

# CST REPORT NO 42

THE PRESENT STATUS OF THE PUFFIN FRATERCULA ARCTICA IN BRITAIN AND IRELAND. [1976] 26p. [Contract Title: Research on the Puffin; Contractor: ITE (M.P. Harris); NCC Research Contract: F3/03/30]

Summary:

It appears as though the recent overall decline in the British population of Puffins, *Fratercula arctica* has stopped, at least temporarily. This conclusion is based on detailed burrow counts at seven Scottish colonies and a survey of published and unpublished data for other British colonies. The few recent apparent declines have been mostly in the small colonies at the southern edge of the species range, e.g., Channel Isles, Brittany, southern England. It is suggested tentatively that it is not a coincidence that the numbers of Puffins have stopped declining just at the time when the temperatures of the seas around Britain have started to fall.

Information is also presented on the numbers of Puffins occurring in other parts of the North Atlantic. Iceland has more Puffins than all other areas combined and the high-arctic small-billed race is a rare bird with a population of 15,000 birds. The Puffin is probably the commonest seabird in the North Atlantic.

Key-Words: FRATERCULA-ARCTICA

The present status of the Puffin Fratercula arctica in Britain and Ireland

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INTRODUCTION

This paper details recent counts and estimates of numbers of Puffins Fratercula arctica in an attempt to determine whether or not the generally accepted overall decline in numbers of Puffins in Britain (Cramp et al 1974) still continues. I have not attempted a complete survey of old records (details in Cramp et al (1974)) unless they seem relevant to present trends. As will be the case for all future assessments of British seabird populations, the base-line is the survey made in 1969-70 during 'Operation Seafarer'. Unfortunately the large areas of coastline which had to be counted and the limited manpower resulted in most colonies being only visited once so that the actual totals of birds must be used with great caution. However it is hoped that a general survey will show up any marked population trends since 1969-70.

Although among the most numerous and attractive of British seabirds, Puffins are very difficult to count as they breed on the most isolated and rugged islands and cliffs, the colonies are large and many burrows are inaccessible. The most accurate method of determining trends in population size is to count regularly the numbers of nesting burrows in areas where this is feasible. Such counts are only just beginning to yield results (see later) and the bulk of this survey is based on counts of individual birds.

The older literature includes many eloquent accounts of vast numbers of Puffins in some areas but many of these old and not-so-old subjective estimates do not stand up to careful scrutiny. However, there have been many well documented declines in numbers within the last hundred years (reviewed by Bannerman 1963, Parslow 1973, Cramp et al 1974).

The numbers of Puffins seen at a colony in a single day can vary by a factor of a thousand. Thus the majority of counts of birds made during single visits to colonies must be gross underestimates of the totals of birds attached to the colony. Further difficulty arises as often it is not clear whether a quoted figure is a



single count or the maximum of several counts, or whether the count is of all birds at colonies and on the sea below the cliffs or, as most Seafarer counts, only of birds ashore. It is not possible to convert counts of birds to breeding pairs although maximum counts of birds on the sea just offshore from colonies prior to breeding sometimes approximate to twice the number of occupied burrows. Most counts have been made late in the season and so include many immatures which exceptionally breed in their third year of life but normally when one or two years older. Many immature birds spend several years as pre-breeders at the colonies. The numbers of these present depends not only on weather and feeding conditions at the time of the count but on the breeding success and post-fledging survival two and more years before. Thus, even when the difficulties of counting large numbers of birds have been overcome, it is difficult to interpret counts. However such counts are usually the only information which we have on the status of this species.

#### Quadrat counts

Permanently-staked quadrats have been set up in seven Scottish colonies and the numbers of occupied burrows, as indicated by hatched egg shells, droppings or excavations and unoccupied burrows have been counted more-or-less annually. All the quadrats, usually 3 or 6 m wide, run from one side of a colony to the other and include areas where there are no burrows. These quadrats thus include central and peripheral parts of the colony and are capable of detecting changes in colony size as well as overall numbers and burrow density in the already occupied areas.

The results (Table 1) show increases on the Isle of May and the Shiant Islands and no declines. In only one case, a quadrat deliberately placed to monitor changes in a very badly eroded bank on the Isle of May, was the 1975 count meaningfully lower than earlier ones. The small difference in the 1971 and 1975 counts from Dun could be due to a slight difference in area covered as only one top corner of a 90 x 3 m strip running down a colony was permanently marked in 1971. The Shiant results are from Garbh Eilean where the quadrats span, both horizontally and vertically, a colony which declined from 6910 burrows (counted by line transects) in 1970 to 5700 in 1971, 4390 in 1972 and 3210 in 1973 (Brooko

1972a, GU). The decline would appear now to have been reversed. However the rate of recovery may not be as great as the 16% increase between 1974 and 1975 suggests as some of the new burrows were among boulders where it is difficult to count nests.

#### Burrow density

The density of occupied burrows is slightly higher than given by table 1 as the areas monitored include some places not used by Puffins. If these areas are omitted then burrow density is highest at Hermaness ( $0.59/m^2$ ) and lowest on the Isle of May ( $0.20/m^2$ ) (Table 2.). In a few places on Dun burrow density was as high as  $1.7/m^2$  even though overall even the densest colonies on that island averaged only  $0.4-0.6/m^2$ . These densities are similar to those found in many Norwegian colonies but far below some parts of Icelandic and Canadian colonies which reach 3-4 burrows/ $m^2$  and 2.8 burrows/ $m^2$  respectively.

#### Surveys of recent counts

All 1969-70 counts were made during Operation Seafarer and the figures are taken from the cards filled in by the observers. Other counts are from normal published sources (cited), The Scottish Bird Report (SBR), RSIB - Seabird Group annual sea-bird census of some colonies (RSFB) or unpublished sources (initials of observer). This survey was bedevilled by confusion of the counting units - i.e. were they individuals, pairs, occupied burrows? Even when counts were recorded as pairs they were in fact often counts of birds either expressed directly as pairs (many Seafarer counts) on the assumption that only half the population is likely to be visible at any time or by dividing the figure by two. I have traced as many counts as possible back to the original counter and discovered what was actually counted; but in some cases this has proved impossible and I give the units as expressed in the report. Throughout this paper I use individual birds unless pairs or burrows are specifically mentioned. Counts not presented in the text are given as an appendix. Following Cramp et al (1974), order 1 indicates 1-9 pairs, Order 2 10-99 pairs, Order 4 1,000-9,999 and Order 5 10,000-99,999 pairs.



## Shetland

Venables and Venables (1955) mention Puffins as increasing in Shetland and a partial survey in 1974 (Harris 1976) and other counts (Appendix) suggest that the increase continues.

The largest colony is in Hermaness NMR. In June 1965, Dott (1967) estimated ca. 9,000 pairs but this figure was arrived at largely by impression and there were vast numbers of birds both on land and sea. Single counts in 1969 and in June 1974 gave 15,000 and 11,500 birds respectively, but, at least in 1974, these grossly underestimate the population. In 1974 I visited Hermaness and the north coast of Unst west of Burra Firth and was impressed both by the extent of the colonies and the numbers of birds present. Time did not allow a census but the area may have as many Puffins as St. Kilda and certainly more than the 50,000 pairs given for the whole of Shetland by Bourne & Dixon (1974). Between 1973 and 1974 the number of occupied burrows in transects increased slightly (Table 1). Lighthouse keepers also report an increase in Puffins on the skerries off the north of Hermaness.

The height and extent of the cliffs make it virtually impossible to count Puffins on Foula. Puffins were thought to have increased in the 1950's but numbers declined again in 1962-3 (Jackson 1966). Seafarer suggested order 5, probably 30,000-40,000 pairs, but J. Holbourn (pers. comm.) put the figure higher at 50,000. Brathay Exploration Group Report (1971) noted a decrease in one area between 1969 and 1971 but islanders thought the species was far more numerous in 1971. The population is still extremely large and increases have been noted in some of the smaller colonies (AKM).

No satisfactory count made at Sumburgh Head in 1969-70 but there were 1,750 pairs in 1967 (MC) and local people said that the colony was declining. In 1974 I estimated 4,500-5,500 birds and doubt that the cliffs are suitable for more pairs to breed. There are three recent counts of birds on Noss, 1100 in 1969, 1765 in 1974 and an incomplete count of 2000+ in 1973 (PKK) but R. Tulloch suggests the population may be great as 3000 pairs. The colony on the Clett of Fetlar was estimated at 1-2,000 pairs in 1959 and 1970 and there were a further 1000 pairs scattered around the rest of the island. Several of the Out Skerries

Islands support small colonies which totalled 296 birds in 1970 and 225 pairs in 1974 (ISR). The population on Fair Isle has increased this century (Williamson 1965), and, considering the difficulties in counting the area, the 1969 estimate of 15,000 pairs is not a meaningful difference from Williamson's (1965) figure of 20,000 pairs. Both local opinion and the transect burrow counts suggest that the increase continues (RAB). Apart from 1,000-2,000 birds on Uyea all the other Shetland colonies are fairly small and the few recent counts tend to be higher than those in 1969-70.

### Orkney

Balfour (1968) thought the Orkney population had declined but there is no further evidence for such a change.

About 60,000 pairs and 47,000 occupied burrows were counted on isolated Sule Skerry in 1967 and 1975 respectively (Stark 1967, Budworth & Blackburn 1975).

Sampling errors and the calculation of colony area from a small-scale map could easily explain this difference. The 5 hectares suitable for burrowing is already fully utilized so the colony cannot become larger. On Orkney proper, the main concentrations of Puffins are near St. John's Head, (estimated as order 4<sup>in 1969</sup> but extremely difficult to count due to the height and aspect of the cliffs) and on Swona where there were 500 birds and 439 birds in 1969 and 1974 respectively (KH). The remaining colonies are mostly small and widely dispersed. More birds have been reported from Papa Westray, Westray and Copinsay since Seafarer, and breeding noted on Gairsay in 1975 was probably a new colonisation (AA).

### Highland Region

There are colonies on many of the cliffs from the northern Sutherland-Caithness border eastwards to Ord Point with the largest (order 4) colonies at Duncansby Head, Ceann Leathad, near The Neck, actually at the border, and Dunnet Head. All these colonies badly need counting as the available figures are little more than guesses yet total ca. 20,000 pairs. The population at Duncansby Head was reported as declining in 1972 and 1973, while there may have been an overall slight increase in birds at the Caithness colonies in 1974 (SER).



The largest British mainland colony, at Clo Mor (order 5 in 1969), has been said to have seriously declined in the last 20 years (SBR, Cramp et al 1974). However this conclusion was only a general impression based on comparing a two-week stay in 1950 with a single afternoon's visit in 1971 (IP) so must be treated with reserve. I did not notice any great change between visits in 1959 and 1972, nor had the population obviously altered between 1971 and 1975 and is probably in region of 25-50,000 pairs (JLFP). Puffins breed at only low densities at the eastern end of Clo Mor near the military gunnery range, despite apparently suitable habitat. As Puffins here are disturbed more than other seabird species during the annual summer bombardments it is conceivable that the colony might have contracted due to these military activities (JLFP). The nearby Faraid Head colony was put at ca. 600 pairs in 1969 but a careful count in 1971 showed 1,300 occupied burrows (Evans 1971). On Hunda Island numbers have probably remained at 450 pairs from 1959 (Dickinson & Harris 1960) to 1974 though only 307 birds were counted in 1970 (SBR). The colony on Am Balg was previously larger than its two Seafarer estimates of 125 burrows and 750 pairs but the timing of the decline is unknown (Parslow & Bourne 1972). Similarly obscure is the timing of declines at colonies on the Ascrib Islands and Fladda-chuain off Skye whose populations totalled only 250 pairs in 1969-70. A gradual reduction in numbers on the island of Rhum still continues despite an increase in one colony between 1969 and 1971. In the 1950's between 300 and 1500 pairs of Puffins bred on Rhum but by 1960 there were only 100 pairs (Evans & Flower 1967). In 1974 there were 60 pairs on the island (PC). There has, however, been a sustained increase on the neighbouring island of Canna with maximum counts of 1200 birds in 1962, 1350 in 1971, 1800 (including two new colonies) in 1974, and 1400 in 1975 (Evans & Flower 1967, AU). The recolonisation of the island of Eigg in about 1926 lasted until at least 1934 but no birds were seen in 1953 (Evans and Flower 1967). The only counts for Muck were 170 and 60 burrows plus 20 birds in 1963 and 1969 respectively.

#### Strathclyde Region

All the colonies on the Treshnish Islands have increased; there were at least 1863 individuals on Lunga in 1974 (BL) compared to two counts of 650 and 1673 birds in 1969. A count made of Staffa from the sea in 1969 produced only 70 birds but/

there were ca. 200 and ca. 250 pairs in 1972 and 1974 respectively (CPA).

Following a decline in the early 1900's the Ailsa Craig colony was almost deserted by 1934. An increase to 246 pairs in 1950 (Gibson 1951) was shortlived and the population was 17-20 pairs in 1969, 22 pairs in 1971 (SBR), 8 pairs plus 12 other birds in 1974, and a few more in 1975 (SW). The only other well established colonies in the area are on Sheep Island and Glunimore in the Sanda Group (details in Gibson 1969). Glunimore was colonised about 1920, the population reached a peak of 200 pairs in 1955 before declining to 125 pairs in 1969. The colony on Sheep Island increased from a few pairs in the 1920's to 200 pairs in 1964 before declining again to 100 pairs in 1969. There are also a few pairs on the Mull of Kintyre (10 pairs in 1956, 12 pairs in 1968, none in 1970 (Gibson 1969)), Iona, Jura and Islay.

#### Western Isles

Several visitors in the first half of this century remarked on the vast numbers of Puffins on North Rona but by the time of the first count in 1958 the population numbered only 8,000 pairs (Dennis & Waters 1962). An apparent reduction in colony area had occurred by 1966 (Robson 1968) and a further reduction by 1972 when there were 6,200 pairs (Evans 1975). The reduction of numbers on neighbouring Sula Sgeir between 1932 and 1949 was possibly due to soil erosion (Atkinson 1949). In 1972 there were ca. 460 pairs (Evans in press). On the Flannan Islands 5,000 out of the 6,000 individual Puffins counted in 1969 were on Eilean Mor. In 1975 there were ca. 4,000 active burrows occupying more-or-less the same area as the colony in 1969 and many more Puffins were seen standing on nearby Eilean Tighe (RP, SM, FGH).

St. Kilda has probably always held the largest British Puffin colonies but it is difficult to interpret past counts. Flegg (1972) has given reasons for supposing a very considerable decline in the period 1969-71, but this has now slowed down if not stopped on Dun and Hirta where transect counts have remained more-or-less constant since 1971 (Table 1). The number of occupied burrows on Dun was estimated at 33,800 in 1969 (GWVB), 7,000-20,000 in 1971 (Flegg 1972) and 33,000-35,000 in 1975 (SM, MPH). These estimates were obtained by slightly different methods and so are not directly comparable. On Hirta the extent of the



colonies on Soay and Boreray in 1971 and estimated a maximum of 77,000 occupied burrows on each island. I made short visits to both areas in 1975 and the colonies were still thriving. The population of the St. Kilda group is probably in the region of 100,-150,000 pairs and the available evidence suggests that the previous decline has halted at least temporarily.

The 1975 count of 5,700 pairs of Puffins on Mingulay (SHS) is far higher than previous estimates of ca. 1500 pairs in 1962 (RJD), 3379 birds in 1964 and 1080 pairs in 1969 (Diamond et al 1965). Puffins on the neighbouring Berneray and Pabbay have not been counted recently but the former had 330 birds and 273 birds in 1964 and 1969 respectively, the latter 37 birds in 1964 (Diamond et al 1965). Haskeir was not visited in Seafarer but there were about 50 pairs in 1953 (Roberts & Atkinson 1955). Elsewhere in the Outer Isles the species breeds on Coppel, Casker and Causamul but the total population is less than a hundred pairs.

Although there is no information on the date of its start, the recent decline in numbers on the Shiantas has been documented by Brooke (1972a). In 1970 there were thought to be ca. 77,000 occupied burrows but the numbers declined by 20% in each of the next two years. The downward trend appears to have been reversed on Garbh Eilean (earlier). The colony on nearby Eilean Mhuire crashed from 15,000 pairs in 1970 to 7,000 pairs in 1971 followed by a more gradual decrease to 5,700 pairs in 1973 (Brooke 1972, GU). No counts have been made since but large numbers of birds were present in May 1975 (CKN) at a time when only non-incubating adults would have been standing around the colony.

#### Grampian, Tayside, Fife, Lothian and Border Regions

Relatively small but increasing numbers of Puffins occur on most suitable coasts and islands from Troup Head south to St. Abbs Head. The principal mainland colonies are Troup Head, near Downies (ca. 50 pairs in 1965, ca. 300 pairs in 1974 (RR)), Foulthugh (ca. 100 birds in 1969, 235 in 1975) and Lud Castle. Much larger increases and new colonisations have occurred on the islands in the Firth of Forth (see appendix). The most spectacular has been the Isle of May from five pairs in 1959 to 2969 occupied burrows in 1975. (The figures of

2,500 pairs in 1969 and 3-4000 pairs in 1972 (Eggeling 1974) were inflated due to inclusion of rabbit burrows). Ringing has shown that part of this increase is due to immigration of young birds from the Farne Islands.

#### Dunfries and Galloway Regions

Less than ten pairs breed at Burrow Head, Mull of Galloway and Scar Rock.

### ENGLAND

Most southern colonies are mere remnants of once large colonies and the numbers of birds present are still declining. Colonies in the North-east are expanding in association with similar changes in eastern Scotland.

#### Cumbria

There has been a slight increase in the number of birds at St. Bees Head from seven in 1969 to 20 in 1975 (JS).

#### Northumberland

The numbers on the Farne Islands have steadily increased since the early 1900's (Watt 1951). Recent counts of pairs are 6800 in 1969, 11,336 in 1971, 12,926 in 1973, 13,363 in 1974 and 13,600 in 1975 (NNHS, MH). There has been redistribution of the Puffins between the various islands due to soil erosion caused, at least in part, by the birds themselves (GH). A similar increase has occurred on Coquet Island. Birds were first seen ashore there in 1962 and the first record of a bird entering a burrow was in 1964; fish were first recorded being brought ashore in 1966 (JCC). There were 400 birds in 1969, 300-350 burrows in 1971, 350 burrows in 1972, 700-800 burrows in 1974 and 635 burrows in 1975 (Dunn 1972, RSFE). The apparent decline 1974-5 is due to a more rigorous definition of "an occupied burrow" (RG).

#### Humberside

Numbers of Puffins at Beapton and Flamborough Head declined between 1906 and 1952 though there was a single report (1945) of a slight increase (Chislett 1952). In 1969 and 1974 these colonies held a total of 997 and 2635 birds



respectively. An incomplete survey in 1975 found 1791 birds where there had been 812 and 2059 in 1969 and 1974 respectively (RSB).

#### Isle of Wight

There has been a steady decrease in numbers since 1923. There were 300-350 birds in 1937 (Cohen & Taverner 1972) but the largest recent count was 20 birds in 1968. A very few pairs may still breed near the Needles (JT).

#### Dorset

Between four and 10 pairs still nest at Portland Bill (ISR). Numbers in the eastern part of the county have gone from 35 pairs in 1964 to 19 pairs in 1974 and 17 pairs in 1975 (Hayson 1975).

#### Cornwall

Numbers had decreased greatly on the mainland by 1948 (Ryves 1945), and only 226 birds were seen in 1969. One hundred and twelve of these were on Lye Rock, where there had been 3,500 birds in 1942 and 200 birds in 1967 (Penhallurick 1969); in 1973 only 24 were counted on this rock (CEWSR). A decline on the Scilly Isles (ca. 100,000 birds in 1908) started soon after 1908. There were still thousands of birds present in 1924 but only 60-100 pairs could be found in 1967 and the population has remained small ever since (Penhallurick 1969). The latest counts are 53-57 pairs on Annet and 34 elsewhere in 1974 (Allen, 1974).

#### Devon

Puffins breed on Lundy where there were 3,500 pairs in 1939 and 400 pairs in 1953 (Davis 1954), 41 pairs in 1969, 164 birds (with just one seen carrying food) in 1972, 100 birds in 1973 (LBO).

#### Isle of Man

In recent years the Galf of Man colony has increased from 14 pairs in 1967 to 30 pairs in 1974 and 100 birds in 1975 (CMO). Elsewhere on the Isle of Man there were ca. 35 pairs in 1969 (Gullen & Slinn 1975).

## WALES

All colonies have declined this century but most populations are now stable.

## Gwynedd

The colony on Ynys Gwylan-fawr was estimated at 450-500 pairs in 1958 (Bennerman 1963), 400 pairs in 1966 (RST) and ca. 500 birds in 1969. It has not been counted since but there appear to be fewer birds when viewed from the mainland (RST). In 1961 15-20 pairs bred on Ynys Gwylan-fach but no birds were seen in 1968 (BBO). The once-large population on St. Tudwals was thought to be extinct by the early 1950's but four birds were seen offshore in 1967. Occasional pairs are regularly seen on the Great Orme and probably breed there (Hope Jones & Dare 1976).

On Anglesey the colony on Puffin Island has varied greatly over the years, e.g. less than 50 pairs in 1903 and 1911 but 2,000 pairs in 1907 (Forrest 1919), 300-400 pairs in 1960 (MRH), 100 individuals in 1969, 141 pairs in 1971 (GW), and 400-500 birds since then (RW). In recent years increasing numbers of birds have been seen at the small colonies on the Skerries and near Holyhead (RWA).

## Dyfed

In 1946 Buxton & Lockley (1946) estimated 50,000 pairs but there were only 7,000 pairs in 1963 (DRS) and 1971 (PC). The population is now more-or-less stable at 5,200-6,500 pairs (Birkhead & Ashcroft 1975). Skokholm's population was estimated at 40,000 birds breeding in 1930 (Lockley 1953), 5, - 10,000 pairs in 1953 (Conder 1953), 6,000 pairs in 1955 (Dickinson 1958) and 2,500 pairs in 1969 and 1971. Grassholm was once among the largest Puffin colonies in Britain (Drane 1894) but the top of the island collapsed due to soil erosion before 1928 (Lockley 1953) and only very few birds are ever seen now though a few probably breed. Other colonies, e.g. St. Margaret's Island, Middleholm, South and Middle Bishop, total only a few hundred pairs. The colony on Cardigan Island (25-30 pairs in 1924) died out by ca. 1930 (Ingram et al 1966).

## West Glamorgan

A few Puffins frequent Worm's Head but breeding was last proved in 1963 (RJH).



This population was probably increasing at the end of the last century but a general decrease was noted between 1925 and the early 1960's (Kennedy *et al* 1954, Rutledge 1966). In some colonies the decline continued until 1969 but may now have stopped.

#### Co. Wexford

Numbers on Great Saltee decreased between 1912 and 1930 and, apart from a doubling between 1943 and 1949, this decrease continued into the 1950's. A slight increase was detected 1960-64 and since 1965 estimates have fluctuated between 400 and 1050 birds but there is no significant trend. Neighbouring Little Saltee had ca. 25 pairs in 1969. (Details from Cabot 1976).

#### Co. Cork

Cape Clear had 30 pairs in 1963, 13 pairs in 1967, 10-12 pairs in 1969 and 1975 (Sharrock 1973, KP). In 1970 the colonies on Bull and Cow Rocks were estimated as 200 pairs and Order 3 respectively (RGHE).

#### Co. Kerry

The history of Puffins at the Blasket Islands colonies has been documented by Evans and Lovegrove (1973). The biggest changes have been on Inishtearaght (whose colony declined from 20,000 pairs in 1963 to 7,500 pairs in 1969 but has since remained at about this size) and Great Skellig where there was a significant reduction between 1973 and 1975. Soil erosion is occurring at these and some of the other colonies and declines can be anticipated. The small numbers breeding on Great Blasket disappeared between 1933 and 1953. The timing of a reduction in numbers on Little Skellig is unknown, but may be due to the increasing number of Gannets. Against these losses can be put small increases on Ruffin Island (5,000 pairs to 7,000 pairs between 1967 and 1973) and Inishnabro the nearest colony to Inishtearaght (116 pairs in 1965, 500 in 1969, 600 in 1973).

## Co. Clare

In 1969, 646 individuals were seen ashore along the 5 km length of the Cliffs of Moher area but at the time this was thought to be an under-estimate. More recent observations have suggested probably at least ten times this number (CSL).

## Co Mayo

Two thousand pairs bred at Illaunmaistir in 1966 and 1969 (JK) and ca. 5,000 birds were seen offshore in 1970 (OJM) but far fewer birds were recorded in 1975 (CSL). The Bills Rock colony has not been censused since 1967 when there were 1900 pairs (Cabot 1967). Clare Island, Stags of Broadhaven and Blackrock totalled 1700 pairs in 1954 (PSR) but held far fewer in 1969.

## Co Donegal

There are Puffin colonies on Tory Island (711 birds in 1970), Horn Head (250 birds in 1969) and at Tormore (ca. 1,000 pairs in 19<sup>70</sup>~~67~~); small numbers also nest at few other places. No Puffins were seen in 1969 at the site of a previous colony at Aranmore.

## Co. Antrim

The main colony, on Rathlin Island, had 2,200 pairs in 1967, 817 pairs in 1969 (including 300 pairs in one stretch of cliffs where there had been 1,350 pairs in 1969) and 1,564 pairs (maximum head count 3,000-5,000 birds in June) in 1974 (PSW). A partial count in 1975 resulted in 1,067 birds where there had been 520 pairs estimated in 1974 (SW). Small numbers nest on Huck Island, The Gobbins, Carrick-a-rede, Sheep Island and Larrybane (JC, PSW).

## Co. Dublin

Colonies on Lambay Island and Ireland's Eye were counted from the sea and appeared to have declined to 100 pairs in 1970 and 8 birds in 1969 respectively by 1960-70 - about a tenth of the 1939 estimates (Lockley 1953).



## CHANNEL ISLANDS

Most Puffins nest on Burhou where, following a decline from tens of thousands of birds in the early 1950's, the population has remained stable from 1969 to 1974 at ca. 1000 individuals (Dobson 1952, RB).

A similar decline in numbers this century, and a possible levelling off in recent years, is recorded for Jersey (10 pairs 1969, 30-40 birds present and 14+ young being fed in 1974 (Jones 1975)), Herm and adjacent islets (12 pairs plus 64 birds in 1969 but fewer since) and Sark (25 pairs 1969) (RB).

## Status in other countries

## Brittany

By far the largest French Puffin colony is at Sept-Iles where there were 10-15,000 pairs at the end of the last century, 7,000 pairs from 1927 to 1950, then a gradual reduction to 2,500 pairs in 1966. Following the Torrey Canyon oil spill in 1967 the population fell to 400-500 pairs in 1969 and remained there until a further small decline to 350-400 pairs in 1973. The other colonies are at Cap Sizun (2-5 pairs 1938 to 1973), Presqu'île de Crozon (60+ pairs in 1930, 3-6 pairs in 1973), Archipel de Molène (130 pairs in 1930, 30-60 in 1967, 12-13 in 1973), Ushant (less than 20 1956-71), Baie de Morlaix (13-15 pairs in 1970, 25 pairs in 1975) and possibly a couple of pairs at Cap Fréhel. Small numbers previously nested on Archipel d'Houat and Archipel de Glénan. (Information supplied by Y. Brien.)

## Faeroe Islands

Earlier this century there were large declines, attributed in several cases to rats, in Puffin populations on the larger islands. However in recent years the populations appear to be holding their own. Only close to villages, have declines been noted, presumably due to persecution. There have been two estimates of the colony at Lamba on western Mykines. In 1967 the colony was estimated at 29,000 burrows ( $1.74 \text{ burrows/m}^2$  (Watson 1969)) whereas in 1972 it was put at 19,000 pairs mainly because the area of the colony was estimated at only  $10,262 \text{ m}^2$  the burrow density being  $1.84/\text{m}^2$ . However J. Dyck, who took part in the latter count, doubts that this is a true decline, rather that it was due to inaccurate

measurement of the area of the colony.

The population is estimated at 400,000 - 1,000,000 pairs (J. Dyck personal communication).

## Iceland

The biggest concentration of Puffins colonies in Iceland is on the Westmann Islands where the population is estimated at 2-3 million birds. From about 1850 until 1870 the Puffin population of the Westmann Islands declined drastically (Jonsson 1896) due to the use of nets spread over burrow entrances to catch breeding birds. About 1870 ~~when~~ <sup>and around 1875</sup> this practice was banned the 'fleygastang' (a large type of landing net which catches mainly non-breeding birds flying around the colonies was introduced from the Faeroes. This soon resulted in an increase in numbers <sup>(Jonsson 1896)</sup> and the population has probably remained stable since. The second biggest Puffin area is in the Bay of Breidifjordur in north-west Iceland. Here the population seems to have increased in the last decades but this is probably a return to former levels because of less persecution of breeding birds in recent years.

The total population is probably now in the order of 3-10 million birds. Lockley (1953) gave 5 million birds for Iceland but this may well have been an underestimate as it was based on only a single visit to the Westmann Islands. The overall impression is that no general decline has taken place in recent years, if there has been any change it is likely to have been an increase. (Information supplied by A. Petersen).

## Sweden

During the 1950's and 1960's a few pairs bred on two small islands off the coast of Bohuslan. The last breeding record was a single pair in 1970. Since then there have been only a few sight records of Puffins in that area (S. Hedgren personal communication).

## Germany

Now extinct though previously (to 1835) small numbers bred on Heligoland.

## Norway

The species breeds at 29 localities with a total population estimated at 12



million pairs. Over half are on the island of Røst in the Lofotens and a further quarter at eight other colonies; there is no firm evidence for any change (Brun 1976).

#### U.S.S.R.

Dement'ev et al (1951) gives the distribution as follows - "In U.S.S.R., large colony of Puffins - about 20,000 pairs - inhabits Ainov Is. Largest colony on Sam Ostrovov Is. is located on Bolshoi Zelenets I., numbering over 500 pairs. Puffin population on Novaya Zemlya small - about 70 pairs at Bezmyannaya and Gribovaya bays. This bird doubtless merits protective measures". A survey of the 11 colonies on the Murmansk coast in 1950 put the population at 16,244 pairs whereas in 1960 it was 36,000 Puffins (though whether birds or pairs is not clear). The colony on Ainov Major and Ainov Minor was put at 20,000 pairs in 1923, 11,000 pairs in 1947, 5,500 pairs in 1950, 1500 pairs in 1957, 11,000 pairs in 1958 and 11,980 pairs in 1960 (Skokova 1962).

#### Jan Meyen

The population is small, probably a few hundred pairs (R. Moss personal communication).

#### Spitzbergen

The Puffin is nowhere very numerous breeding in single pairs or in small colonies numbering not more than a few hundred individuals. No estimate of the population is available but as only 27 colonies are known the total population must be small (details from Løvenskiold 1964).

#### Bear Island

In 1970 the population was estimated at less than a few hundred birds (Williams 1971). Apparently it has never been a numerous species here (Løvenskiold 1964).

#### Greenland

The Puffin has always been a rare bird never occurring in large colonies.

like those in the boreal regions (Salomonsen 1950). On the west coast colonies are scattered and the total population can only be a few thousand pairs (details of colonies in Brown et al 1975). On the east, Puffins only occur near Scoresby Sound. These colonies must be very small; there are only two records totalling four birds in recent years and no evidence of nesting (Korte 1973).

Complete protection was afforded to the species in 1960 to prevent the destruction of nest burrows by egg collectors. Since then the populations on two skerries in the Bay of Disko on the west coast have increased from 200 and 100 pairs to 1,000 and 500 pairs respectively (F. Salomonsen pers. comm.). Further north the law is not strictly enforced but still the populations at four colonies, Horse Head, Kingigtuarssuk Middle, Torquassôrssuk and Nôrdo, changed little between 1965 and 1974. (PGHE).

#### Eastern Canada and New England

The centre of the Atlantic Puffin's ~~(*F. americana*)~~ breeding range in North America is along the east coasts of Newfoundland and Labrador. The total population is estimated to be about 317,000 breeding pairs of which 71 percent nest in four colonies in Witless Bay, Newfoundland, 20 percent in southeast Labrador and almost all of the remainder in the Gulf of St Lawrence (Brown et al 1975). The little information available from earlier times suggests that populations in the Gulf of St. Lawrence, Nova Scotia, New Brunswick and Maine have declined considerably in the last 50 years whereas there may have been a slight but noticeable increase in the colonies off Labrador. (Information supplied by D.N. Nettleship).

#### World population

The best estimates of the sizes of the various Puffin populations (the nomenclature and geographic divisions follow Salomonsen (1944), although there may be no sharp division between the races in Norway (Pethon 1967)) are given in Table 3.

No attempt is made to have a consistency of units as any conversions would compound the errors. The actual figures are little more than calculated



guesses and are not meant to be treated literally but rather as orders of magnitude. However, they do put the various populations into perspective. The high-arctic, very large-billed race F.a. naumanni is obviously a rare bird compared to the much smaller southern race F.a. grabae and the intermediate F.a. arctica. The Iceland population of the last subspecies must be many times larger than all other populations combined. Lockley (1953) estimated the total world population as not less than 500,000 breeding adult F.a. naumanni, 5,600,000 F.a. arctica and 9,125,000 F.a. grabae which gives a total similar to mine. However this overall agreement is probably a matter of chance. Some data are so subjective that little can be gained by more detailed comparisons.

The Puffin is probably the commonest sea-bird in the North Atlantic which makes it ~~surprising~~ odd that the main wintering grounds are still unknown. Presumably the many millions of birds must be very dispersed throughout the ocean during the non-breeding season.

#### Present status in the British Isles

While there have been dramatic decreases in the numbers of Puffins at many colonies during this century, the present survey suggests that the overall decline may have halted, at least temporarily. As stressed earlier, care must be taken in the use to which any individual count is put but even so the numbers of apparent increases well outnumber the apparent decreases. This could be <sup>artificial</sup> caused either by recent observers only reporting large counts, dismissing small counts as having been made on 'off-days' when the birds were not congregating at the colonies, or by recent counts being maxima of several counts whereas older counts, especially those in Seafarer, were one-off estimates. However, many of the increases have been so large and/or in well studied colonies that I think that the trend is genuine. The few recent apparent declines have been mostly in the small colonies at the southern edge of the species range, e.g. Channel Isles, Brittany, Southern England (figure 1). On the other side of the Atlantic, the most southern populations, in New England, increased steadily from near-extinction in the early 1900's but it is not clear whether the increase has continued after the late 1950's (Drury 1973). Against this the more northern populations, including those in Scotland, are flourishing.

A survey of the literature does not allow the construction of even an approximate timetable of past declines. Even in the best documented colonies it is impossible to guess either when the decline started or the approximate time of greatest drop in numbers. Many factors have often been implicated in specific declines - increases in numbers of Great Black-backed Gulls Larus marinus on North Rona and Annet, of Herring Gulls L. argentatus on Puffin Island, Anglesey, of Great Skuas Stercorarius skua on Foula, of Gannets Sula bassana on Sula Sgeir, rats on Lundy, Shiant and Ailsa Craig, and soil erosion caused by the birds themselves on Grassholm, parts of the Farne Islands and of the Isle of May (Table 1). However, in a few cases all such obvious causes of decline can be ruled out. The most puzzling instance is St. Kilda. The human inhabitants killed large numbers of Puffins for food and their feathers yet the Puffin population declined after the St. Kildans evacuated the island in 1930 (Flegg 1972). There are no rats on these islands neither has there been a large enough increase in numbers of predatory gulls to explain the decline. Probably there has been some primary common factor responsible for the past decline in many British populations whose effect has been accentuated by the various secondary influences mentioned above.

Despite earlier concern, contamination by pollutants appears not to be an important cause and most birds have low levels of toxic chemicals and heavy metals (Farslow et al 1972). In any case many declines took place before pollutants became a serious threat to the environment. Lockley (1955) suggested that climatic changes might have resulted in a reduction of the species' food supply but Cramp et al (1974) thought that such changes were unlikely to be implicated in the recent declines in northern Britain. My personal view, based on studies continuing on St. Kilda, agree with Lockley, i.e. that changes in the marine environment are likely to have affected the Puffin's food supply, possibly during the breeding season. Southward et al (1975) have shown that, despite short term fluctuations approximating to a 6-11 year cycle, the sea off southern England is getting colder. The peak sea temperature of a long term cycle was reached in the 1940's or 1950's and the temperature has been falling since about 1960. These workers predict that this gradually cooling-off should continue until 1990 or later and will



result in increases in the abundance of cold water marine species. Indeed such changes are already apparent with the return of some fish, e.g. cod and haddock, to certain areas. Some British populations of Guillemots are now increasing after a period of decline (Harris 1976, Lloyd 1975) and it may not be a coincidence that Puffins also seem to be coming upon better times.

### The Future

Regular monitoring of Puffin colonies on St. Kilda, The Shetlands, Hermaness, Faraid Head and the Isle of May is to continue as part of the Institute of Terrestrial Ecology's research into this species. Study plots are also in position on North Rona (PHEE) and Flannan Islands (SM, PGH) and it is hoped to visit these from time to time. Other workers are following colonies on the Blasket Islands, Farne Islands and Skomer. Together these give a good geographic coverage of the bulk of the British population. There are few other large colonies where it is feasible or safe to set up similar studies but the coverage could be expanded to include some smaller colonies if more people were interested.

All these quadrats are in grassy areas but many birds have their nest-sites out of reach among boulders. Such boulder colonies are sometimes of considerable size, e.g. one on Garbh Eilean, Shetlands has been estimated at 45,000 pairs (Brooke 1972b). It is possible that population trends in these colonies might be different to those in grassy areas. Attempts have been made to estimate the size of these boulder colonies by comparing the numbers of birds seen carrying fish into the area with similar measurements made at the same time in nearby grassy colonies with a known number of occupied burrows. However, breeding may be several weeks out of phase in different colonies and even within a single colony (Hornung and Harris in prep) and the numbers of loads of fish brought to the young depends on the age of the young (R. Ashcroft personal communication, personal measurements). Comparisons between colonies, even when close together, may not be valid unless it is possible to check that the breeding seasons and nesting successes are similar. This is rarely possible and it is unrealistic to expect to get accurate counts of pairs nesting in boulder colonies.

Earlier the difficulties of interpreting counts of birds of colonies were

stressed but such counts are all we can hope to get in many colonies where burrows are inaccessible. Such counts are made on an annual basis in several places e.g. Handa, Bempton. To be of maximum use such counts should be undertaken several times a year and comparisons made between the annual maximum counts in spring or late summer. The most useful counts are those made early in the season when breeders first return to the colonies and congregate on the sea below the colonies. In most of Britain this is in mid to late April but in eastern Scotland the season is 3-4 weeks earlier. Unfortunately few people visit colonies at this time, Puffin-counting being an occupation for warm summer evenings. These late counts include breeders and immatures and bear only a complicated and ill-understood relationship to the number of breeding pairs. However if they are made several times a year at approximately the same weeks annual comparisons of maxima are still possible. Whenever counts are made it is imperative to record the time (evening or very early morning always give the highest counts), weather conditions and separately the numbers of birds on land and on the water. Actual counts should be expressed as individual birds and if any attempt is made to convert this to pairs the method used must be explained in detail.

#### SUMMARY

It appears as though the recent overall decline in the British population of Puffins, Fratercula arctica has stopped, at least temporarily. This conclusion is based on detailed burrow counts at seven Scottish colonies and a survey of published and unpublished data for other British colonies. The few recent apparent declines have been mostly in the small colonies at the southern edge of the species range, e.g. Channel Isles, Brittany, southern England. It is suggested tentatively that it is not a coincidence that the numbers of Puffins have stopped declining just at the time when the temperatures of the seas around Britain have started to fall. Information is also presented on the numbers of Puffins occurring in other parts of the North Atlantic. Iceland has more Puffins than all other areas combined and the high-arctic small-billed race is a rare bird with a population of 15,000 birds. The Puffin is probably the commonest seabird in the North Atlantic.



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Counts of pairs (p) or individual (i) Puffins Fratercula arctica at colonies not documented in the text. Sources can be identified, by initials, in acknowledgements. All 1969-70 counts are from 'Operation Seafarer'.

		Year									
Shetland		67	68	69	70	71	72	73	74	75	
Mainland	The Nab			0			c.20i				PKK
	Corbie Geo			order 2			18i	19i	27i	c.50i	LJ, MPH, PKK
	Sumburgh	1750p		250i					4500-		
	Valley of Kame			c.200p					5500i		MG, MPH.
	Red Noup			200i					110i		MPH
	Landvillas			300i					247i		MPH
	Grey Noup			order 2					1500i		MPH
	Giltarump			1p					c.100p		MPH
	Ronas Voe			50i					300i		MPH
	Vailla				17i				6i	40-50i	PKK
	Lyra Skerry				order 2				9i	20i	PKK, MPH
										230i	PKK, MPH
Yell	Red Geo			320i						200+i	PKK
Fetlar	a)			400i			125i			527i	RSPB
	b)			150i			200i		61i		RSPB
	c)			40i			80i		95i	338i	RSPB
	d)			506i			975i		406i	991i	RSPB
Outer Skerries	Housay										
	Bound				250i				42i	40p	ISR
	Bruray				40i				150p	150p	ISR
									25p	35p	ISR
Orkney	Papa Westray			4i				30+i			DL
	Corinsay			50p						120i	MB
	Switha			235i					196i		DL
Highlands	Stroma				100p				439i		RSPB
	Canna			620i	570i	1350i		765i	1800i	1400i	AN

		Year									
		67	68	69	70	71	72	73	74	75	
Grampian	Dunnottar			ca.70i						217i	MPH
	Clashrodne				12i					26i	PGHE
	Findon Ness				6i					144i	PGHE
Tay	Inchkeith	64i	44i	80i	80i	110i	350i	450i	490i	292p	SBR, ERG
Lothian	Craigleith			410i	800i	600i	325i	1400i	1170i	1100i	SBR, ERG, RMJS
Northumberland	Inner Farns			500p		721p		1585p	1554p	1140p	) MH, NNEH
	East Wideopens			700p		545p		499p	557p	657p	
	West Wideopens			1500p		2506p		1985p	2644p	2196p	
	Brownsman			2000p		3360p		5086p	4446p	5374p	
	Staple			2000p		3915p		5288p	3715p	3764p	
	South Wanses			50p		175p		271p	248p	240	
	North Wanses			50p		60p		101p	87p	93	
	Longstone End			0		4p		19p	10p	25	
	Big Harcar			0		50p		92p	82p	44	) EKD, RSPB
	Coquet			400i	200p	325p	350p		700-	655p	
									800p		
Humberside	Bempton			812i					2059i	1791i	RSPB
	Flamborough Head			185i					576i		RSPB
Dorset	Portland			6p	5-6p	5-10p	5p	6p		4p	PBO
	Anvil Point			15p			47i		19p	17p	TH
	Isle of Wight		20i	5i	4i	4i	1i	1p			HBR
	Durleston			20-30p		47i			19p		SPAC, WTH
Devon	Lundy	110i		41p	68i	120i	164i	100i			LBO
Cornwall	Lye Rock	200i		112i		42i		24i			) Penhallurick 1969, CBMS Allen (1974)
	The Molls	12p		18i		20i		6i			
	Long Island	6i		77i		35i					
	Short Island	52i		22i		6i					
	Annet	50-100p	115+1		ca.50p				53-57p		JLFP, CBMS



		Year									
		67	68	69	70	71	72	73	74	75	
Isle of Man	Calf of Man	14p	20p	25p	30p	30p	30p	30p	30p	100i	MM, RH, CHO
Gwynedd	Skerries			5p				114i			RMA, GW
	South Stack			4p			82i	26i	64i	60i	RMA
Dyfed	North Bishop		25i	40i						15p	RSPB
	St Margaret's Isle			4p	1p	2p	1p	2p	1p	3p	SJS
Channel Is.	Jersey			10p					14p+40i	4	RB
	Jethou			17i			20i	11i			<del>M Hill</del> M Hill
	Godin			50i	15i	52i	22i	16i	10i		AJB
	Galeu			0		1p		0	0		<del>M Hill</del> M Hill
	Longue Pierre			14i	9i	20i	15-20i	24i	12i		M Hill
	Burhou			1028i	500i	1000i	1000i	1080i	1000i		M Hill
	Sark			25p		16p		20-25p			FRGR
Co. Wexford	Great Saltee		875i	750i	750i	1050i	776i	400i	553i	750i	Cabot 1976

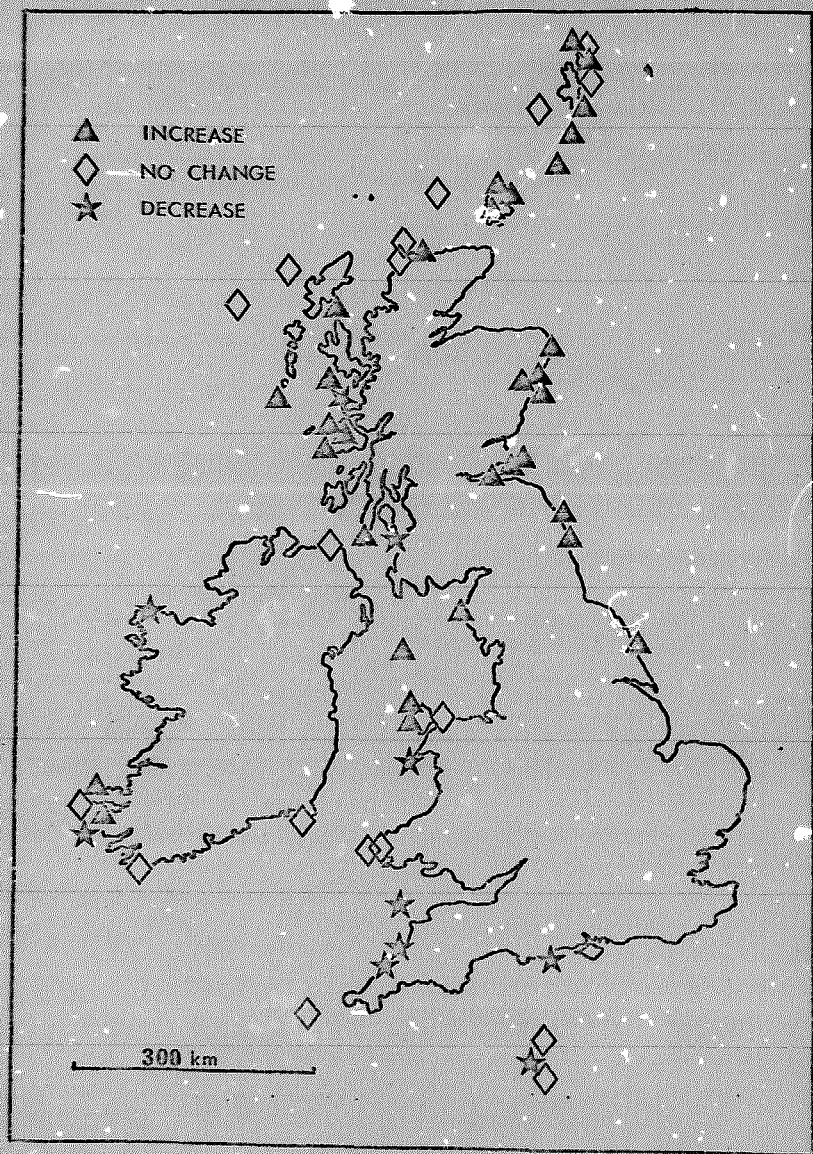


Figure 1. Changes in numbers of Puffins Fratercula arctica at colonies which have been counted or had their approximate sizes estimated since 1969-70



Table 1.

COUNTS OF OCCUPIED BURROWS OF PUFFINS Fratercula arctica IN PERMANENTLY MARKED QUADRATS

Colony	Habitat	Area monitored m <sup>2</sup>	1971	1972	1973	1974	1975	Observers
Hermaness, Unst.	Heavily grazed grass	378			182	199		USA
Fair Isle	Heavily grazed grass, some erosion	1395		86	65	117	141	RAB, MPH
St. Kilda - Dun i	Ungrazed sorrel	270	208			188	200	EKD, SM, MPH
Dun ii	Ungrazed sorrel	4595				1179	1260	SM, MPH
Hirta	Heavily grazed grass	153	36			34	57	EKD, SM, MPH
Garbh Eilean, Shianta Is.	Heavily grazed grass	1440			532	564	655	CU, MPH
Isle of May i	Rabbit-cropped grass	396		0		34	53	MPH
ii	Rabbit-cropped grass	6674				284	436	MPH
iii	Very eroded, much bare earth, nettles	c. 1400		200			153	MPH
Faraid Head, Sutherland	Grazed grass	1970		84	95			MPH

Colony	Occupied burrows per m <sup>2</sup>		Source
	Maximum	Mean	
Hermaness, Unst	1.11	0.59	this study
Dun, St. Kilda	1.7	0.4-0.6	this study
Soay, St. Kilda	?	0.18	Brooke (1972 <sup>b</sup> )
Garbh Eilean, Shianta	1.56	0.52	this study
Eilean Mhuire, Shianta	?	0.41	Brooke (1972 <sup>b</sup> )
Brownsman, Farne Island	?	0.69-1.35	M. Hornung (pers. comm.)
West Wideopens, Farne Islands	?	0.69-0.99	"
Inner Farne, Farne Islands	?	0.62-0.66	"
Sule Skerry, Orkney	?	0.85	Budworth & Blackburn (1975)
North Rona, Outer Isles	0.84	0.49	Evans (1975)
Isle of May, Firth of Forth	0.70	0.20	This study
Fair Isle, Shetland	0.67	.11	" "
Faraid Head, Sutherland	0.19	0.03-0.06	" "
Westmann Islands, Iceland	?	3.0-4.0	Fridriksson (1975)
Ainov Islands, Russia	?	0.5-1.5	Stokova (1962)
Trenyken, Norway	2.72	?	Brun (1966)
Værøy, Norway	0.80	0.01-0.48	" "
Lovund, Norway		0.2-0.4	Myrberget (1959)
Great Island, Newfoundland	2.80	1.3	Nettleship (1972)
Lamba, Faeroe Islands	?	1.74-1.84	Watson (1969), J. Dyck (pers. comm.)

Table 2. Densities of occupied Puffin burrows in various colonies. Maximum densities often occur in very small areas.



Table 3. Estimates of the orders of size of various Puffin<sup>1</sup> populations,  
(Fratercula arctica)  
 Details of sources are in the text.

Race	Place	Probable population size
Fratercula arctica grabae	Scotland	ca. $\frac{1}{2}$ million pairs
	Ireland	20,000 - 25,000 pairs
	England	ca. 15,000 pairs
	Wales	8,000 - 10,000 pairs
	Isle of Man	ca. 200 birds
	Channel Isles	ca. 1200 birds
	Brittany	400 - 450 pairs
	Southern Norway	ca. 200 pairs
	Faeroes	400,000 - 1,000,000 pairs
Fratercula arctica arctica	Western Greenland	few thousand pairs
	Iceland	8-10 million birds
	Canada & United States	ca. $\frac{1}{3}$ million pairs
	North Norway	1 $\frac{1}{4}$ million pairs
	Bear Island	few hundred birds
	Jan Meyen	few hundred birds
	Russia	? 20,000 pairs
Fratercula arctica naumanni	North-west Greenland (Thule six small colonies area)	
	Eastern Greenland	very few
	Spitzbergen	5,000-10,000 birds
	Novaya Zemlya (? this race)	few