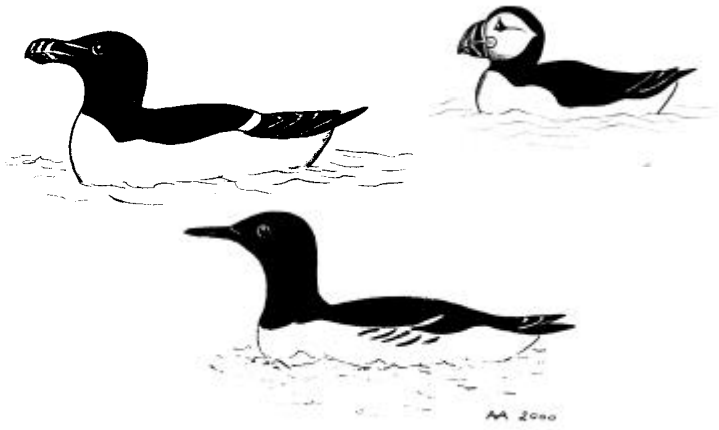
Populations of Guillemots, Razorbills and Puffins in Faroese Waters as Documented by Ringed Birds

Bergur Olsen, Faroese Fisheries Laboratory, Tórshavn
Jens-Kjeld Jensen, Nólsoy
Andrias Reinert, Fiskaaling, við Áir



This report should be cited as:
Olsen, B., Jensen J.-K. and Reinert, A. 2000. Populations of Guillemots, Razorbills and Puffins in Faroese Waters as Documented by Ringed Birds. GEM Report, No. C22-161-1.

GEM Report
No. C22-161-1

Populations of Guillemots, Razorbills and Puffins in Faroese Waters as Documented by Ringed Birds

Bergur Olsen, Jens-Kjeld Jensen, and Andrias Reinert

November 2000

For further information please contact:
Bergur Olsen
Faroese Fisheries Laboratory
Nóatún
P.O. Box 3051
FO-110 Tórshavn
Faroe Islands

e-mail: berguro@frs.fo

Contents

Populations of Guillemots, Razorbills and Puffins in Faroese Waters as Documented by Ringed Birds

1 Introduction

Faroese waters hold a substantial part of the North Atlantic seabirds (Grimmet and Jones 1989). Therefore, establishment of an offshore oil industry in this area requires an understanding of the risk that may be posed to seabirds. During the year, the proportion of different populations change (Salomonsen 1944). In the summer, Faroese breeding birds dominat, but in the winter, birds from abroad feed in these waters while some of the Faroese seabirds migrate to other areas. The GEM Network, therefore, has funded this project to identify the auk populations that could, potentially, be affected by exploration and production operations in Faroese waters.

The aim of this project is to analyze the recoveries of guillemots, razorbills, and puffins in the Faroe Islands in order to estimate the composition of the populations that, potentially, will be at risk from an oil industry in Faroese waters.

1 Material and Methods

2.1 Data Available

Faroese ringing and recovery data analyzed in this paper include all data up to and including 1997. The most important auk-ringing project in the Faroe Islands was on guillemots, *Uria aalge*, when the Faroese Fisheries Laboratory, from 1968 to 1977, ringed 5715 guillemots. Most of these birds were ringed after they were taken with snares (Fig. 1) on the water below the breeding colonies on Stóra Dímun and Viðoy (Reinert 1976, Olsen 1980, 1982). Guillemots caught with snares are generally immatures and the few guillemots ringed as chicks and recaptured with snares were 2-4 years old. Chicks were ringed on the breeding ledges when they were about two weeks old. In total, 6378 guillemots have been ringed in the Faroe Islands; 634 as chicks and 5744 as adults. Only 61 razorbills have been ringed. They were

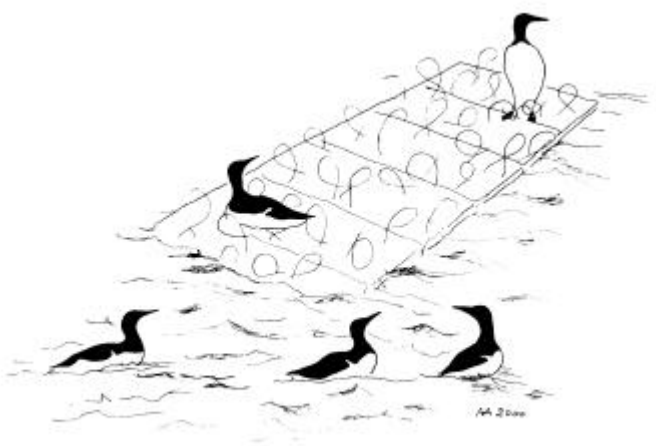


Fig. 1 . Guillemots caught on a snare. These birds, which generally are immatures, were ringed and released.

all ringed as adults and most of them were taken with snares for ringing. In total, 3778 puffins have been ringed. Of these, 2898 were ringed since 1991; 2004 as chicks and 894 as adults. The chicks were taken from the nest and the adults were taken mainly with the traditional *fleyg* which mainly catches non-breeders (Fig.2.). Ringing data on auks from abroad have been supplied by the Copenhagen Bird Ringing Centre, Denmark, the British Trust for Ornithology, U.K., and from available literature. The data and sources are shown in Tab.1-3.

Tab. 1. The number of guillemots ringed in the North East Atlantic region and the number of these subsequently recovered in the Faroe Islands.

Populations	No. ringed	Sources	No. recovered
Heligoland	4,368	1909-79; Wijs 1985	0
United Kingdom	187,782	until 1995 incl.; BTO Ringing Scheme	153
Faroes	6,349	until 1997 incl. (This study)	708
Iceland	5,375	1921-1995; Petersen and Guðmundsson 1998	5
Russia	-		1
Norway	12,646	1914-1996; Ringmerkaren	0
Baltic	36,362	1960-1988; Lyngs and Kampp 1996	0

Tab. 2. The number of razorbills ringed in the North East Atlantic region and the number of these subsequently recovered in the Faroe Islands.

Populations	No. ringed	Sources	No. recovered
United Kingdom	81,798	until 1995 incl.; BTO Ringing Scheme	17
Faroes	61	until 1997 incl. (This study)	8
Iceland	4,235	1921-1995; Petersen and Guðmundsson 1998	49
Norway	1,979	1914-1996; Ringmerkaren	0
Baltic	17,706	1960-1988; Lyngs and Kampp 1996	0

Tab.3. The number of puffins ringed in the North East Atlantic region and the number of these subsequently recovered in the Faroe Islands.

Populations	No. ringed	Sources	No. recovered
Norway	15,584	1914-1996; Ringmerkaren	14
Iceland	64,242	1921-1995; Petersen and Guðmundsson 1998	36
Faroe Islands	3,997	until 1997 incl. (This study)	87
United Kingdom	187,782	until 1995 incl.; BTO Ringing Scheme	25
France	-		2

The recoveries of common guillenmots (950), razorbills *Alca torda* (74), and puffins *Fratercula arctica* (166) were broken down to area of origin, cause of recovery (found dead, shot, fle yg, caught in fishing gear, etc.) and age-class (first-winter, older than one year, and adult: birds ringed as adults or recovered older than three years). Only two Brunnich's guillemots *Uria lomvia* were recovered in the Faroes, no black guillemot *Cepphus grylle* is recovered from abroad and no little auk were recovered.

An estimate of the relative composition of birds from different regions that stay in Faroese waters can be calculated using the formula PxFR/N for each region, where P = population size in the region where the birds came from, N = number ringed in this region and FR= number of these rings recovered in the Faroe Islands. Due to lack of detailed information and different sources of bias, the results should only be regarded as indicators of relative abundance.

2.2 Sources of Bias

The ringing scheme is dependent on individuals that find the ringed birds and report back. Therefore, the chance that a ring is reported varies both geographically and over time. In the Faroe Islands, 94% of the auks are reported by hunters and, therefore, changes in hunting legislation and variation in hunting traditions are very important as well as the hunter's attitude toward reporting killed, ringed birds.

Fig. 2. Bird caught by *fleyg*. The bird is caught with a *fleygingastong* (a pole with a net at the end) as it is flying along the colony. With this method mainly immatures are taken.

The origin of the ringed birds. Most of the auks ringed abroad are ringed as chicks so the origin is known. The majority of guillemots ringed in the Faroes, however are ringed as 2-3 year old immatures swimming beneath the cliffs in the breeding season (Reinert, A. 1976, Olsen, B. 1982). Some of these immatures may be visitors from other populations and the same may be the case for razorbills and puffins ringed as adults, but this is anticipated to be a minor cause of bias.

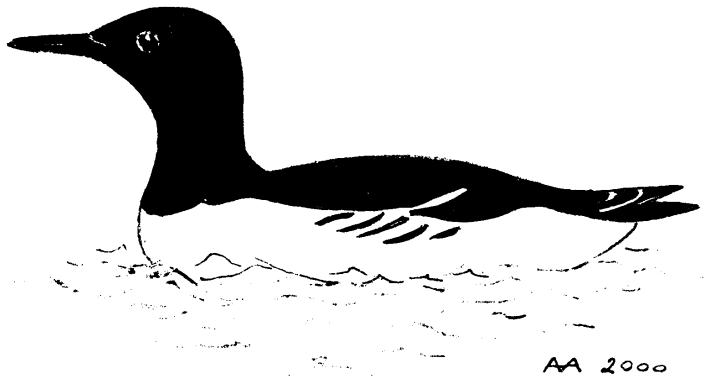
Variation in ringing effort. In the Faroe Islands, the ringing effort for guillemots was high in 1970 and 1971 (Fig. 4). It had been low for puffins until the 1990s and only a few razorbills have been ringed. In Great Britain, the Baltic and Heligoland, the ringing effort has been very high, in Norway moderate and very low in Iceland (Tab.1-3).

Changes in hunting legislation and variation in hunting traditions. Until the 1st of April 1980, guillemots and razorbills could be hunted year round in the Faroe Islands, and summer was the main hunting season, during which the birds mainly were shot from boats (Fig. 3), taken by snares on the water (Fig.1) or by fleyg (Fig. 2). In 1980, hunting in the summer was banned, so snares and fleyg were prohibited. Since then, it has only been possible to shoot auks from a boat. At first there was a hunting season from the 15th of August to the 1st of April. In 1987 and 1988, the hunting season was from the 1st of September to the 1st of April, and since 1989 it has been from the 1st of October to the 20th of January. During these years, the tradition changed toward more intense hunting in the winter of guillemots and razorbills. The puffin has been protected against shooting in the period from the 15th of March to the 1st of September since 1954. Since 1980, the hunting season for puffins has been the same as for guillemots and razorbills. Furthermore, puffins have been taken by the traditional *fleygastong* (Fig. 2) in the breeding season and this method is still allowed. Hunting legislation has also changed in other countries and in Norway hunting of guillemots was banned in 1979, after which reported bag numbers dropped considerably (Barrett and Vader 1984) and consequently also the chance of recoveries of ringed birds.

Reporting of ringed birds. The public attitude towards reporting rings from killed birds is quit variable and extremely difficult to estimate. Generally, a large proportion of the ringed birds caught in the Faroes are reported as they are hunted in a traditional way. Reporting birds killed accidentally by other activities, such as fishing gear may cause problems for the fishermen, and in some areas fishermen, therefore, are reluctant to report ringed birds caught in fishing gear (Lyngs and Kampp 1996).

Fig. 3. Shooting auks from a boat was allowed year round until 1980. Now the hunting season is from the 1st of October to the 20th of January.

3. Results and discussion



3.1 Guillemot *Uria aalge*

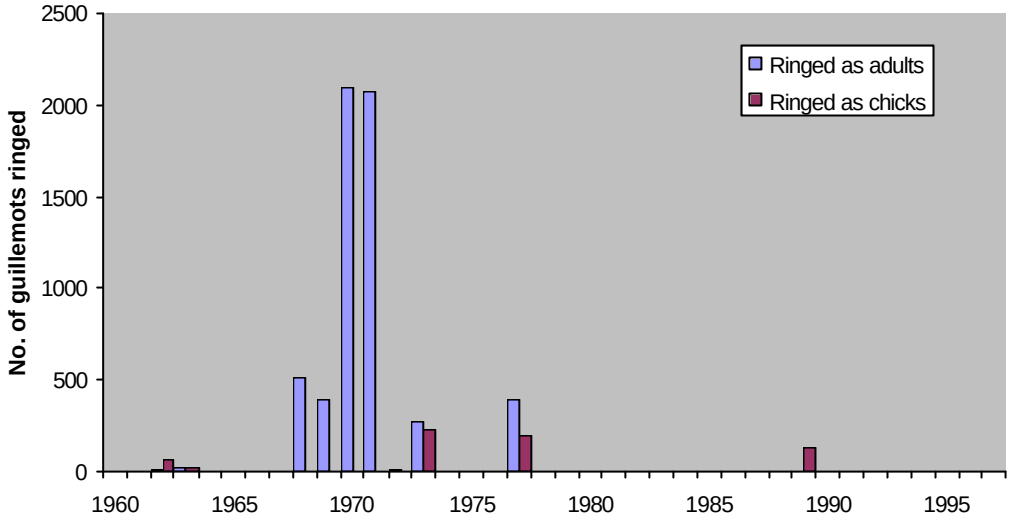
The guillemot is the largest of the four species of auks that breed in the Faroe Islands and has a wing-span of about 71 cm. Most birds breed in large colonies on steep cliffs, usually over 100 meters high and on rock stacks. They build no nest, but lay their single eggs on rock ledges. About 175,000 pairs breed in the Faroe Islands. The guillemot has a wide breeding range in both the North Atlantic and in the northern Pacific.

Guillemots feed on fish and some marine invertebrates. Sandeel, Norway pout and sprat are the most common in diets of birds in the Faroes. The birds fish by diving from the surface and swimming underwater, propelling themselves by flapping their wings. They usually dive to about 20 metres, but can swim down to 180 metres or more after bottom-dwelling species (Piatt and Nettleship 1985). Most breeding birds feed within 50 km of their colony, although their foraging range just prior to egg laying can be up to 200 km (Tasker *et al.* 1987).

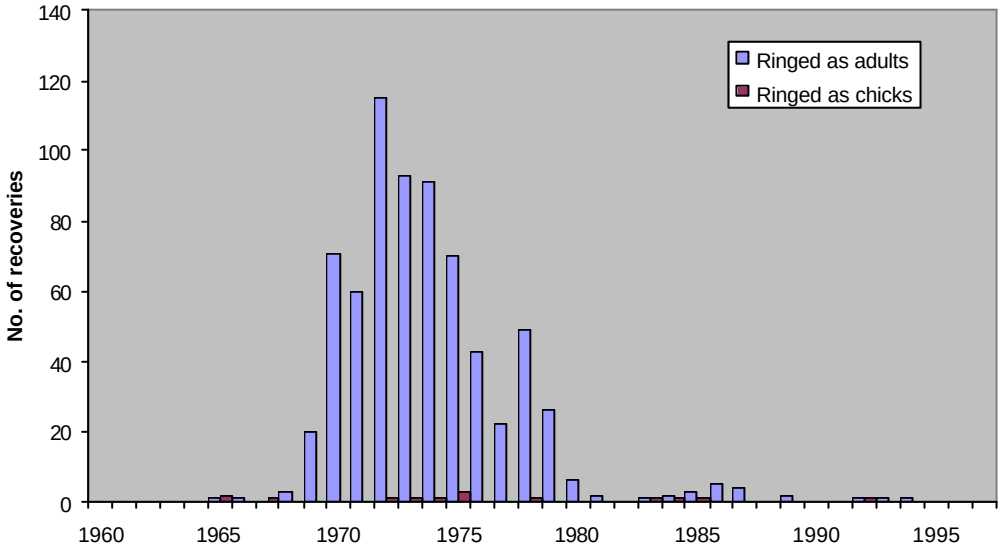
The guillemot has increased in most of its European range during the last century. The main exceptions are the Faroe Islands, where there has been a decline since late in the 1950s (Olsen 1992), and northern Norway, where there has been a major crash in numbers in the 1980s.

3.1.1.1 *Guillemots ringed and recovered in the Faroe Islands*

The ringing of guillemots in the Faroe Islands was concentrated in the four years 1968-1971 (Fig. 4) and a total of 6378 guillemots were ringed. The subsequent recoveries of these rings in the Faroe Islands are shown in Fig. 5.



Figur 4. Guillemots ringed in the Faroe Islands.



Figur 5. Guillemots ringed in the Faroe Island and subsequently recovered in the Faroe Islands.

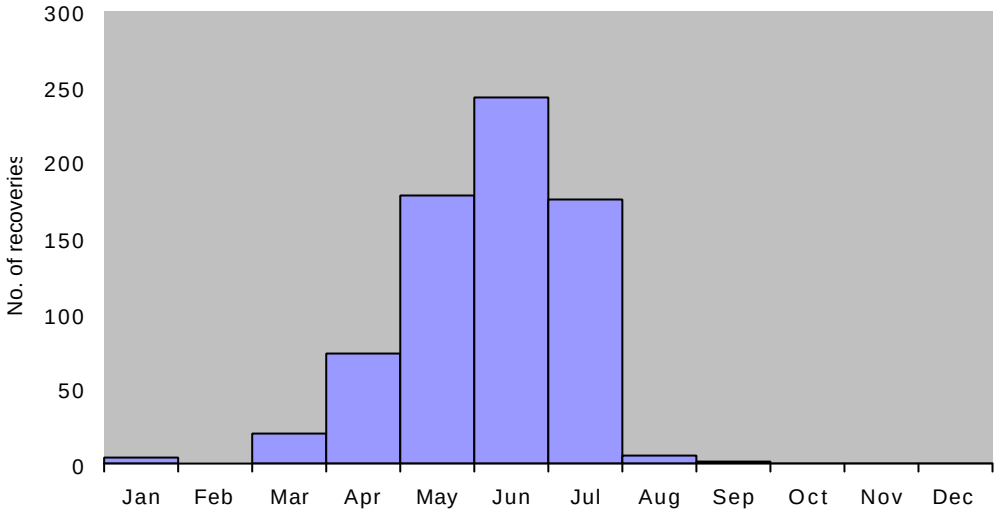


Fig. 6. Temporal distribution of guillemots ringed and subsequently recovered in the Faroe Islands.

Guillemots are recovered in the spring and summer (Fig. 6), mainly as a result of hunting (94%) (Tab. 4). The causes of recovery for the hunted birds are 81% shot and 13% taken on snares on the water beneath the breeding cliffs, or with fleyg as the birds are flying along the breeding cliffs. Only one bird found dead was oiled.

Tab. 4. Causes of recoveries of guillemots ringed and recovered in the Faroe Islands

Shot	576
Snare and fleyg	92
Found dead	7
Found dead in fish gear	4
Found dead oiled	1
Found sick	1
Only the ring found	1
Caught and released	20
Unknown	6
Total	708

Even though guillemots are recovered around all the islands, they are mainly recovered in the vicinity of villages (Fig.7). Each dot represents a recovered bird, however, the location of the birds are not exact to coordinates, as most recovery reports refer only to the general areas where the birds have been recovered. The bold lines indicate breeding cliffs, at which no shooting is permitted closer than three miles.

Fig. 7. Approximate recovery locations of guillemots ringed and recovered in the Faroe Islands. Each dot represents a recovered bird, however, the locations of the birds are not exact to coordinates, as most recovery reports refer only to the general areas where the birds have been recovered. The bold lines indicate guillemot breeding cliffs at which no shooting is permitted closer than three miles (from Olsen 1980).

3.1.1.2 *Guillemots ringed in the Faroe Islands and recovered abroad*

The total of guillemots recovered abroad is 83, mainly in Norway and Scotland (Tab.5). In Norway and Iceland, the birds were caught mainly in fish nets or shot, while in Britain and Denmark they were found dead, about half of them oiled. Tab. 3 summarises the causes of recoveries of guillemots recovered abroad .

Tab. 5 . Guillemots ringed in the Faroe Islands and recovered abroad

Norway	48	Danmark	3
Iceland	4	Sweden	1
Greenland	1	Germany	1
Scotland	17	The Netherlands	1
England	7		

Tab.6. Causes of recoveries of guillemots ringed in the Faroes and recovered abroad

Dead in fish net	34
Found dead	17
Found dead oiled	15
Shot	15
Caught	1
Caught and released	1
Total	83

Most of the recoveries outside the Faroe Islands are from the winter, however, recoveries occur every month, but July (Fig. 8).

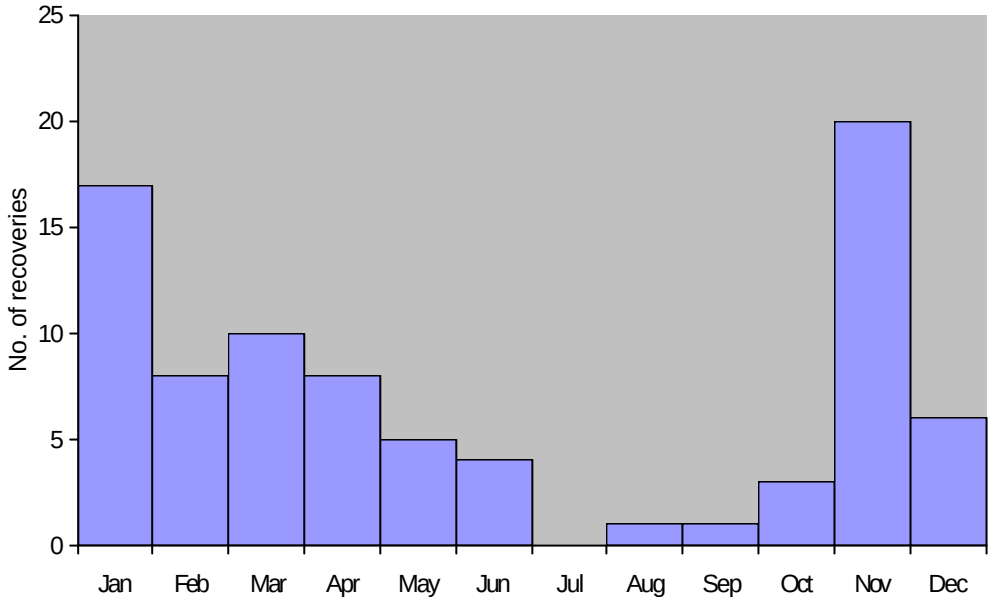


Fig. 8. Temporal distribution of guillemots ringed in the Faroe Islands and recovered abroad.

3.1.1.3 *Guillemots ringed abroad and recovered in the Faroe Islands*

A total of 159 guillemots ringed abroad have been recovered in the Faroe Islands (Tab. 7). The birds were ringed in Scotland (95.0%), England (1.3%), Iceland (3.1%) and Murmansk (0.6%). Of this number, 93.1 % were ringed as chicks and 6.9% as adults. Of the 148 birds ringed as chicks, only four were ringed outside Britain: one in Murmansk, and three in Iceland.

Tab. 7. Guillemots ringed abroad and recovered in the Faroe Islands

Ringing site		Coordinates	Ringed as chick	Ringed as adult	Total
Russia					
Murmansk					
	Seven Islands	68.49N-37.20W	1		1
Iceland					
	Látrabjarg	65.29N-24.28W	1		1
	Skrúður	64.54N-13.38W		2	2
	Krísuvíkurberg	63.50N-22.00W	1		1
	Hellisey	63.22N-20.22W	1		1
Britain					
Shetland					
	Hermaness	60.50N-00.52W	1		1
	Ramna Stack	60.39N-01.19W	1		1
	Foula	60.08N-02.05W	6		6
	Sumburgh	59.51N-01.16W	16		16
	Fair Isle	59.32N-01.38W	26	4	30
W. Scotland					
	Sule Skerry	59.05N-04.24W	2		2
	Shiant Islands	57.54N-06.22W	3		3
	Isle of Canna	57.03N-06.35W	50	1	51
	Treshnish Isles	56.30N-06.26W	1		1

E. Scotland					
	Inver Hill	58.11N-03.30W	1		1
	Badbea	58.09N-03.33W	11	1	12
	Ceann Ousdale	58.08N-03-35W	7		7
	Troup Head	57.45N-02.15W	1		1
	North Sutor	57.43N-04.00W	9	1	10
	Whinnyfold	57.23N-01.52W	2		2
	Isle of May	56.11N-02.33W	7		7
England					
	Holy Island	55.42N-01.48W		2	2
Total			148	11	159

Only four birds were recovered before 1981. Since then, the mean number has been eight birds each year (Tab. 9). Most of the birds, 88%, are recovered in the hunting season in October, November, December, and January (Tab. 9, Fig. 10). Furthermore, 83% are recovered in their first year of life at about half a year old (Tab. 10). As most of the recovered birds are ringed in Britain, they will be analyzed separately. Of the five birds from Iceland, one was recovered in May 1940, while the other three were recovered in 1995-1997; one in August and three in November. The geographical distribution of the recovered guillemots is shown in Fig. 9.

Most of the guillemots, 91%, are recovered as shot, only 4 % found dead, and 1% in fish gear (Tab. 8).

Tab. 8. Causes of recovery of guillemots ringed abroad and recovered in the Faroe Islands

Shot	144
Found dead	6
Found dead in fish gear	2
Only the ring found	1
Caught and released	1
Unknown	5

Tab. 9. Distribution by year and month of recoveries in the Faroe Islands of guillemots ringed abroad as chicks

	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97
January	0	0	0	0	4	1	0	0	3	6	4	1	0	2	1	0	0
February	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0
March	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
April	0	0	0	0	0	4	0	0	1	0	0	0	0	0	0	0	0
May*	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
June	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
August	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
September	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

October	0	1	0	0	3	0	4	1	2	7	0	3	2	0	9	0	0
November	0	0	9	4	0	0	7	8	4	2	1	0	4	1	6	0	1
December**	2	0	3	1	1	0	0	2	12	5	0	0	2	0	2	0	0
Total	2	1	12	5	9	5	12	12	23	21	6	6	8	3	18	0	1

*One bird was recovered in May 1940, 1972 and 1978. **One bird was recovered in December 1931.

Tab. 10. Distribution by month and age of recoveries in the Faroe Islands of guillemots ringed abroad as chicks

	1st year	2nd year	3d year	4th year	5th year	>5th year	Total
January	21	0	0	0	1	0	22
February	2	0	0	0	0	1 (8½ year)	3
March	0	0	0	0	0	1 (13½ year)	1
April	5	0	0	0	0	0	5
May	3	0	1	0	0	1 (6 year)	5
June	0	0	0	0	0	0	0
July	0	0	0	0	0	0	0
August	1	1	0	0	0	0	2
September	0	0	0	0	0	0	0
October	18	7	5	0	2	0	32
November	43	0	1	2	0	1 (6 year)	47
December	30	0	0	0	0	1 (9 year)	31
Total	123	8	7	2	3	5	148

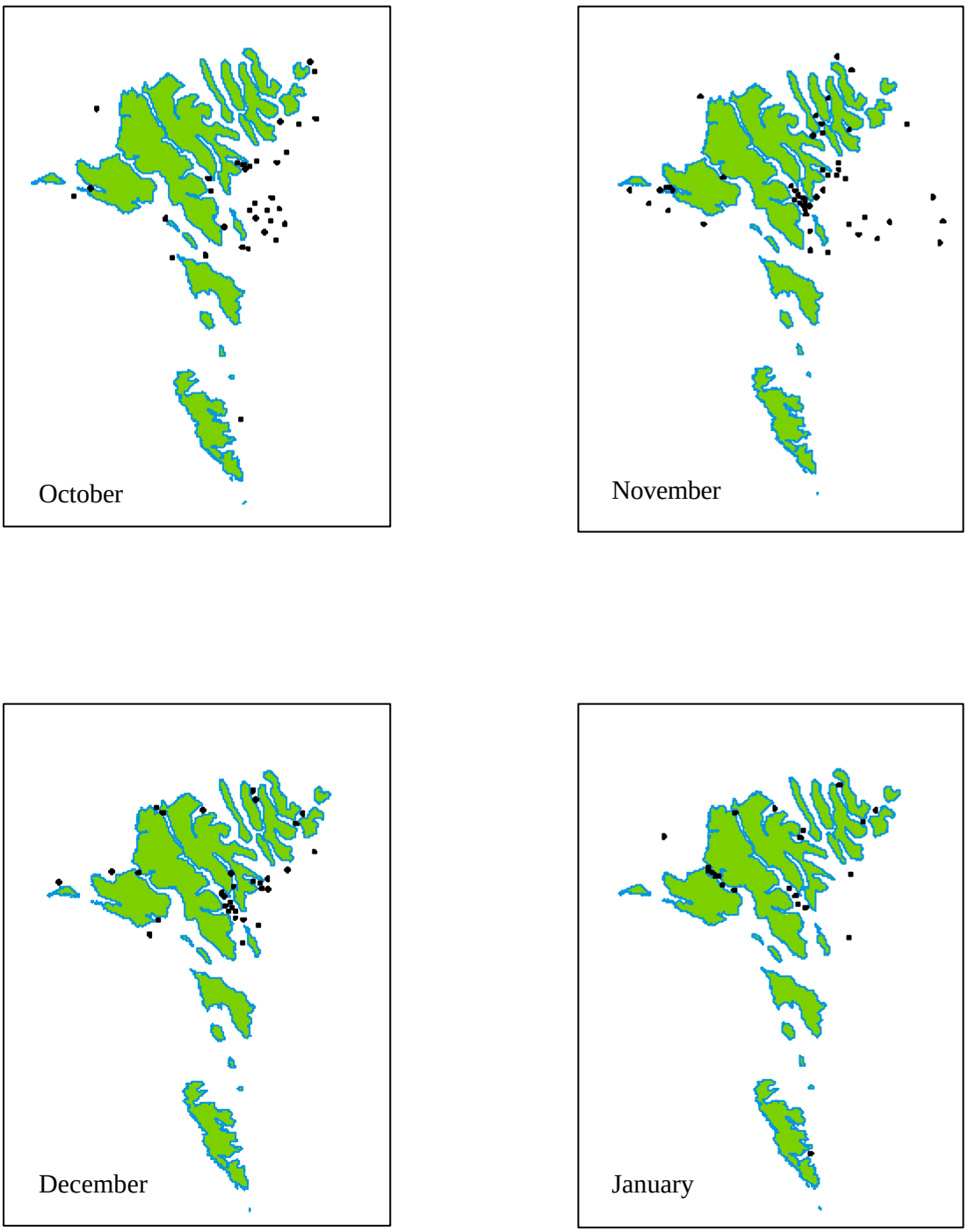


Fig. 9. Geographical distribution of guillemots ringed abroad and recovered in the Faroe Islands in the hunting season from the 1st of October to the 20th of January.

3.1.1.4 *Guillemots ringed inBritain and recovered in the Faroe Islands*
As most of the recovered guillemots from abroad are ringed as chicks in Britain (Tab.7), the recoveries of these birds are analysed in more detail below.

The number of recoveries from 1970 to 1997 of guillemots ringed as chicks in Britain is shown in Fig. 10 and the age at recovery is shown in Fig. 11. The temporal distribution of guillemots recovered in their first year of life and older than one year is shown in Fig. 12.

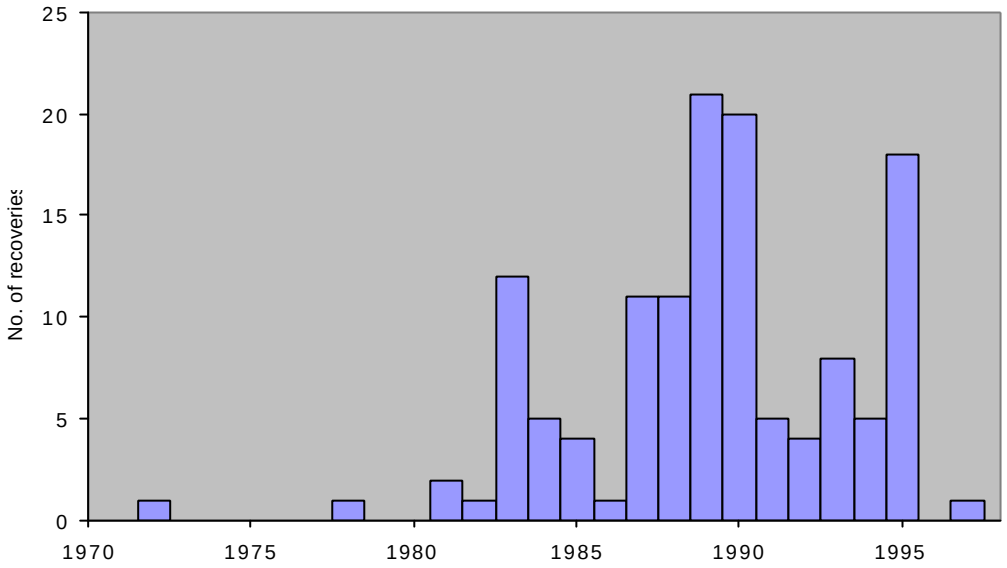


Fig. 10. Number of British guillemots ringed as chicks recovered in the Faroe Islands 1970-1997.

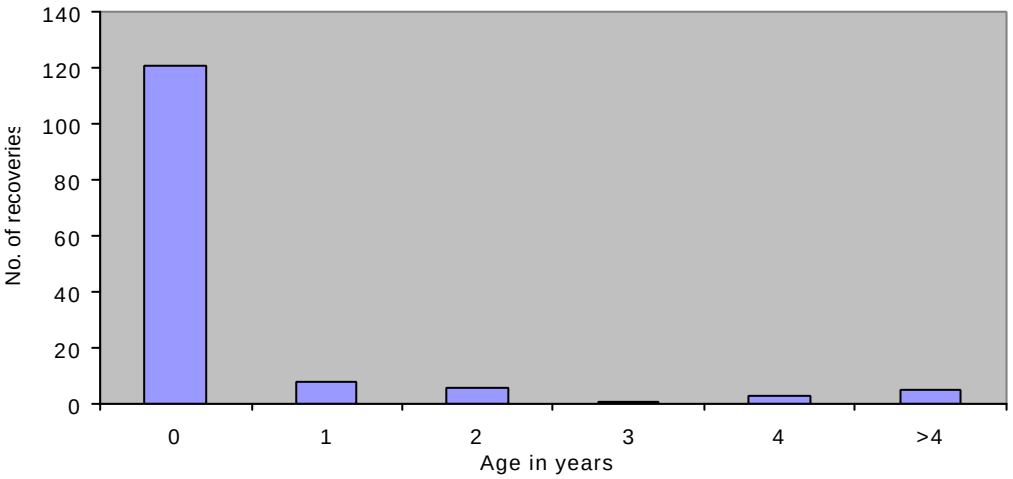


Fig. 11. Age at recovery in the Faroe Islands of British guillemots ringed as chicks 1970-1997.

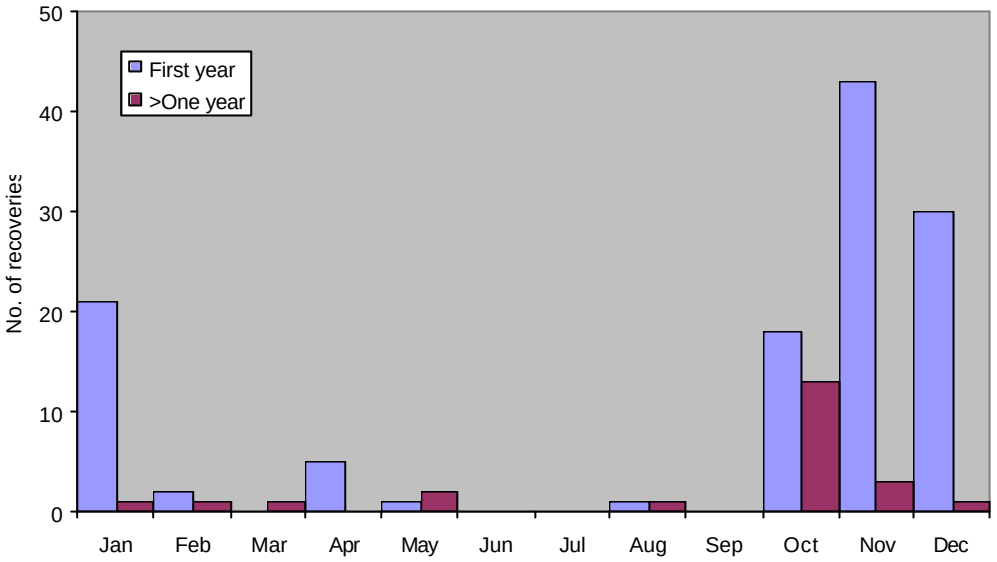


Fig. 12. Temporal distribution of British guillemots ringed as chicks and recovered in the Faroe Islands in their first year of life and older than one year.

The total number of guillemots ringed as chicks in Britain 1970-1995 was 155,740. Of these, 144 (0.09%) were recovered in the Faroe Islands (Tab. 7). The number ringed as adults in the same period was 31,473 and 9 (0.03%) were recovered in the Faroe Islands (Tab. 7).

3.1.2 Discussion

In the Faroe Islands, almost all the guillemots recovered were hunted (96%) (Tab. 4 and 8) and of these 89% were shot. Therefore, changes in the hunting regulation in 1980, from a summer season to a winter season, are very important when analyzing the results. Recoveries of guillemots ringed in the Faroe Islands in 1968 to 1971 gradually diminished during the 1970s, as the year-classes became smaller (Fig. 4 and 5). However, subsequent to hunting in the summer being prohibited in 1980, recoveries have been negligible. The Faroese guillemots were mainly hunted from March to August (Fig. 6) in the Faroes. However, breeding birds visit the colonies irregularly from late February, and from that time the birds probably are in Faroese waters, although, too far out for the hunters. Abroad, guillemots were recovered mainly from November to May while only a few were recovered in the summer (Fig. 8). This indicates that the Faroese guillemots leave Faroese waters after the breeding season and stay mainly along the coast of Norway and Britain during the winter (Tab. 5), as also shown by Olsen (1982). The abundance of Faroese birds in these areas is, however, difficult to estimate as the recovery conditions are quite different; in Norway, the birds were caught mainly in fish nets or shot, while they were found dead on the beaches in Britain. Thus, using these rough figures underestimates the birds occurring along the British coasts, as there has been no hunting in this area. However, using the birds found dead overestimates the figures for Britain, as the activity of searching for dead birds on the beaches is much greater and more organized in Britain than in Norway.

After 1980, guillemots from abroad, especially Britain, started to be recovered in Faroese waters in the winter (Tab. 9 and Fig. 10). Although the effort of ringing guillemot chicks in Britain was increasing at that time (Fig. 13), the main reason for the increase in recoveries was due to the increase in the hunting activity in the winter, after hunting was banned in the summer. Like the Faroese guillemots (Fig. 7) that were shot in the summer, those from abroad (Fig. 9) also were shot close to the islands, mainly within a couple of miles from land. However, those shot in October and November tend to be more to the east at distances up to 10-20 miles from land. This may be due to weather conditions affecting the hunters, but it may also be a result of the general distribution of the guillemots, as they are mainly concentrated in feeding areas.

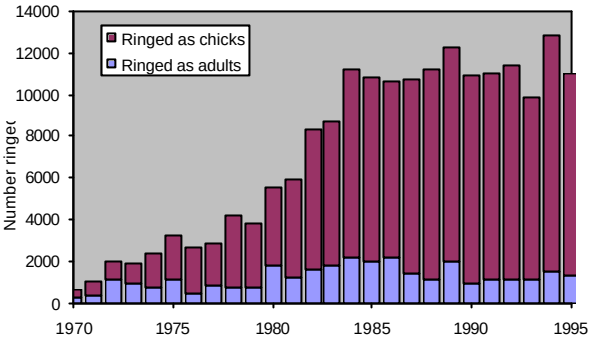
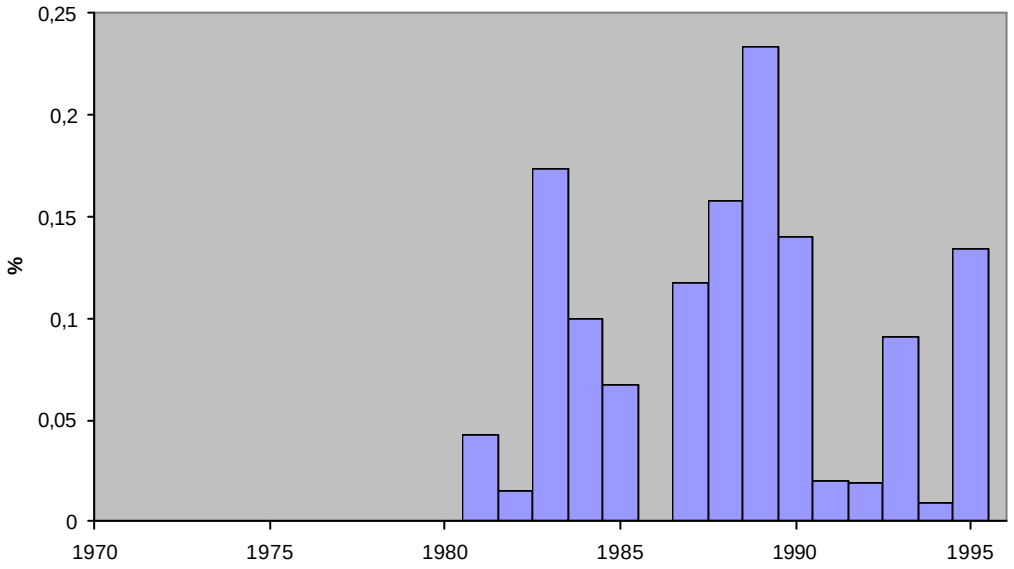


Fig. 13. Annual number of guillemots ringed in Britain and Ireland 1970-1995.

The highest concentration of guillemots at sea in the summer is beneath the breeding colonies, which are indicated as bold lines in Fig. 4, but in these areas shooting is prohibited closer than three miles and, therefore, these concentrations are not reflected in the recoveries from hunters. The number recovered each winter fluctuates (Fig. 10), and, although account is taken for variation in the ringing effort, there is still considerable fluctuation (Fig.14). The reason may be variation in the weather



Fg.14. British guillemots recovered in the Faroe Islands 1970-1995 in their first year of life, as a percent of number of chicks ringed the previous summer.

conditions affecting the ability of hunters, but there may also be real fluctuations in the population occurring in Faroese waters due to, e.g., variation in the migration pattern and the survival of the chicks. British guillemots are recovered in considerable number in all of the four months of the hunting season (1st of October to the 20th of January) (Fig. 12). This indicates that first-year British guillemots

arrive in Faroese waters before the onset of the hunting season and stay some time after. Guillemots older than one year are in their highest number in October (Fig. 12). The number of British guillemots in Faroese waters in the summer probably is low, as the recoveries also were very low before 1980 when shooting guillemots in the summer was allowed.

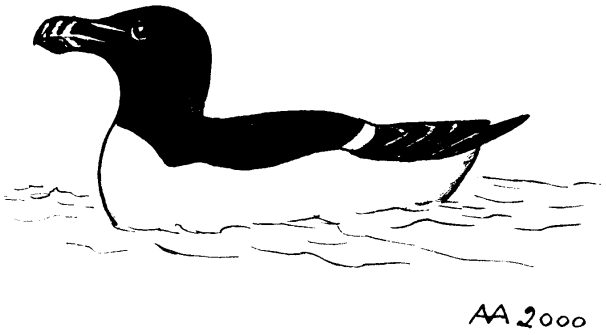
Until recently, there was only one guillemot recovered from Iceland, and that was in May 1940. Four more were recovered from 1995-1997; one in August and three in November. Although this is a low number of recoveries, a considerable number of Icelandic guillemots probably occur in Faroese waters. Taking into account the low ringing activity and the size of the Icelandic guillemot population (Tab. 10), 58% of the guillemots from abroad occurring in Faroese waters actually are Icelandic. This is a minimum figure, as there also may be Icelandic guillemots in the summer. Although a sizable number of guillemots have been ringed in the Baltic, Norway, and on Helgoland (Tab. 10), no ringed birds have been recovered from these areas, indicating that these birds are not common in Faroes waters.

Tab. 10. Breeding populations (pairs) of guillemots in the North East Atlantic region, the number of birds ringed, and the number of these subsequently recovered in the Faroe Islands. From these figures a rough estimate of the composition of the population of guillemots occurring in Faroese waters is calculated. Population estimates are from Golovkin (1984), Bakken and Mehlum (1988), SOF (1990), Lloyd *et al.* (1991), Lyngs (1992), Gardarsson (1995), Bloch *et al.* (1996), and Asbirk *et al.* (1997).

Populations	Pairs	No. ringed	No. recovered	Proportions (%)
Heligoland	2,400	4,368a	0	0.0
United Kingdom	806,100	187,782b	153	3.1
Faroes	175,000	6,349c	708	92.5
Iceland	990,000	5,375d	5	4.4
Svalbard	40,000-100,000	-	0	0.0
Russia	4,750	-	1	-
Norway	100,000-120,000	12,646e	0	0.0
W Sweden	10	-	0	0.0
Baltic	13,000	36,362f	0	0.0

a) 1909-79; Wijs 1985
b) until 1995 incl.; BTO Ringing Scheme
c) until 1999 incl. (This study)
d)1921-1995; Petersen and Guðmundsson 1998
e) 1914-1996; Ringmerkaren
f) 1960-1988; Lyngs and Kampp 1996

In total, 92.5% of the guillemots occurring within ten miles of the Faroe Islands are Faroese (Tab. 10). The Faroese birds occur mainly from March to August (Fig. 6) together with a small number of Icelandic and British birds. The population of guillemots in the summer is 350,000 breeding birds (175,000 pairs) and the portion of immatures that is in the area. This portion is, however, not known, but the total number of guillemots in Faroese waters in the summer may be about 500,000 individuals. In addition, about 100,000 flightless chicks leave the colonies in late July and early August and possibly stay within the Faroese Plateau and the surrounding banks for a month or so before they migrate, mainly to Northern Norway (Olsen 1982). In the winter, mainly Icelandic and British guillemots are in Faroese waters in about equal proportions. The size of the winter population is not known, but there are considerably fewer guillemots than in the summer.



3.2 **Razorbill** *Alca torda*

The razorbill is a bit smaller than the guillemot and has a wing-span of about 65 cm. They build no nests, but lay their single eggs in crevices or under boulders in the same cliffs as guillemots. The density is, however, low in the Faroe Islands and the breeding population is estimated to be about 4,500. The razorbill breeds only in the North Atlantic with the centre of its distribution in Iceland.

Razorbills eat fish, especially sandeels, Norway pout and sprat, and some invertebrates. They fish by diving from the surface like guillemots, but they usually dive only to 57 metres. They sometimes go as deep as 120 metres (Piatt and Nettleship 1985). Breeding birds can forage 20-30 km from the colony, although most feed within a few kilometres of the colony (e.g. Webb *et al.* 1985).

Razorbills are known to have declined since the 1960s in West Greenland, the Gulf of St. Lawrence, Norway, and France, but appear to have increased between 1969-70 and 1985-78 in Britain and much of Ireland (Lloyd *et al.* 1991).

3.2.1 Results

3.2.1.1 *Razorbills ringed in the Faroe Islands*

Only 61 razorbills were ringed in the Faroe Islands, and they were all ringed as adults. Eight (13%) of these were recovered, all shot in the Faroe Islands in 1970-1975; two in April and three in May and June, respectively.

3.2.1.2 *Razorbills ringed abroad and recovered in the Faroe Islands*

A total of 66 razorbills ringed abroad were recovered in the Faroe Islands. Of these, 41 were ringed as chicks and 25 as adults; 49 were ringed in Iceland and 17 in Britain (Tab.11).

Tab. 11. Razorbills ringed abroad and recovered in the Faroe Islands.

Ringing site		Coordinates	Ringed as chick	Ringed as adult	Total
Iceland					
	Grímsey	66.30N-18.00W	26	10	36
	Raudinupur	66.30N-16.32W		1	1
	Skoruvíkarbjarg	66.23N-14.53W		3	3
	Látrabjarg	65.29N-24.28W	3	4	7
	Heymaey	63.24N-20.17W		2	2
Britain					
Shetland					
	Unst	60.50N-00.52W	2	1	3
	Foula	60.08N-20.05W	1		1
	Fair Isle	59.32N-01.37W	2	1	3
W. Scotland					
	North Rona	59.08N-05.50W	1		1
	Pentland Skerries	58.41N-02.55W	1		1
	Clo Mor	58.40N-05.00W		1	1
	Handa	58.23N-05.11W	1	1	2
	Shiant Islands	57.54N-06.22W	3	1	4
Wales					
	Bardsey Island	52.45N-04.48W	1		1
Total			41	25	66

Razorbills were recovered mainly as a result of hunting (97%) and one was reported killed due to unknown reasons, probably hunted. The circumstances of one is unknown (Tab. 11).

Tab. 12. Causes of recovery of razorbills ringed abroad and recovered in the Faroe Islands.

Shot	61
Caught in fleyg	3
Killed, method unknown	1
Unknown	1
Total	66

The Icelandic razorbills were recovered in the winter while the British were mainly recovered in the summer (Fig. 15). Age at recovery is shown in Fig. 16 and the geographical distribution is shown in Fig. 17.

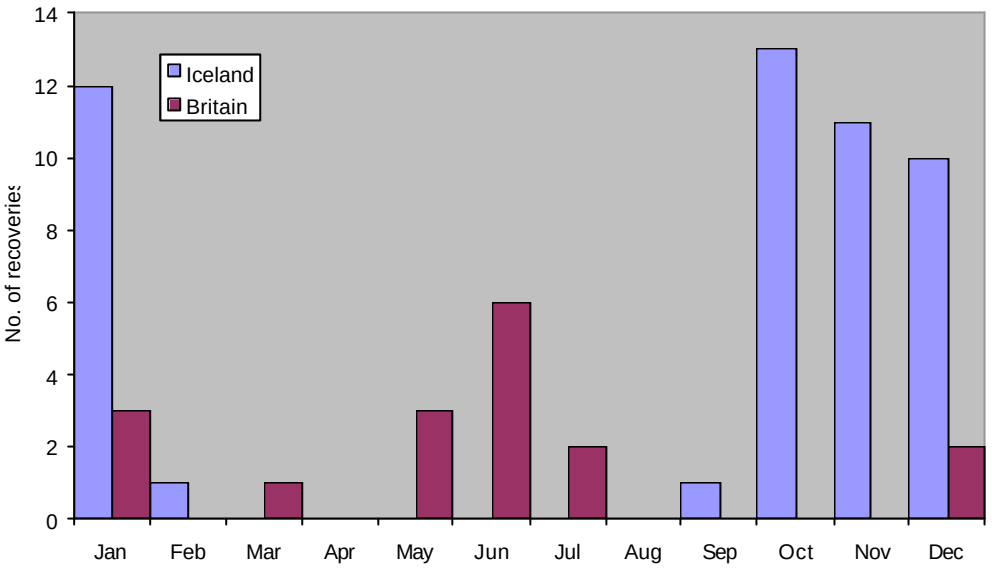


Fig. 15. Temporal distribution of razorbills ringed in Iceland and Britain and recovered in the Faroe Islands.

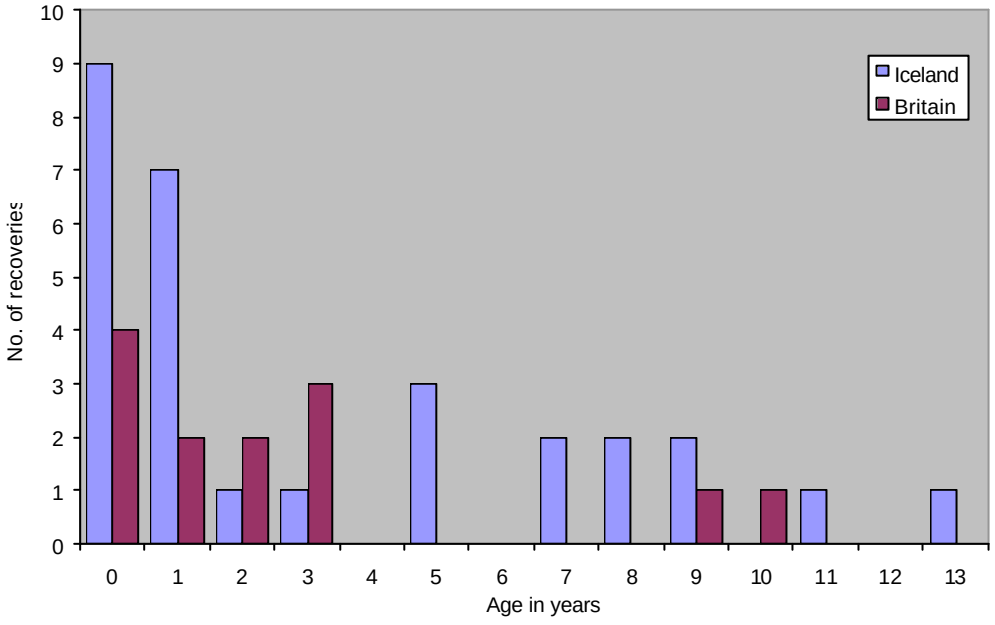


Fig. 16. Age at recovery in the Faroe Islands of razorbills ringed in Iceland and Britain.

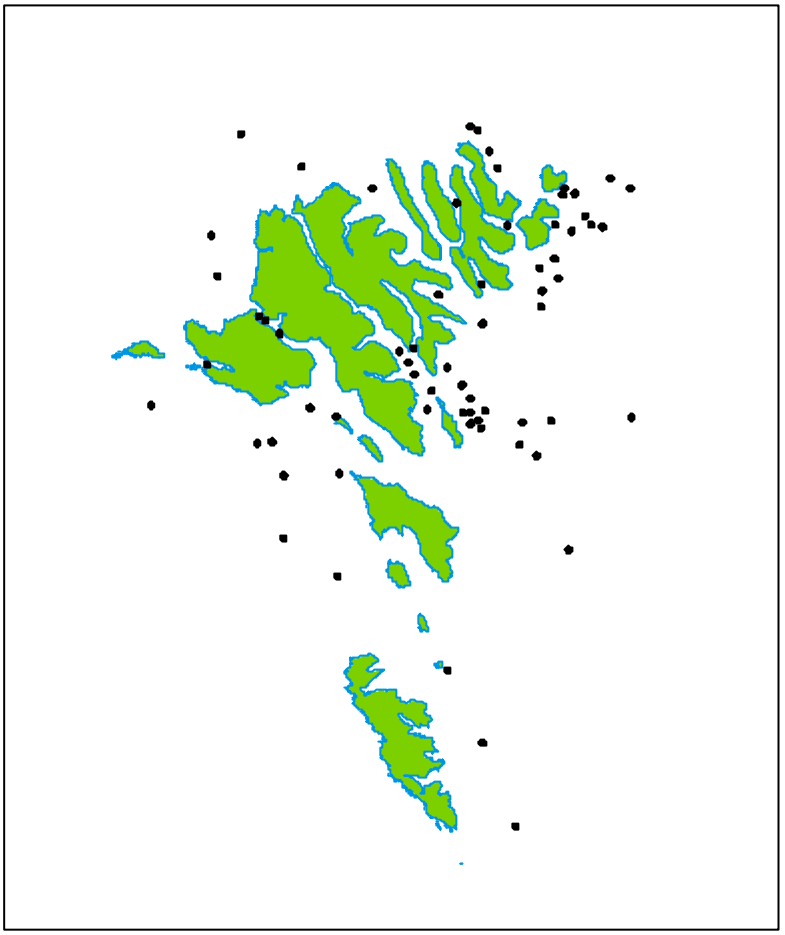


Fig. 17. Geographical distribution of razorbills ringed abroad and recovered in the Faroe Islands.

3.2.2 Discussion

As with the guillemots, almost all the razorbills recovered in the Faroe Islands were hunted (97%) (Tab. 12) and of these 92% were shot. Therefore, changes in the hunting legislation in 1980, from a summer season to a winter season, also is important when analyzing the results of the recovered razorbills. Tab. 13 shows the breeding populations of razorbills in the North East Atlantic, the number of birds ringed, and the number of these subsequently recovered in the Faroe Islands. The recoveries of the eight razorbills that were ringed in the Faroe Islands are all from the Faroes and shot in the summer season before 1980. In the same period, 11 British razorbills also were recovered (Fig.15). At that time 43,553 razorbills had been ringed in Britain and, using the population figures from Tab. 13, the proportion of British and Faroese razorbills in the summer was 1:19. Icelandic razorbills may also be in Faroese waters in the summer, but, as only 153 razorbills had been ringed in Iceland before the restriction of the hunting period, the chances of recoveries in the summer have been negligible. In the hunting season from the 1st of October to the 20th of January (Fig. 15), Icelandic razorbills are in Faroese waters and probably also both before and after that period, as the recoveries are quite equal during the four months. From 1981-1995, 34,878 razorbills were ringed in Britain, but only four (0.01%) were recovered in the Faroe Islands, while 49 (1.20%) of the 4,082 razorbills ringed in Iceland in the same period have been recovered in the Faroe Islands. Using the population figures from Tab.13, the proportion of British and Icelandic razorbills in Faroese waters in the winter is in the

order of 1:300. As only 61 razorbills have been ringed in the Faroe Islands and all before 1973, it is not possible to conclude anything about their winter area. In Iceland, a part of the Icelandic razorbills remain in Icelandic waters during the winter and ,therefore, probably some of the Faroese razorbills also remain in Faroese waters during the winter while some migrate to Norway and the North Sea.

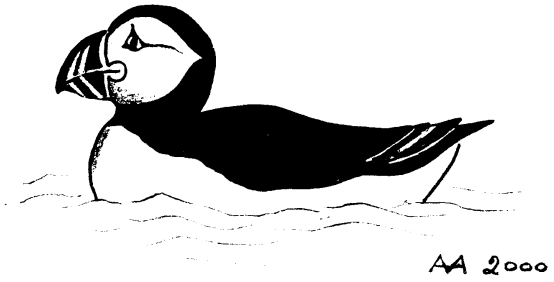
Tab. 13. Breeding populations (pairs) of razorbills in the North East Atlantic region, the number of birds ringed, and the number of these subsequently recovered in the Faroe Islands. Population estimates are from Golovkin (1984), Bakken and Mehlum (1988), SOF (1990), Lloyd *et al*. (1991), Lyngs (1992), Gardarsson (1995), Bloch *et al*. (1996), and Asbirk *et al.* (1997).

Populations	Pairs	Number ringed	Recovered in Faroes
Heligoland	5-10	-	0
United Kingdom	120,000	81,798[a]	17
Faroes	4,500	61	8
Iceland	380,000	4,235[b]	49
Russia	3,700-4,200	-	0
Norway	30,000	1,979[c]	0
W Sweden	42	-	0
Baltic	10,000	17,706[d]	0

a) until 1995 incl.; BTO Ringing Scheme
b) 1921-1995; Petersen and Guðmundsson 1998
c) 1914-1996; Ringmerkaren
d) 1960-1988; Lyngs and Kampp 1996

Icelandic razorbills (Fig.16) recovered in the Faroe Islands are mainly one-half and one and one-half years of age, indicating that it is especially the young birds that migrate. However, birds in almost all age classes up to 13 years have been recovered. The age of British razorbills is mainly one-half to three years.

Razorbills breed on the same cliffs as the guillemots, but in a much lower number and their exact locations have not been mapped. Geographically, razorbills recovered at sea in the winter (Fig.17) are more equaly distributed than guillemots (Fig. 9), probably reflecting different feeding strategies.



3.3 **Puffin** *Fratercula arctica*

The puffin is the smallest of the auks breeding in the Faroe Islands and has a wingspan of about 56 cm. It lays a single egg underground in a burrow dug into turf or under boulders. This is the most common auk in the Faroes and the breeding population is estimated to be about 550,000 pairs. The puffin breeds only in the North Atlantic, but over a wide area. The center of its distribution is Iceland.

Puffins feed on fish and marine invertebrates. In the Faroe Islands during summer, their main food sources are sandeel and Norway pout. The birds dive from the surface and swim underwater after fish, which they catch mostly at depths of less than 15 metres. Especially in the evenings at the heigh of the breeding season, huge flocks gather at the breeding colonies, standing on grassy slopes, forming rafts on the sea below the cliffs or, wheeling in synchrony over the colony. Breeding birds usually feed within a few kilometres of the colony.

The number of puffin appear to be stable in their main area, Iceland, but have been decreasing during the 1900s in the Faroe Islands and in some of the colonies in Norway and Scotland.

3.3.1 Results

3.3.1.1 *Puffins ringed in the Faroe Islands*

A total of 3,778 puffins have been ringed in the Faroe Islands. The ringing started in 1923, but most of the birds, 2,898, have been ringed since 1991. Of these, 2,004 were ringed as chicks and 894 as adults; 97 puffins were recovered in the Faroe Islands and 91 of these were recovered as a result of hunting and two were found dead in fish gear (Tab.14). Only three birds were reported from abroad; one found dead in Scotland, one caught in Iceland, and one with unknown recovery conditions was reported from Greenland.

Tab. 14. Causes of recovery of puffins ringed and recovered in the Faroe Islands.

Shot	11
Caught in fleyg	70
Caught in fleyg and released	10
Killed, method unknown	2
Found dead in fish gear	2
Unknown	2
Total	97

Puffins were recovered in the summer months, mainly in July (Fig. 18) at an age of two to five years (Fig. 19).

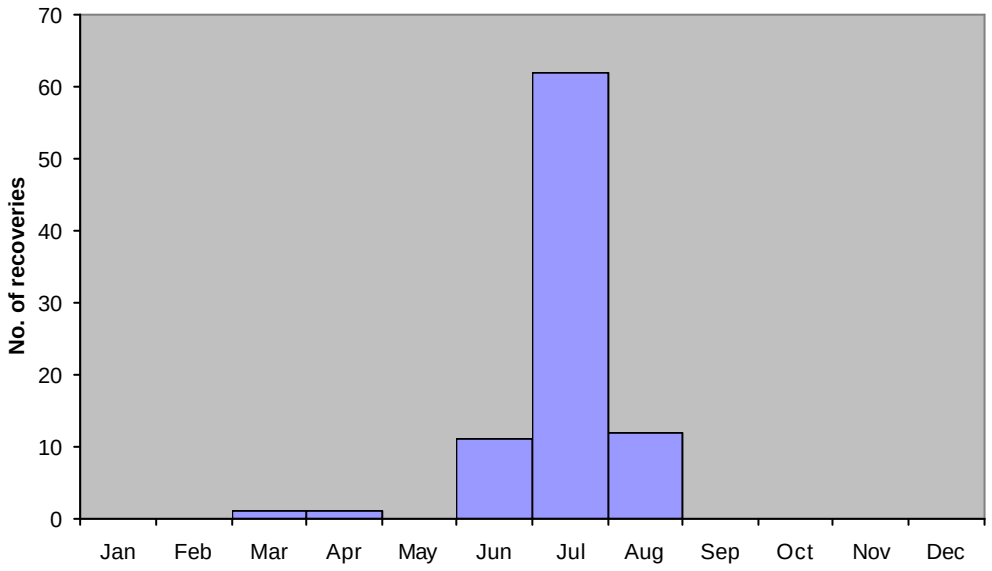


Fig.18. Puffins ringed and recovered in the Faroe Islands 1939-1997.

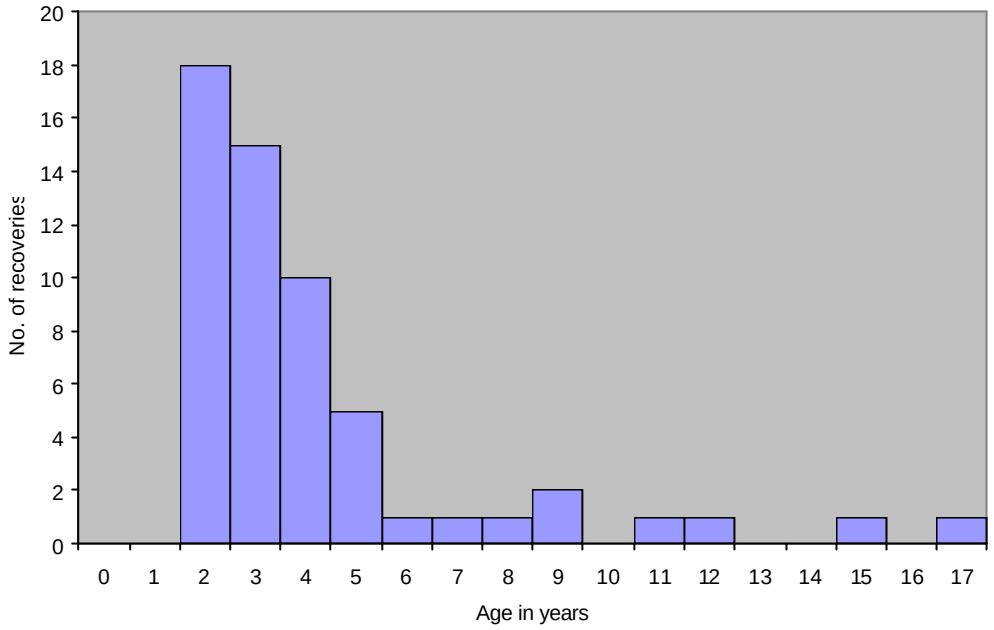


Fig. 19 . Age at recovery in the Faroe Islands of Faroese puffins ringed as chicks.

3.3.1.2 *Puffins ringed abroad and recovered in the Faroe Islands*

The total number of puffins ringed abroad and recovered in the Faroe Islands is 77 (Tab. 15); 36 were ringed in Iceland, 25 in Britain, 14 in Norway and 2 were ringed in France. The two birds from France, however, had been transferred from the Faroe Islands as chicks.

Tab. 15. Puffins ringed abroad and recovered in the Faroe Islands.

Ringing site		Coordinates	Ringed as chick	Ringed as adult	Total
Norway					
	Andøya	69.17N-15.52E		2	2
	Lovund	66.22N-12.21E		2	2
	Røst	67.26N-11.52E	4	2	7*
	Runde	62.25N-05.38E	3		3
Iceland					
	Vestmannaeyjar	63.24N-20.17W	25	11	36
Britain					
Shetland	Foula	60.08N-02.05W		1	1
Orkney	Sule Skerry	59.04N-04.24W	2	13	15
N. Scotland	Durness	58.34N-04.45W		1	1
W. Scotland	St. Kilda	57.49N-08.35W		1	1
E. Scotland	Isle of May	56.11N-02.33W	3	1	5**
Wales	Scomer Island	51.44N-05.18W		1	1
England	Farne Islands	55.37N-01.37W		1	1
France					
	Ile Bono	48.53N-03.29W	2		2***
Total			39	36	77

*Age at ringing is unknown for one bird. ** Age at ringing and recovery date is unknown for one bird. *** The birds had been transferred from the Faroe Islands as chicks.

Puffins were mainly recovered as a result of hunting; 40 (52%) were shot and 31 (40 %) were caught in fleyg. Furthermore, 3 (4%) were found dead in fish gear, the ring number was read in 1(1%) and for 3 (4%) of the birds the recovery condition is unknown (Tab. 16).

Tab. 16. Causes of recovery of puffins ringed abroad and recovered in the Faroe Islands.

Shot	40
Caught in fleyg	31
Found dead in fish gear	2
Caught and released	1
Unknown	3
Total	77

The temporal distribution of recovered puffins is shown in Fig. 20 and 21 and the age at recovery is shown in Fig. 22. The geographical distribution of recovered puffins is shown in Fig. 23.

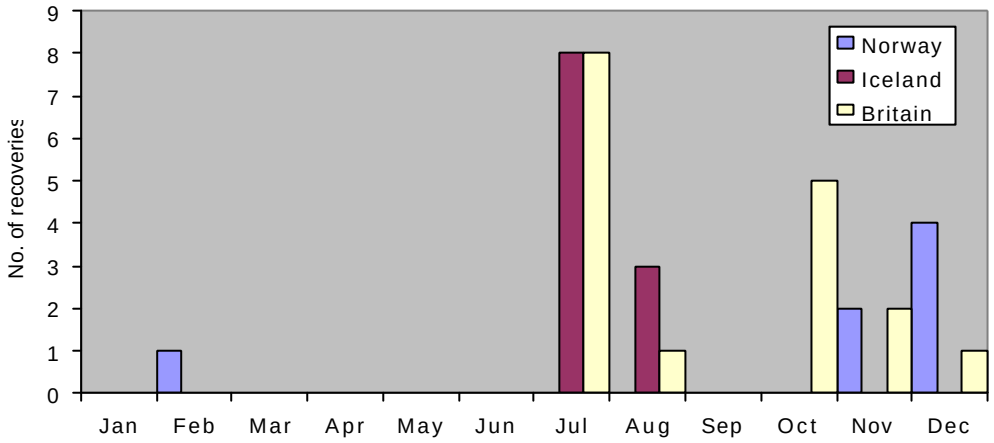


Fig. 20. Recovery in the Faroe Islands of puffins ringed abroad as adults.

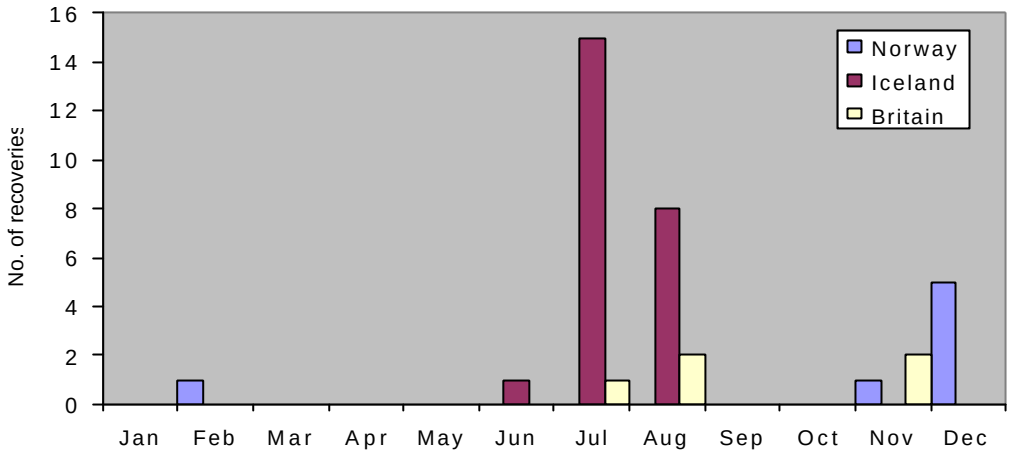


Fig. 21. Recovery in the Faroe Islands of puffins ringed abroad as chicks.

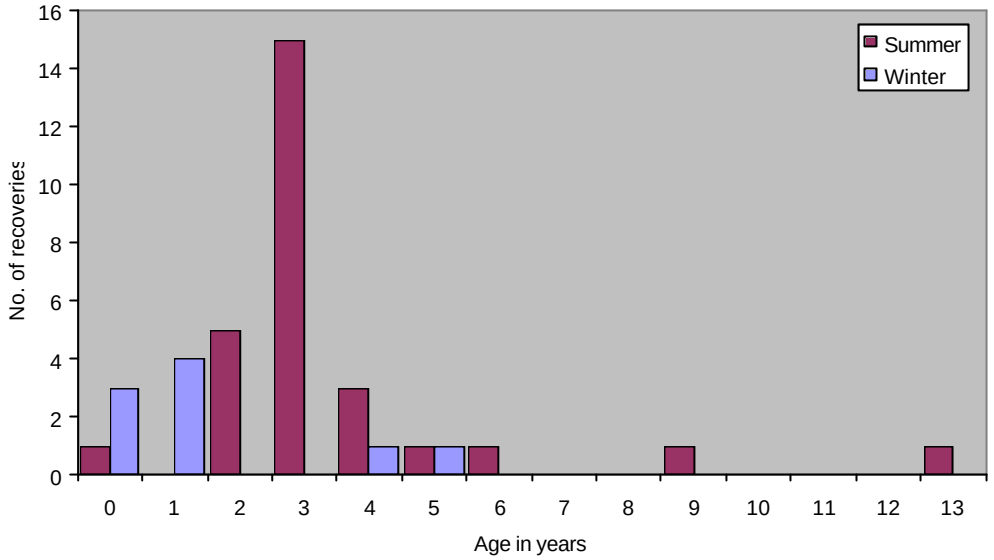


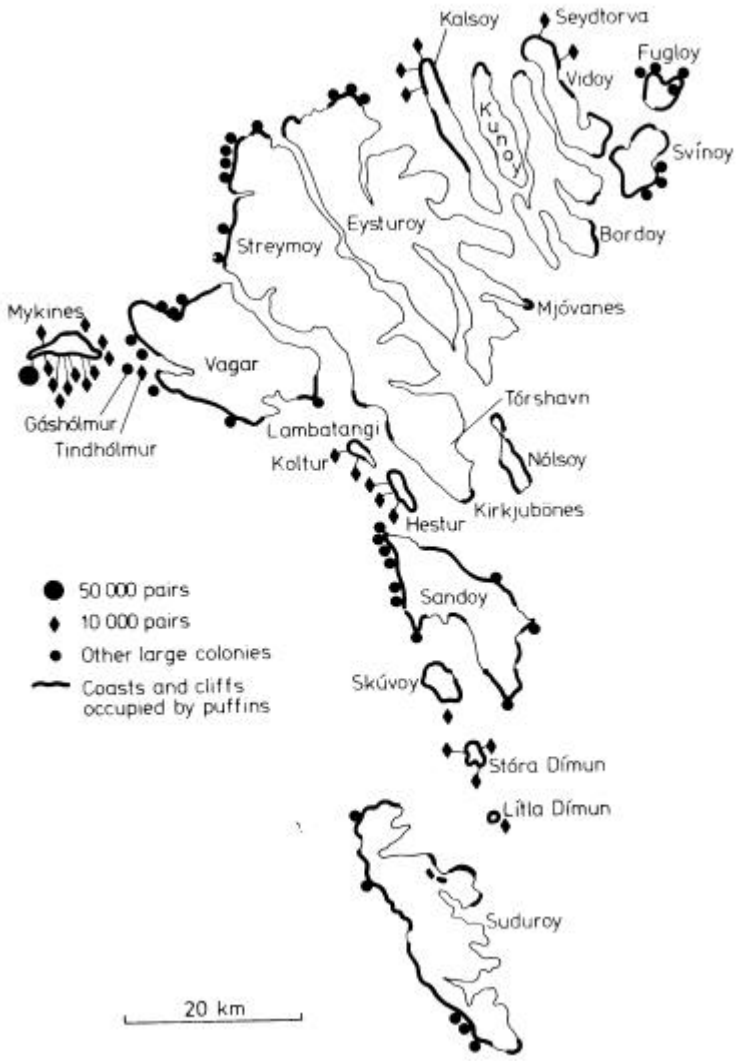
Fig. 22. Age at recovery in the Faroe Islands in summer and winter of puffins ringed abroad as chicks.

Fig. 23. Geographical distribution of puffins ringed abroad and recovered in the Faroe Islands. The birds recovered on land were hunted in the summer by fleyg. Those recovered at sea were shot

mainly in the winter. Two birds found dead in fish gear 100 and 200 nautical miles, respectively, north of the Faroe Islands are not on the map.

3.3.2 Discussion

Unlike guillemots and razorbills, puffins have been protected against shooting in the summer since 1954. Therefore, most of the recoveries from the summer are by fleyg, for which there has been no change in the legislation. Legislation regarding the shooting of puffin is now the same as for guillemots and razorbills. Puffins ringed and recovered in the Faroe Islands (Fig. 18) reflect the season for fleyg, which starts late in June and lasts until the puffins leave early in August. However, the puffins arrive on the water beneath the colonies in the middle of April and are established in the colonies from late April to late August. In June and especially July, the puffins may crowd in huge flocks of thousands of birds on the water beneath the colonies (Fig.24). The age at recovery is also reflected by the selective fleyg hunting, which mainly takes prospecting immatures from the wheel of puffins circling the colonies. Hunters also try to avoid the breeding birds by not taking birds carrying fish in their beaks. One year old birds are not recovered (Fig. 19) and they are normally not in the vicinity of the



colonies.

Fig. 24. The main puffin colonies in the Faroe Islands (from Harris 1984).

Puffins ringed in Britain were recovered both in the summer and the winter, while those from Iceland were recovered only in the summer and those from Norway only in the winter (Fig. 20 and 21). Puffins recovered in the summer were mainly 3 years of age (Fig 22), while the few recovered in the winter mainly were one-half and one and one-half years of age. The Norwegian and Icelandic birds ringed as chicks are overrepresented in the recoveries compared to those ringed as adults, while it is the opposite for the British birds (Fig. 20 and 21 and Tab. 17). Wing lengths of puffins shot at or near the Faroes during winter indicate a Norwegian origin of the birds (Jensen 1986).

Tab.17. The proportion of puffins ringed as chicks compared to the proportion of these birds in the recoveries.

	Number Recovered	Ringing scheme % ringed as chicks	Recoveries % ringed as chicks
Norway	11	18	64
Iceland	36	54	69
Britain	24	74	21

The geographical distribution of puffins recovered in the summer depends much on where it is possible to use the fleygmethod (Fig. 2), but generally it is at the largest colonies (Fig. 24). Puffins recovered in the winter (Fig. 23) were shot in the same areas as guillemots (Fig. 9) and razorbills (Fig. 17), as hunters especially go for guillemots and razorbills, which occur in higher numbers than the puffins.

Tab. 18 shows breeding populations of puffins in the North-east Atlantic, the number of birds ringed, and the number of these subsequently recovered in the Faroe Islands. From these figures, the proportion of the different puffin populations occurring in Faroese waters is calculated (Tab.18). In the summer, it is mainly Faroese breeding birds, but among the immatures (Fig. 20-22) 9% of the birds are from Iceland. In winter, the puffins in Faroese waters are from Norway, corresponding to 10% of the total population, if the efficiency of shooting in the winter is the same as for fleyg in the summer. A small portion (0.6%) of British puffins are in Faroese waters both in summer and winter. The two recoveries from France are excluded as these birds had been transferred from the Faroe Islands. Among some hundred other puffin chicks, they were transferred in a fruitless attempt to restore a colony in France, which became extinct partly due to the wreck of the oil tanker, Torrey Canyon (Mortensen, 1990).

Tab.18. Breeding populations (pairs) of puffins in the North-east Atlantic region, the number of birds ringed, and the number of these subsequently recovered in the Faroe Islands. From these figures, a rough estimate of the composition of the population of puffins occurring in Faroese waters is calculated. Population estimates are from Harris (1984), Lloyd *et al.* (1991), Bloch *et al.* (1996), and Asbirk *et al.* (1997).

Populations	Pairs	Number ringed	Recovered in Faroes	Proportion (%)
Russia	20,000	-	0	0.0
Norway	2,000,000	15,584[a]	14 (0.09%)	10.3
Iceland	2,000,000-3,000,000	64,242[b]	36 (0.06%)	8.0
Faroe Islands	550,000	3,778	97	81.0
United Kingdom	500,000-950,000	187,782[c]	25 (0.01%)	0.6
France	470	-	2*	-

a) 1914-1996; Ringmerkaren. b) 1921-1995; Petersen and Guðmundsson 1998. c) until 1995 incl.; BTO Ringing Scheme. * The birds had been transferred from the Faroe Islands.

4 Other Auks

About 3,500 black guillemots breed in the Faroe Islands (Block *et al.* 1996). At sea, they mainly occur within some hundred meters of land (Olsen 1999). They aggregate in sheltered areas in flocks of 10-100. Three ringed black guillemots have been recovered, all ringed in the Faroe Islands. Brunnich's guillemots are rarely seen in the Faroes, but two ringed Brunnich's guillemots have been recovered; one from Norway and one from Greenland. Little auk occurrs sometimes in large numbers in the winter, especially in the fjords of the northern islands. They are often found dead on the shore, but no ringed little auk have been recovered.

5 Conclusion

This is the first time the composition of the guillemot, razorbill, and puffin populations occurring in Faroese waters has been analyzed. Although, the composition mainly is Faroese birds, it is clear that birds from the huge collonies in Iceland, Scotland, and Norway are feeding in Faroese waters, especially in the winter. The auks recovered were mainly shot from small boats with limited range (Fig. 3) and, therefore, most of the recoveries were close to the islands within ten nautical miles from land and only occasionally as far out as 20 miles. However, most of the areas where the birds were recovered at sea are good feeding areas, and, thus, the birds would be more concentrated here rather than further out.

- **The guillemots** are mainly Faroese (92.5%) (Tab. 10). The Faroese birds occur mostly from March to August together with a small portion of Icelandic and British birds. In the winter, however, the population mainly consists of Icelandic and British birds in about equal proportions. The British birds are mainly in their first winter (Fig. 11).

- **The razorbills** in the summer are mainly Faroese, but about 5% are from Britain and some may also be from Iceland. In the winter, Icelandic razorbills are numerous from the 1st of October to the 20th of January (Fig. 15) and probably also both before and after. These birds are mainly in their first and second winters (Fig. 16). A small portion (1:300) is from Britain. It is not possible to conclude anything about the Faroese birds in winter, but probably some of them remain in Faroese waters while some migrate to Norway and the North Sea.

- **The puffins** occurring in the summer are mainly Faroese, but about 8% are from Iceland (Tab. 18). The birds recovered in the summer were mainly two to five years old, while one-year-old birds were not recovered (Fig. 19 and 22). In the winter, the puffins in Faroese waters are from Norway, corresponding to 10% of the total population. A small portion (0.6%) of British puffins are in Faroese waters both in summer and winter.

6 Acknowledgments

We wish to thank the GEM Project for sponsoring this study. Thanks to the Copenhagen Bird Ringing Centre, Denmark, and the British Trust for Ornithology for supplying data on ringed birds, and to Annika Gulklett for keying in the data held in the Faroes. We would also like to thank the people that

have ringed the birds and all those that have returned the recovered rings. Without their contribution, this report could not have been produced. We would also like to thank Arne Myhrvold for his constructive comments on the manuscript.

7 References

Asbirk, S., Berg, L., Hardeng G., Koskimies, P. and Petersen, Æ. 1997. Population sizes and trends of birds in the Nordic Countries 1978-1994. TemaNord 614. Nordic Council of Ministers, Copenhagen.

Bakken, V and F. Mehlum 1988. AKUP sluttrapport, sjøfuglundersøkelser nord for N 74°/Bjørnøya. – Norsk Polarinst. Rapp. 44: 1-174.

Barrett, R. T. and Vader, W. 1984. The status and conservation of breeding seabirds in Norway, pp 323-334 in Croxall, J.P., Evans, P.G.H. and Schreiber, R. W. (eds), Status and conservation of the world's seabirds. ICBP Tech. Pub. No. 2, Cambridge.

Bloch, D., Jensen, J.-K. and Olsen, B.1996. List of birds seen in the Faroe Islands. – Føroya Náttúrugripasavn, Føroya Fuglafrøðifelag, and Føroya Skúlabókagrunnur.

Gardarsson, A. 1995. Svartfugl í íslenskum fuglabjørgum. – Bliki 16: 47-65.

Golovkin, A. N. 1984. Seabirds nesting in the USSR: the status and protection of populations, pp 473-486 in Croxall, J.P., Evans, P.G.H. and Shreiber, R.W. (eds), Status and conservation of the world's seabirds. ICBP Tech. Pub. No. 2, Cambridge.

Grimmet, R.F. A. and Jones, T. A. 1989. Faroe Islands, pp 137-144 in Important Bird Areas in Europe. ICBP Tech. Pub. No. 9, Cambridge.

Harris, M.P. 1984. The Puffin. T & AD Poyser, Calton. 224 pp.

Jensen, J.-K. 1986. Lunderne *Fratercula arctica* ved Færøerne om vinteren: hvor kommer de fra? The origin of Puffins wintering in Faeroese waters. Dansk Ornith. Foren. Tidskr. 80:131-132.

Lloyd, C., Tasker, M. L. and Patridge, K. 1991. The status of seabirds in Britain and Ireland. – T. & A. D. Poyser, London. 355pp.

Lyngs, P. 1992. Ynglefuglene på Græsholmen 1925-90. – Dansk Orn. Foren. Tidsskr. 86: 1-93.

Lyngs, P. and Kampp, K. 1996. Ringing recoveries of Razorbills *Alca torda* and Guillemots *Uria aalge* in danish waters. Dansk Orn. Foren. Tidsskr. 90: 119-132.

Mortensen, E. 1990. Royndirnar at flyta føroyskar lundapisur til Svøríki og Frakland. Frágreiðing frá Føroya Fuglafrøðifelag 4: 32-33.

Olsen, B. 1980. Ringmerking av lomviga í Føroyum. Report to Føroya Løgting. 20p.

Olsen, B. 1982. Nogle årsager til nedgangen i den færøske lomviebestand vurderet ud fra mønsteret i tilbagegangen og ringmærkningsresultater (English summary). Viltrapport, Trondheim 21: 24-30.

Olsen, B. 1992. Teljingar av lomviga í Høvdanum á Skúvoynni 1973 til 1991 (English summary). Fiskirannsóknir 7: 6-15.

Olsen, B. 1999. Teistar sæddir undir Hesti 1996. Frágreiðing frá Føroya Fuglafrøðifelag 13: 28-29.

Piatt, J.F. and Nettleship, D.N. 1985. Diving depths of four alcides. Auk 102: 293-297.

Petersen, Æ. and Guðmundsson, G. A. 1998. Fuglamerkigar á Íslandi í 75 ár. English summary: Seventy-five years of bird-ringing in Iceland. Bliki 19: 49-56.

Reinert, A. 1976. Lomvigin l-Vl. Dimmalætting 99(97)4, (98)5, (100)3, (102)5, (107)3,8, (144)4-5.

Salomonsen, F. 1944. The Atlantic Alcidae. The seasonal and geographical variation of the auks inhabiting the Atlantic Ocean and adjacent waters. Gøteborgs Kungliga Vetenskaps- och Vitterhets-Samhalles Handlingar, Serie B 3(5), 1-138.

SOF 1990. Sveriges fåglar, 2nd edition – Stockholm.

Tasker, M.L., Webb, A., Hall, A.J., Pienkowski, M.W. and Langslow, D.R. 1987. Seabirds in the North Sea. Nature Conservancy Council, Peterborough.

Webb, A., Tasker, M.L., Murray, S. and Best, M.A. 1985. The distribution of Guillemots (Uria aalge), and Puffins (Fratercula arctica) at sea around Flamborough Head, June 1984. Nature Conservancy Council Chief Scientist Directorate Report no. 590.