult and overwinter (Scott & Rose 1996); 13 birds ringed in northern Britain and Ireland have been similarly recovered there, mostly in the north of Britain. However, two birds ringed in their first-year in northern Britain have been recovered as adults in Denmark and Norway. A second-year bird ringed in Northumberland in August has also been recovered in The Netherlands during the non-breeding season. The only other recovery involving a bird ringed as a pullus was that of a fourth-winter bird recovered close to its natal site in Eire.

Table 2 Recoveries of British and Irish-ringed Red-breasted Mergansers, 1909-1997.

Ringing Place	Year	Month	Sex	Age*	Recovery place	Age at recovery**	Distance moved (km)
Fermanagh, N. Ireland	1909	June	F	F.G.	Fermanagh, N Ireland	?summer	16
Grampian, Scotland	1964	June	F	F.G.	Highland, Scotland	?autumn	24
Tayside, Scotland	1970	Aug	F	Y	Jutland, Denmark	5th winter	824
Grampian, Scotland	1973	July	?	F.G.	Grampian, Scotland	?summer	0
West Connaught, Eire	1973	Sept	M	Y	West Connaught, Eire	4th winter	7
South Leinster, Eire	1975	Feb	M	Ad.	Lancashire, England	3rd+winter	302
Grampian, Scotland	1976	July	?	Y	Hordeland, Norway	5th winter	565
Strathclyde, Scotland	1981	Jan	F	F.G.	Strathclyde, Scotland	same winter	0
Grampian, Scotland	1988	June	F	Ad.	Grampian, Scotland	3rd+winter	0
Northumberland, Eng	1990	Aug	M	Imm.	Anglesey, Wales	2nd summer	315
Northumberland, Eng	1990	Aug	M	Ad.	Lothian, Scotland	3es+winter	56
Northumberland, Eng	1990	Aug	M	Imm.	Northumberland, Eng	2nd winter	59
Northumberland, Eng	1990	Aug	M	Imm.	Dijk, Netherlands	7th winter	574
Northumberland, Eng	1990	Aug	M	Imm.	Tayside, Scotland	5th winter	132
Northumberland, Eng	1990	Aug	M	Imm.	Lothian, Scotland	2nd winter	61
Highland, Scotland	1992	July	F	Ad.	Highland, Scotland	2nd+winter	13

*Ringing Age: Y = pulli (young of the year); Imm. = immature bird hatched in the previous calendar year; Ad. = adult plumage, hatched before previous calendar year; F.G. = fully grown bird of unknown age

** Finding age: winter, = October-March; summer = May-July; autumn = July-August

Additional information on the movements of Red-breasted Mergansers in Britain comes from a study of fully grown males caught and wing-tagged from the moulting flock at Lindisfarne, Northumberland in 1989 (*n* = 15), 1990 (*n* = 53) and 1991 (*n* = 1) by Northumbria Ringing Group (see Wernham *et al.* 1997). The 41 sightings of these tagged birds were recorded according to season, where winter was defined as September to April (39 sightings) and breeding/moulting as May to August (two sightings) (Marquiss & Duncan 1993). Winter sightings were concentrated around Lindisfarne but extended as far north and west as Mull and as far south as Cumbria. There were also sightings of a single bird at Lindisfarne in July and another in August. Multiple sightings were made of seven tagged birds. These data suggest that, in general, Red-breasted Mergansers may be faithful to wintering sites during the winter and between years but that some individuals may move further afield.

Scott & Rose (1996) suggested that most of the of Red-breasted Mergansers breeding in Iceland (2,000-4,000 pairs; Asbirk *et al.* 1997) migrate south to winter off the coasts of Ireland, Scotland and northern England. Of the 367 Red-breasted Mergansers ringed in Iceland, nine adult and juvenile birds have been recovered in northern Britain during the winter (Petersen & Gudmundsson 1998; **Table 1**). At least three of these birds had been ringed during the summer of their first year. A single bird ringed in Iceland has also been recovered in The Netherlands (Aevar Petersen *pers. com.*), indicating there may be some interchange with continental birds, at least during the

Table 3 Published biometric data for Red-breasted Mergansers from the nominate race (Swedish birds) and those of the race *schioleri* (from Vaurie 1965; ranges are shown).

Race	*n*	Wing length (mm)	Length of exposed culmen (mm)	Breadth at base of bill (mm)
Nominate (Sweden)	17	235-250	58-66	14.5-18.5
schioleri (Greenland)	30	242-263	50-63	14.0-17.5

Table 4 Published biometrics of sexed Red-breaster Mergansers from The Netherlands and Britain (ranges are shown; sample sizes not available).

	Wing length (mm)		Bill length (mm)	
	♂	♀	♂	♀
The Netherlands[1]	235-255	216-239	56-64	48-55
Britain[2]	244-259	217-230	53-62	48-55

From data published in [1]Cramp & Simmons (1977) and [2]Witherby (1939)

non-breeding season.

2,000-4,000 pairs of Red-breasted Merganser breed in Iceland and 5,000-15,000 individuals spend the winter there (Aevar Petersen *pers. com.*). Scott & Rose (1996) suggested that most of the birds bred in east Greenland move to Iceland in the winter (where there has been a single recovery) with smaller numbers moving to Britain and Ireland.

Morphology

Red-breasted Mergansers of the race *schioleri* have, on average, longer bills and longer wings than those of the nominate race, although there is much overlap between the two races (Vaurie 1965; **Table 3**). **Table 4** shows the ranges of wing and bill lengths of male and female birds measured in The Netherlands (examples of the north-west and central European group) and Britain (examples of the east Greenland, Iceland, Britain and Ireland group). Although it is not possible to analyse these data statistically, there appears to be little difference in the morphology of birds from these two countries.

Discussion

Scott & Rose (1996) suggested that the population of Red-breasted Mergansers which originates from breeding grounds in Iceland, east Greenland, Britain and Ireland should be considered separate from that which breeds in the rest of north-western and central Europe. However, evidence

provided in this paper suggests that there may be some overlap between these groups, the scale of which is unknown. There are few ringing data available at present but individual birds ringed in their first year in Scotland and Iceland and subsequently recovered in Norway, Denmark and The Netherlands show that there may be movements of birds from the east Greenland, Iceland, Britain and Ireland group to the continent, either annually during the non-breeding season or as a result of post-breeding dispersal. Evidence from systematic counts suggest that large numbers of birds from the rest of north-western Europe move to all parts of Britain during the winter, not just to southern areas as previously thought (Lack 1986). Biometric data are equally sparse but they show that there are probably no morphological differences between birds from the two groups.

With the paucity of data available, it is not possible to quantify the degree of interchange between individuals from the two groups during the winter or, more importantly, during the breeding season. Although the present information suggests there is no reason for a split, caution should be exercised when interpreting such a small amount of data. An intensive study of the status of Red-breasted Mergansers breeding in northern Europe is urgently required so that distinct populations of this species can be conserved effectively in the future, especially in Britain and Ireland where large numbers of the proposed east Greenland, Iceland, Britain and Ireland population over-winter. Ringers throughout Europe, especially in Britain and Ireland, should be encouraged to i) ring more pulli to increase the number of known-origin marked birds, ii) increase the effort put into catching wintering birds to determine their origin, and iii) collect more biometric data for morphological comparisons. As Red-breasted Mergansers are notoriously difficult to catch at any time of the year, it may be necessary to devise new catching methods to increase the numbers available for ringing. Wing-tagging studies have been successful in the past and would continue to be useful in determining the movements of these birds throughout Europe. However, to assess the integrity of populations more directly, it will also be necessary to determine differences in the genetic make-up of potentially separate groups. Molecular techniques have been used successfully in recent years to distinguish between populations of other birds (eg Mundy *et al.* 1997; Barrowclough *et al.* 1999; Van Duyse *et al.* 1999) and would be a particularly useful for identifying population splits for European Red-breasted Mergansers.

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