UK CETACEAN STATUS REVIEW

Peter G.H. Evans, Pia Anderwald and Mick E. Baines

Sea Watch Foundation
11 Jersey Road,
Oxford 0X4 4RT

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1.1 INTRODUCTION The UK Cetacean Group, subsequently forming the Sea Watch Foundation, has been collecting sightings data on marine mammals from UK and Irish waters since 1973 (with some data going back to 1958) from opportunistic sightings and effort-related recording (Evans, 1976, 1980, 1992; Evans *et al*., 1986). Around three thousand persons have contributed data over this period although the bulk of information come from a much smaller number conducting regular watches either from land or on offshore surveys. The resultant database comprises c. 50,000 hours of survey effort, and around 53,000 sightings records of which 37,000 are opportunistic and the remaining 16,000 are effort-related.

In this review, as in the previous one (Evans, 1992), we have adopted the Oxford English Dictionary definition of the term "status", meaning "relative importance" of one species to another; in the present context, this is expressed in terms of the relative frequency with which a species has been observed or its relative abundance. No attempt is made to determine actual UK population sizes for any species of cetacean, since our knowledge does not extend that far, but some regional population estimates have been made over short time periods, and where these have occurred, they are cited in the species texts. Comparisons of changes in relative abundance both in space and time are made within the constraints of the areas of coverage for monitoring.

An analysis of the data was made for the years up to 1978 (mainly dating from 1973, but including regular coverage from some observers, for example weather ships and bird observatories, dating back in some cases to 1958), and published in Mammal Review (Evans, 1980). A further analysis was carried out for the years up to 1985, under contract to the UK Nature Conservancy Council (Evans *et al.*, 1986), and a status review was undertaken for the years 1986-91, commissioned by the UK Department of the Environment (Evans, 1992). The present review brings the analyses up to date, focusing upon the period 1992-2002. Emphasis is placed upon the nine commoner cetacean species, and, particularly, populations of minke whale, Risso's dolphin, white-beaked dolphin, short-beaked common dolphin, bottlenose dolphin, and harbour porpoise occurring over the continental shelf. Where possible, analyses concentrate upon effort-related data but casual records are also used when appropriate for more general distributional studies.

1.2 METHODS From the early 1960s to the late 1980s, most sightings contributed to the database were opportunistic and not from dedicated watches, with the exception of certain land-based observation points (such as bird observatories – see Evans, 1992 for a full list of land-based sites regularly watched). Subsequently, the majority have been effort-related usually from dedicated watches and made from both land and offshore. Effort intensity also varies and within the database has been scored into seven categories (Table 1).

Land-based watches are mainly from headlands or islands, of 1- to 3-hour duration, and, for a number of sites, conducted on a regular basis varying from frequent intervals (daily to weekly) between April and September to longer intervals (weekly to monthly) in

winter (though some sites are not watched at all in winter). During the course of the watches, visual scans with the naked eye are generally made to detect cetaceans, followed by binocular or telescope observations to confirm possible sightings and determine species identity, group size, presence of calves, and behaviour. Effort is recorded as start and end time of watches along with duration of watching in minutes. Environmental data are usually collected at 10- to 30-minute intervals and include cloud cover, wind direction and force (using Beaufort scale), sea state, swell height, precipitation, and visibility.

Table 1. Effort Intensity Categories

Category	Effort Intensity
1	Casual watching (generally applied to wardens, etc, of small island observatories who are present over particular time periods but are not actually conducting dedicated sea watches)
2	Dedicated watching of the sea (applies mainly to ferry operators, yachtsmen, persons on watch of merchant or naval vessels, weather ships, etc) by persons inexperienced at observing cetaceans
3	Dedicated watching of the sea for non-cetacean Marine wildlife (seabirds, sharks, etc) by persons inexperienced at observing cetaceans
4	Dedicated watching of the sea for non-cetacean Marine wildlife (seabirds, sharks, etc) by persons experienced at observing cetaceans
5	Dedicated watching for cetaceans by inexperienced observers
6	Dedicated watching for cetaceans by experienced observers
7	Dedicated watching for cetaceans by experienced observers using line transect distance methodology

Offshore observations involve a combination of platforms of opportunity including research vessels, fishery protection vessels, seismic vessels, whale watching vessels and ferries, and cruises dedicated to surveying for cetaceans. Until Global Positional Satellite (GPS) systems were available, regular positions of the vessels were usually taken by DECCA navigation; during the 1980s, these were increasingly replaced by GPS, which could also directly record the speed and course of the vessel, usually done at 10- to 30-minute intervals. With DECCA, sightings were recorded to the nearest minute (= 1 nm), but once GPS had been introduced, positional data was generally recorded to the nearest second. For surveys at effort intensity category 7 and in some cases, category 6, distance and angle measurements were also taken, allowing positions to be plotted to a greater accuracy (generally within 100 metres).

Sightings are recorded on standardised recording forms, with identification verified from a description of diagnostic features or from photographs, except in the case of trained observers and others regularly observing that species, when supporting data for every sighting is no longer required (see section on Quality Assurance).

Structure of the database

All records are transcribed and coded onto an Access computer database along with various environmental data such as weather conditions particularly sea state, water depth, and sea surface temperature (see Appendices 1-4).

In any database, data are held in tables in which each row represents a single record (e.g. a sighting event) and each column represents a field or specific item of information (e.g. species, group size, etc). A simple database might consist of a single table, but this becomes very inefficient for larger sets of data. One of the main problems associated with single table databases is the large amount of repeated or redundant data in the table, making it slow and unwieldy to manipulate. Such problems can be overcome by using the relational database model (Codd, 1970), in which the data are divided among several tables, linked by common fields. So, for example, details of the names and addresses of observers may be stored in a separate table, with links to other tables provided by a unique reference number for each observer. It is then necessary only to incorporate a field for the observer reference number in a table holding sightings data, rather than repeating all the fields required for names and addresses.

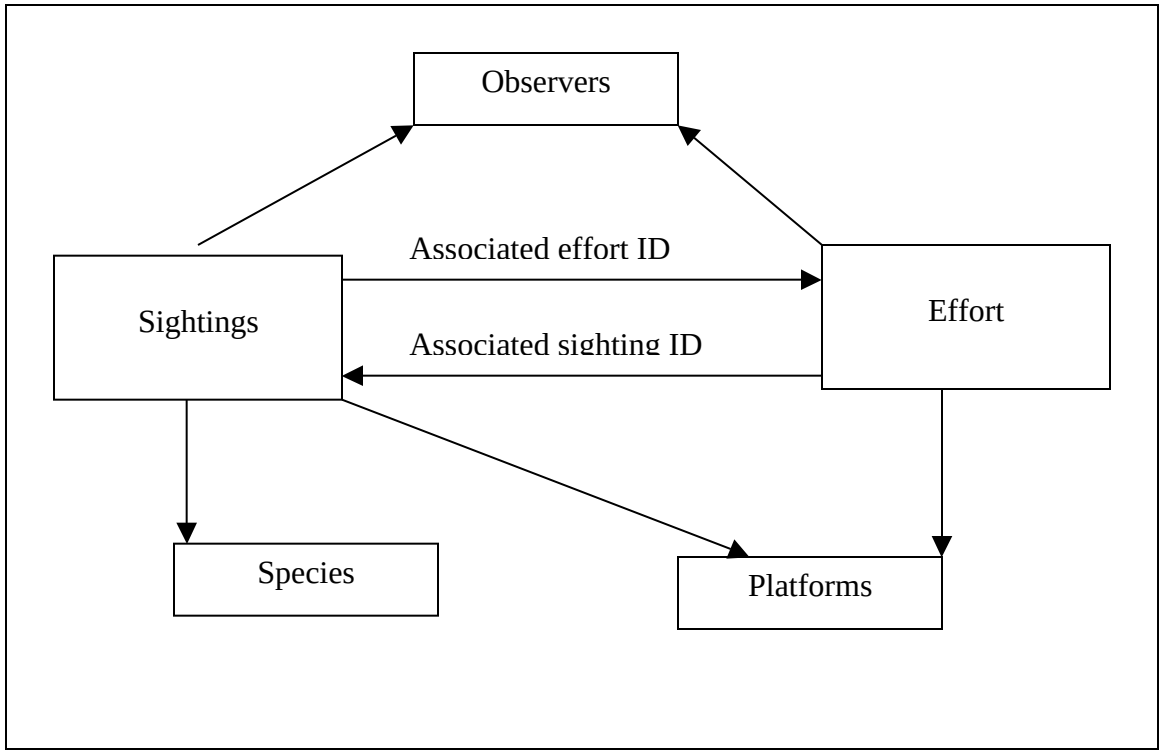

Figure 1. Schematic diagram outlining the structure of the Sea Watch database (each box represents a table; arrows represent common fields linking the tables)

The main tables and the most important linking fields that define the relationships between the tables in the Sea Watch database are shown in Figure 1. There are two large tables, one holding sightings data, the other holding effort data. When sightings were made during periods when effort was recorded, a field in the sightings table holds a code

identifying the corresponding effort record. Effort records have a field containing the identity codes of any sightings made during that effort period. There are also links between the sightings table and tables holding observer details, platform details, and species names. The effort table is also linked to observer and platform tables.

In addition to the main tables referred to above, there is a table to hold details of persons who have entered data, and a table to record the update history of the database.

Analyses In order to provide a standardised description of animal distribution, sightings rates are used to describe the perceived density of animals in particular areas. Usually, sightings rates are presented as encounters per km of survey track line, but since some data used here were collected by stationary observers from vantage points such as cliff-tops in timed intervals, the number of sightings and number of individuals sighted per unit time (per hour in this case) were considered to be more appropriate measures of sightings rate and individual rate. Distribution maps are constructed using the GIS program ARCVIEW linked to the Access database. Although sightings rates are known to be affected by weather conditions (particularly sea state), no attempt has been made here to correct the data for this. A more detailed analysis of harbour porpoise data making such corrections has been presented in Evans and Wang (2002). Distribution maps showing numbers of individuals sighted per unit time, corrected for sea state and summed by grid square (one degree of longitude by half a degree latitude), using the standardised system developed by the International Council for the Exploration of the Sea (ICES), are presented elsewhere (see Reid *et al*., 2003).

In this review, individual sightings for each species are plotted directly on maps. These include both casual sightings and effort-related observations. For particular analyses (for example, regional comparisons of seasonal variation in sightings frequency), data have been grouped into 11 major sea areas which can be described broadly as follows (in clockwise direction): West Scotland; North Scotland (Caithness and the Northern Isles); East Scotland (northern North Sea); Eastern England (central North Sea); South-east England (southern North Sea and eastern Channel); South-west England (western Channel); Wales; North-west England (including Isle of Man); Northern Ireland; Eastern Ireland; and Southern and Western Ireland (see Fig. 2). It should be noted that regional analyses use only data from within those boundaries (i.e. within the median lines between adjacent nations; otherwise (as off western Scotland), out to the 200 mile EEZ). Sightings from adjacent seas beyond these boundaries are shown in the direct plots, and are used for off-shelf vs on-shelf comparisons.

Numbers of sightings and of individuals per hour of observation are used for an examination of long-term trends for those species where sufficient effort-related sightings data exist (minke whale, Risso's dolphin, white-beaked dolphin, short-beaked common dolphin, bottlenose dolphin, and harbour porpoise). Cuzick's trend tests (Cuzick, 1985) are then applied to test for trends, and the significance level of P=0.05 is corrected for multiple testing using a Bonferroni adjustment. Table 2 summarises effort for each region in the different time periods.

DATA INTERPRETATION

Quality Assurance Analyses are conducted making the assumptions that species were identified correctly, there is no bias in the estimated numbers of animals per group for each sighting, nor in the recording of associated data on sea state, location, and other environmental parameters. Emphasis is placed upon not assigning records to a particular species if this could not be confidently done, and, instead, broader category codes are used for this purpose (see Appendix 3).

Although errors in identification can occur even with observers that have received training, there is a higher probability of this happening when the network of observers involves a large number, and they are of varying abilities and experience. In order to cater for this, we have produced various identification training aids – an illustrated booklet, a laminated chart and poster, a slide pack of 80 slides, and, most recently, a video. Training courses (involving a combination of lectures and practical sessions) are held for observers undertaking effort-related watches. Finally, identifications from observers whose knowledge and experience of identification of that particular species are not known are accepted only on the basis of adequate field descriptions or supporting photographs or drawings, and detailed recording forms have been developed for the purpose This is particularly important for species of similar appearance such as fin and sei whale, short-beaked common and striped dolphin, white-beaked and Atlantic white-sided dolphin. It is not usually an issue for the two commonest near-shore species – the harbour porpoise and bottlenose dolphin.

Once species verification has taken place, there remains the possibility of errors in coding. For species codes, this is avoided now by using letters (such as HP for harbour porpoise – see Appendix 3); previously, numeric codes (e.g. 2241 for harbour porpoise) had been used. Once data have been coded and entered onto an Access database, an error checking procedure is applied with each line checked by a separate person against the original record sheets. This could not be applied to those datasets supplied electronically by other groups where the original data sheets have not been viewed (notably, Cornwall Wildlife Trust data supplied by Nick Tregenza, the Biscay Dolphin Research Programme aboard the Pride of Bilbao ferry, the Plymouth-Santander ferry surveys, and the surveys in North Wales by Friends of Cardigan Bay/WDCS, and by Marine Awareness North Wales (Richard Shucksmith, Emily Dicks and others)). However, a series of error checking computer programs were run on the entire database. These helped to identify: 1) duplicate sightings (for example, where separate observers have reported the same sighting); 2) any transect lines that cross land (this can occur when locational information is provided on either side of a peninsula which is then rounded by the survey vessel; and also may occur if the meridian east and west of Greenwich is mis-coded); 3) distances traversed in an impossibly fast time; and 4) sightings made in unlikely conditions of visibility such as darkness. All errors of this nature found within the database were either corrected, or, if the original records could not be checked, those data were omitted.

Biases in Coverage

Although all months of the year and all regions of the British Isles have been covered, effort has been greatest between April and September (see Fig. 3), within 30 km of the coast, and in certain regions (North and West Scotland, Irish Sea, and the Channel). These biases will obviously be reflected in the distribution maps and those seasonal plots where effort is uncorrected.

Table 2. Distribution of Effort (in hours) by 4-year period since 1980

Region / Year	1980-82	1983-86	1987-90	1991-94	1995-98	1999-2002
E Eire	0	0	0	63	110	9
E England	1791	2626	2756	2171	62	17
E Scotland	4	0	134	5702	2001	614
N Ireland	0	0	0	22	15	0
N Scotland	87	117	610	5289	609	68
NW England	0	0	3	22	833	0
S & W Eire	0	0	78	77	141	0
SW England	0	522	413	4124	2184	84
W Scotland	0	0	48	2912	1433	588
Wales	111	147	1092	1875	2357	2049

Table 3. Distribution of Effort (in hours) by region for entire Sea Watch database

Region	Total effort
E Eire	182
E England	17981
E Scotland	8459
N Ireland	37
N Scotland	6809
NW England	858
S & W Eire	429
SW England	7327
W Scotland	4981
Wales	7772

Survey effort has varied over time, with some regions receiving more intensive coverage (see Tables 2 & 3), detailed as follows: Between July and October 1980, dedicated surveys for cetaceans and seabirds were conducted in the waters west of Britain and Ireland (from 47-61^{o} N, 5-12^{o} W) (Evans, 1981). Between June and October 1988 (Evans and Lane, 1989), August and September 1990 (Evans and Gilbert, 1991), and May and September 1992-95 (Evans, 1997; Evans *et al*., 1997), regular land-based surveys were conducted in Shetland coastal waters, with boat surveys between 1992-95. In 1990-91, boat surveys were conducted on average every two months in the Moray Firth (Evans and

Lewis, 1993). Between June and September 1992-99, boat surveys were undertaken in the Minches and Sea of Hebrides, West Scotland (Boran *et al*., 1999). During the summers of 1990-present (July-August in the early years, April-September more recently), boat surveys have been undertaken in southern Cardigan Bay. Surveys covering all of the Irish Sea were made in June and August 1995; and parts of the Celtic Sea, Channel, and southern North Sea between August-October 1997 and March-June 1998 (Rosen *et al*., 2001), and along the Aberdeen coast from 1998 to the present (Weir and Stockin, 2002). In addition to those dedicated surveys, ferries as platforms of opportunity have been used for effort-related recording in various parts of the UK but particularly in the Channel from Plymouth to Santander between March and November 1993 to the present (Fletcher and Curtis, 1999), and Portsmouth to Bilbao on a monthly basis between August 1995 and the present (Williams *et al*., 2001). Only the data from the earlier Channel ferry surveys have been submitted to the database at this stage.

Table 4. List of sightings records according to species (in decreasing order of abundance)

Species	No. of Sightings	% Sightings	No. of Individuals	% Individuals
Harbour Porpoise	27122	52.91	105058	33.60
Bottlenose Dolphin	10475	20.43	77671	24.84
Long-finned Pilot Whale	1472	2.87	38103	12.19
Short-beaked Common Dolphin	1856	3.62	25821	8.26
White-beaked Dolphin	1232	2.40	12596	4.03
Risso's Dolphin	953	1.86	5846	1.87
Atlantic White-sided Dolphin	224	0.44	5811	1.86
Minke Whale	2549	4.97	3550	1.14
Killer Whale	574	1.12	2513	0.80
Sperm Whale	90	0.18	321	0.10
Northern Bottlenose Whale	104	0.20	298	0.10
Fin Whale	106	0.21	255	0.08
False Killer Whale	4	0.01	134	0.04
Striped Dolphin	15	0.03	122	0.04
Humpback Whale	46	0.09	55	0.02
Sei Whale	27	0.05	47	0.02
Beluga	12	0.02	12	0.00
Cuvier's beaked Whale	6	0.01	9	0.00
Northern Right Whale	3	0.01	4	0.00
Narwhal	2	0.00	4	0.00
Pygmy Sperm Whale	3	0.01	3	0.00
Sowerby's beaked Whale	1	0.00	1	0.00
All Identified Species	46876	91.44	278234	88.99

A summary of the number of sightings and number of individuals of species within the Sea Watch database is given in Table 4. This includes only those records identified to species (thus overall percentages are less than 100%), and from UK and adjacent seas.

RESULTS

Systematic List

Twenty-eight species of cetaceans have been recorded during the present century in British and Irish territorial waters. Twenty-five of those species have been recorded in the last ten years; and fifteen species are either resident or at least annual visitors to the region.

In this review, the sightings data have been treated in the following manner: (1) all records are listed for rare species (defined as those species with ten or less sightings since 1966); (2) direct plots of all sightings since 1960 are given for all other species; (3) for the 15 regular species, histograms of seasonal occurrence are plotted; (4) more detailed analyses by region are performed on nine species – minke whale, killer whale, long-finned pilot whale, Risso's dolphin, Atlantic white-sided dolphin, white-beaked dolphin, short-beaked common dolphin, bottlenose dolphin and harbour porpoise, using all sightings data uncorrected for effort; and this is repeated for seven species (minke whale, killer whale, Risso's dolphin, white-beaked dolphin, short-beaked common dolphin, bottlenose dolphin and harbour porpoise) using effort-related sightings data only; and 5) longer-term changes (where possible using the following periods 1980-82, 1983-86, 1987-90, 1991-94, 1995-98, and 1999-2002) are examined in terms of sightings (and numbers of individuals) per unit effort for minke whale, Risso's dolphin, white-beaked dolphin, short-beaked common dolphin, bottlenose dolphin, and harbour porpoise. Finally, the database is also used to examine ecological aspects such as timing and location of breeding, migration patterns, and variations in group size.

Each species is considered separately below, with a brief summary of present legislative and conservation status; current distribution and status first globally, then in Europe and finally in the UK, with evidence for any recent changes in the UK; seasonal occurrence and other aspects of its ecology are then reviewed, with reference to any obvious potential conservation threats. Comparisons are drawn from historical information derived from the Scottish and Irish whaling industry which operated earlier in the 20th century (Brown 1976; Thompson, 1928), and from strandings records collected by the Natural History Museum (London) since 1913 (Harmer, 1914-27; Fraser, 1934, 1946, 1953, 1974; Sheldrick, 1989; Sheldrick *et al*., 1994; Muir *et al*., 2000).

2.2 SYSTEMATIC LIST

2.2.1 SUBORDER MYSTICETI (BALEEN WHALES)

FAMILY Balaenidae. Right whales

NORTHERN RIGHT WHALE *Eubalaena glacialis*

International protection includes Appendix 1 (at present endangered and needing immediate protection) of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered

and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland); one of species managed by the International Whaling Commission (completely protected). Status listed by IUCN (Baillie and Groombridge, 1996) as endangered. In UK, it receives special protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

A relict eastern North Atlantic population occurs, with a handful of sightings on or near the continental shelf edge in the Canaries, off the Iberian Peninsula, the Irish Sea, off south-west Ireland, west of Scotland, in Norway and south of Iceland (Brown, 1986; Evans, 1992; Gunnlaugsson and Sigurjönsson, 1990; Sigurjönsson *et al*., 1989, 1991; Martin and Walker, 1997; N. Aguilar, *pers. comm.*; E. Urquiola and V. Martin, *pers. comm.*; C. Weir, *pers. comm.*). Right whales in Iceland and Norway have been matched to animals seen in the western North Atlantic, and preliminary genetics data, at least at these latitudes, indicate that stock separation between west and east is unlikely.

Table 5. Records of Northern Right Whale

Date	Location	No. of animals	Comments (Source)
June 1964	Cape Clear, Co. Cork, Ireland	1	(Evans, 1980)
Aug 1970	Cape Clear, Co. Cork, Ireland	1	(Evans, 1980)
Sept 1974	c. 600 km west of Scotland	1	two sightings at the same location four days apart (Evans, 1992)
May 1979	northern Irish Sea	2	(Evans 1992)
Aug 1980	Outer Hebrides, Scotland	1	(Evans, 1992)
June 2000	Hatton Bank, north-west of Rockall	1	(O. O' Cadhla *pers. observ.*)
28 July 2000	62° 19' N, 00° 07' E, i.e. north of the Shetland Islands	1	(G. Reeder *pers. observ.*)

The northern right whale population size in the eastern North Atlantic is unknown but is thought to number no more than the low tens of individuals; the western North Atlantic population is estimated at around 325 individuals (Knowlton *et al*., 1994; Kraus *et al*., 2000), and is thought to be in decline (Caswell *et al*., 1999). The species feeds in temperate or high latitudes in summer, and calves in lower latitudes in winter. Historically, the main calving grounds in the eastern north Atlantic were Cintra Bay off Western Sahara, N.W. Africa, and the Bay of Biscay, and the species migrated west of Britain and Ireland, where they were captured during the Scottish and Irish whale fisheries mainly in June, after which the species was thought to move to Scandinavian feeding areas during July and August (Collet, 1909; Thompson, 1928; Fairley, 1981). The return migration pattern has not been documented. Those few more recent sightings in British and Irish waters have occurred between May and September (Table 5).

FAMILY Balaenopteridae. Rorqual whales

HUMPBACK WHALE *Megaptera novaeangliae*

International protection includes Appendix 1 (at present endangered and needing immediate protection) of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland); one of species managed by the International Whaling Commission (completely protected since 1966). Status listed by IUCN (Hilton-Taylor, 2000) as vulnerable. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

Although widely distributed around the world's oceans, humpbacks are now rare in Atlantic waters of Europe, following over-exploitation by humans (Clapham *et al*., 1999). In Europe, they occur mainly on or near the continental shelf from Iceland and Norway south to South-west Ireland and the Bay of Biscay. Numbers are greatest around Iceland (Sigurjönsson *et al*., 1989, 1991), but sightings involving small numbers in the British Isles have increased since the 1980s (Evans, 1992, 1996b).

The North-west Atlantic humpback whale population has been estimated by photo-ID at 10,600 animals (Smith *et al.*, 1999). The feeding stock within the Gulf of Maine is estimated to be increasing at 6.5% per annum (Barlow and Clapham, 1997). The size of the population in the eastern North Atlantic is not known but is believed to be larger than formerly thought (Øien, 1990).

Sightings from around the British Isles have increased markedly since the early 1980s (Fig. 56a) and occur in three main areas – Northern Isles south to eastern Scotland; northern Irish Sea to South-west Scotland; and Celtic Sea between southern Ireland, South Wales and South-west England (see Fig. 4). Since 1980, there have been five strandings: one male at Leys beach, Gileston, St Athan, South Glamorgan (Wales) on 16 Oct 1982; a female in Loch Linnhe, three miles south of Fort William, Highland (Scotland) on 23 Aug 1985; a female in Tralong Bay, Co. Cork (Ireland) on 31 July 1992; a male at the Pegwell end of Sandwich Bay, Kent (England) on 21 March 2001; and an unsexed animal at the Bay of Stoer, Highland (Scotland) on 7 Sept 2001 (Sheldrick *et al*., 1994; The Natural History Museum UK Cetacean Strandings Project, Annual Reports 1990-2002; Berrow and Rogan, 1997).

In shelf waters, the species occurs mainly from May-September, but some sightings extend through the winter (November-March) (Fig. 50a) and this is supported by acoustic recordings from SOSUS (SOund SUrveillance System) hydrophone arrays north and west of Scotland and Ireland (Clark and Charif, 1998; Charif *et al*., 2001). Sightings in Ireland (mainly from the south coast) increase through the summer reaching a peak in September with a rapid decline thereafter (Berrow *et al*., 2001).

The species often undergoes extensive latitudinal migrations from summer feeding grounds to tropical mating and calving areas in winter, and during the early twentieth century, humpbacks were captured in the Scottish whale fisheries mainly in July and August (Thompson, 1928). In the eastern North Atlantic, the traditional calving grounds were around the Cape Verde Islands, Canaries, and Madeira off North-west Africa, and recent sightings in this region suggest that a small breeding population may still exist here (V. Martin and E. Urquiola, *pers. comm.*; L. Freitas, *pers. comm.*). However, the bulk of the North Atlantic population clearly breeds in the Caribbean, summering mainly off eastern United States and Canada, and West Greenland. Some western Atlantic individuals have been identified off Iceland and Norway (Stevick *et al*., 1998), and mixing between the two stocks clearly takes place (Larsen *et al*., 1996). Acoustic data from the SOSUS arrays including tracks of individual humpbacks over several hours showed evidence of a late winter/early spring southward migration into and through the more northerly four sectors of the North-east Atlantic (Clark and Charif, 1998; Charif *et al*., 2001). No corresponding northward migration was detected, however.

BLUE WHALE *Balaenoptera musculus*

International protection includes Appendix 1 (at present endangered and needing immediate protection) of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland); one of species managed by the International Whaling Commission (completely protected since 1994). Status listed by IUCN (Hilton-Taylor, 2000) as endangered, with North Atlantic population designated as vulnerable. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

Although also widely distributed throughout the world's oceans, it is now rare in most regions. In the eastern North Atlantic it is very rare, occurring in deep waters from Iceland, Svalbard, and the Barents Sea south to the Cape Verde Islands and west of the Iberian Peninsula, and probably favouring troughs on the edge of sea mounts (e.g. Rockall Trough). A handful of sightings have also occurred in recent years in the southern Bay of Biscay, but only four records from the British Isles (Table 6).

Estimates for the eastern North Atlantic population have ranged from a maximum of 442 animals (Gunnlaugsson and Sigurjönsson, 1990) to 1,000-2,000 (Sigurjönsson in Christensen *et al.*, 1990; Sigurjönsson, 1995), but survey coverage is inadequate for a reliable overall population estimate. Although no abundance estimates exist, the western North Atlantic population is also considered small (Clapham *et al*., 1999).

West and south of the British Isles, blue whale sightings have all occurred between May and September (the same time as peak catches of the species occurred in the Scottish whale fishery between 1913 and 1927 - Thompson, 1928). However, they have been recorded acoustically with SOSUS hydrophone arrays north and west of Britain and Ireland throughout the year, but particularly in November and December, at latitudes 52^{o} - 58^{o} N (Clark and Charif, 1998). Although this may reflect a seasonal peak in vocal behaviour, the presence of animals at this time runs counter to previous suggestions of an extensive latitudinal migration northward west of Britain and Ireland in March and April, summering in Norway, and then returning south in September to winter in low latitudes (Christensen *et al*., 1992). Vocal activity showed a decline from mid-December through February to minimal levels in March through June, before a gradual increase again from mid-July through September (Clark and Charif, 1998). However, seasonal patterns of calling activity appeared to be synchronous across all of the regions, indicating no systematic seasonal migration, and there was no consistent pattern of directional movement in any month (Clark and Charif, 1998).

Table 6. Records of Blue Whale

Date	Location	No. of animals	Comments (Source)
May 1977	Off NW coast of Ireland	1	sighting (Evans, 1992)
1997	110 miles north-west of Shetland in Faroe-Shetland Channel, Scotland	1	sighting (Stone, 1998)
1997	80 miles west-north-west of Shetland in Faroe-Shetland Channel, Scotland	1	sighting (Stone, 1998)
1997	90 miles west of Shetland in Faroe-Shetland Channel, Scotland	2	sighting (Stone, 1998)
1997	150 miles north-west of Cape Wrath, Scotland on Wyville Thompson Ridge, Scotland	1	sighting (Stone, 1998)

FIN WHALE *Balaenoptera physalus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix III (can be exploited so long as regulation keeps populations out of danger) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland); one of the species managed by the International Whaling Commission. Status listed by IUCN (Hilton-Taylor, 2000) as endangered. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

This species occurs worldwide in mainly temperate and polar seas of both hemispheres. In the eastern North Atlantic, it is uncommon, presently occurring mainly in deep waters (200-4,000 m depth, particularly around 1,000 m isobath) from Iceland and Norway south to the Iberian Peninsula, and east into the Mediterranean (particularly the Ligurian Sea). In northern Europe, fin whales are most frequently seen in the Norwegian Sea west

of Norway, north and west of Scotland (particularly south and south-east of the Faroe Islands in the Shetland-Faroe Channel), off Southern Ireland east into the St George's Channel, and across the Bay of Biscay (see Fig. 5). Brereton and Williams (2001) reported that >99% of fin whale sightings in the Bay of Biscay occurred in water depths of 1,000 m or more. Sightings were evenly distributed across water depths of between 1,000 m and 4,000 m, with no evidence of an association with the initial slope of the continental shelf edge (200-1,000 m). Highest relative abundance in the Bay of Biscay was found between 45º-45.5º N by 3º-5º W (Brereton and Williams, 2001).

No current estimates exist for the North Atlantic population as a whole, but recent sightings surveys indicate a total population numbering somewhere over 46,000 individuals, but still below its former size (Buckland *et al.*, 1992; IWC, 1992). In the North-east Atlantic, Gunnlaugsson and Sigurjönsson (1990) estimated fin whale abundance at 11,563, whilst a small region of the Atlantic Frontier, including the Faroe-Shetland Channel, was estimated to hold 1,912 fin and sei whales during a survey in July-August 1998 (Hughes *et al*., 1998). The fin whale was the most commonly taken large whale in the Scottish and Irish fisheries between 1903 and 1928 (Thompson, 1928; Brown, 1976; Fairley, 1981), and the most frequently recorded whale from SOSUS arrays (Clark and Charif, 1998). Sightings in UK waters have fluctuated, with peaks in 1988-89 and 1997-99 (Fig. 56b).

In coastal waters, fin whales occur mainly between May and August (with peak numbers of both sightings and individuals in August - see Fig. 51b), although at least a segment of the population over-winters (when effort-related sightings reach a peak – Fig. 52a). Over-wintering animals may possibly breed south of Ireland and in the western approaches to the English Channel, since groups as well as adults with calves have been recorded there at this time (Evans, 1992). During the early twentieth century, catches in Scottish waters occurred mainly west and north of the continental shelf between April and October, with peak numbers north and west of Shetland during July and August (Thompson, 1928; see map in Evans, 1990). A comparison of seasonal variation *on* vs *off* the shelf indicates a strong summer peak in August off the shelf, at the same time as a smaller peak on the shelf; however, highest numbers of sightings and individuals on the shelf (and within 12 nm of the coast) are recorded in December (Figs. 53a, 54a).

Peak numbers of sightings occur at the same time in northern Britain as in southern Britain and the Bay of Biscay (i.e. during August) (see also Evans, 1992; Stone, 1997, 1998, 2000; Pollock *et al*., 2000; Weir *et al*., 2001; Brereton and Williams, 2001; Notarbartolo di Sciara and Evans, in press). However, as indicated above, there is another peak in sightings around December, occurring mainly in southern Britain. In the Bay of Biscay, Brereton and Williams (2001) found some indication of a southerly movement towards the end of the summer, following the period of peak occupancy. In August, 70% of sightings were made north of 45º N, whilst in October, less than 40% of sightings occurred north of this latitude (Brereton and Williams, 2001). Casual sightings from Ireland reported to the Irish Whale and Dolphin Group occur mainly from June through to November (Berrow *et al*., 2001).

There is some indication from sightings observations that, in northern Britain, fin whales make a general northward movement off NW Scotland from June to October (Stone, 1997), and Bloch (1998) also suggested a summer clockwise migration around the Faroes. On the other hand, vocalising animals have been recorded west of the European continental shelf between 42^{o} and 62^{o} N in all months of the year (with no obvious seasonal latitudinal trend); least vocal activity occurs from May through July, increasing during August and September to peak activity between October and February (Clark and Charif, 1998; Charif and Clark 2000; Swift *et al*., 2002). The latter coincides with the main period when mating is thought to take place (Evans and Stirling, 2001; Aguilar, 2002), whereas peak sightings in summer close to the shelf edge may be related to seasonal peaks in euphausiid crustaceans such as *Meganyctiphanes norvegica* upon which the species is known to feed, and of *Calanus finmarchicus* copepods that in turn are important prey for *Meganyctiphanes* (Evans, 1987; Vikingsson, 1997; Sigurjönsson and Vikingsson, 1997).

In an acoustic study of large whale distribution in the Faroe-Shetland Channel using the Integrated Underwater Surveillance System (IUSS) or SOSUS arrays, Swift *et al*. (2002) found a marked decline in detection rates over the period October to December/January. They concluded, on the basis of the absence of acoustic detections to the south of the Faroes, that this was the result of a northward movement of the species presumably into Icelandic waters where acoustic detections occur throughout winter months (Charif and Clark, 2000). However, sightings there peak in late June and July (Sigurjönsson and Vikingsson, 1997), and it may be instead that those whales move southwards in October.

Swift *et al*. (2002) further suggest that the importance of the Faroe-Shetland Channel for *Calanus finmarchicus* highlights the role that particular area may play as key habitat for fin whales. The same could apply to other areas such as the Bay of Biscay, that may represent a separate population.

SEI WHALE *Balaenoptera borealis*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix III (can be exploited so long as regulation keeps populations out of danger) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland); one of the species managed by the International Whaling Commission. Status listed by IUCN (Hilton-Taylor, 2000) as endangered. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

Worldwide distribution in mainly temperate and polar seas of both hemispheres. In the eastern North Atlantic, sei whales appear to be rare, occurring in deep waters from Iceland and Norway south to the Bay of Biscay and Iberian Peninsula. The species

winters off North-west Africa, Spain and Portugal and in the Bay of Biscay, and then migrates northwards to summering grounds off Shetland, the Faroes, Norway, Bear Island and Svalbard, though with numbers apparently varying greatly from year to year (Thompson, 1928; Horwood, 1987; Sigurjönsson *et al*., 1991; Evans, 1992; Cattanach *et al*., 1993; Stone, 1997, 1998, 2000; Williams *et al*., in press; see Fig. 5). Pelagic, temperate deep waters between 500 and 3,000 m depth are favoured, and the species seems to have a more offshore distribution than fin whales or other balaenopterids (Horwood, 1987; Sigurjönsson, 1995).

No current estimates exist for the North Atlantic population, but recent sightings surveys indicate a population numbering 13,500+, with evidence of noticeable depletion of stocks from some of the former whaling grounds (Christensen *et al*., 1990; Joyce *et al*., 1990; Sigurjönsson, 1992, 1995; Cattanach *et al*., 1993). Sightings in UK shelf waters are few and fluctuate with peaks in 1990, 1993 and 1998 (Fig. 56c).

Around the British Isles and Ireland, the species occurs mainly between July and October (Fig. 51c). Its presence on the shelf is more or less confined to the period from May to August, whereas off the shelf, it is recorded from June to December (Fig. 53b). Historical catches in the Outer Hebrides occurred mainly in June along the shelf edge near St Kilda, whereas those taken in Shetland waters came also from the shelf edge but mainly in July and August; few were taken before April or after September (Thompson, 1928). Sightings in recent years have generally been further offshore, in deeper waters, than the fin whale, for example, in areas like the Faroe-Shetland Channel (particularly in August), Rockall Trough west of the British Isles, and in the Bay of Biscay (Evans, 1992; Stone, 1997, 1998, 2000; Murray and Simmonds, 1998; Pollock *et al*., 2000; Weir *et al*., 2001; Cresswell and Walker, 2001; Williams *et al*., in press; Fig. 6).

Most sightings have been reported in July-October (Fig. 51c) but the more southerly records (south of 59^{o} N) occur mainly in June and July, although casual sightings along the coast of Co. Cork, Ireland, reported to the Irish Whale and Dolphin Group occurred between July and November with a peak in November (Berrow *et al*., 2001).

MINKE WHALE ***Balaenoptera acutorostrata***

International protection includes Appendix I status (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland) of CITES (in force from July, 1975); Appendix III (protected) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (in force from June 1982) (can be exploited so long as regulation keeps populations out of danger); Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix III (can be exploited so long as regulation keeps populations out of danger) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is one of the species managed by the International Whaling Commission. Status listed by IUCN (Hilton-Taylor, 2000) as near

threatened. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

Common and widely distributed in all the major oceans of the world from tropical to polar seas, though most abundant in relatively cool waters and on the continental shelf (in depths of 200 m or less). It occurs in small numbers along the Atlantic seaboard of Europe mainly from Norway south to France, and in the northern North Sea, although abundance is greatest in the north. The species is widely distributed along the Atlantic seaboard of Britain and Ireland, with numbers greatest off the west coast of Scotland and around the Hebrides (where aggregations of up to twenty have been recorded); it also occurs regularly in the northern and central North Sea as far south as Yorkshire, but is rare in the southernmost North Sea and eastern half of the English Channel. In the western English Channel, it is evenly distributed to the continental shelf edge, being largely absent from the deeper parts of the Bay of Biscay. In the Irish Sea, the species occurs mainly on the western side, south of the Isle of Man (Evans, 1992; Northridge *et al*., 1995; Boran *et al*., 1999; see Fig. 7).

The only population estimate for minke whales in UK waters is from the North Sea where a line transect survey in July 1994 estimated 8,445 (95%CI: 5,000-13,500) (Hammond *et al*., 1995). The latest population estimate for the Northeast Atlantic stock seasonally inhabiting the Norwegian and Barents Seas was 86,700 individuals (95% CI: 61,000-117,000) (Schweder *et al*., 1993).

Table 7. Seasonal Occurrence of Minke Whales

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	July-Sept	July-Sept	Sept	Sept
North Scotland	June-Aug	June-Aug	(June-Aug, Oct)	June-Aug, Oct
East Scotland	Aug	Aug	(Feb, July-Sept, Dec)	(Feb, July-Sept, Dec)
East England	Aug	Aug	-	-
SW England	(June, Aug)	(June, Aug)	(July-Aug)	(July-Sept)
Wales	(May-Aug)	(May-Sept)	-	-
East Ireland	(May-July)	(June-July)	July	July
West Ireland	Aug (-Sept)	Aug-Sept	June	June (Aug)
- = insufficient data				

The species has been recorded in every month of the year in UK waters, but is mainly seen near the coast from May to September (see Fig. 51d; note that between November and March, such small numbers have been recorded that they do not show up on Figure 51). Although slight regional variations may exist, the peak numbers of sightings and individuals (both for all sightings and for those corrected for effort) appear to occur at similar periods throughout the British Isles, notably sometime between June and September (Figs. 8-11; Table 7), and no differences exist between on-shelf and off-shelf nor between inshore (within 12 nm) and offshore (beyond 12 nm) seasonal distributions, except for a wider seasonal spread of sightings off the shelf (Figs. 53c, 54b). These coincide also with the period when most minke whales have been taken in recent times

by whale fisheries off Norway, the Faroes and north of Scotland (Stephenson, 1951; Haug *et al*., 1995). Casual sightings from Ireland reported to the Irish Whale and Dolphin Group also show a large increase in June through to October (Berrow *et al*., 2001).

Minke whales show a significant long-term increasing trend over the period 1988-2002 (Fig. 55a; Cuzick's trend test, z = 3.465, two-sided P = 0.0005 for sightings rates; z = 3.411, two-sided P = 0.0006 for individual rates). This trend is apparent across regions (West Scotland, North Scotland, and East Scotland – Figs. 55b,c,d), although that increase may occur earlier in East (and possibly North) Scotland (1995-98) than in West Scotland (1999-2002).

2.2.2 SUBORDER ODONTOCETI (TOOTHED WHALES)

FAMILY Ziphiidae. The beaked whales

NORTHERN BOTTLENOSE WHALE *Hyperoodon ampullatus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982; but for this species, applied from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland); one of the species managed by the International Whaling Commission (completely protected). Status listed by IUCN (Hilton-Taylor, 2000; Reeves *et al*., 2003) as lower risk (conservation dependent). In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

Restricted to the North Atlantic from the Caribbean and Canaries north to West Greenland and Svalbard, the northern bottlenose whale is uncommon, occurring mainly in ocean trenches of the northern North Atlantic such as occur off Newfoundland ("the Gully"), western Norway, and in the Barents Sea. Its distribution seems to be strongly influenced by that of its major prey - squid of the genus *Gonatus*.

In waters adjacent to the UK and Ireland, the species is sighted primarily in the Faroe-Shetland Channel, Rockall Trough, and southern Bay of Biscay (Evans, 1992; Stone, 1997, 1998, 2000; Bloch *et al*., 1996; Bloor *et al*., 1996; Pollock *et al.*, 1997, 2000; Williams *et al*., 1999; Weir, 2001; Walker *et al*., 2001; see Fig. 12). The species is found mainly in deep waters of greater than 1,000 m depth, often over submarine canyons and adjacent to the continental shelf edge, although it occasionally enters more shallow waters (300 m or less depth). In the Bay of Biscay, Walker *et al.* (2001) recorded all sightings over shelf slope waters at depths of 650-4,000 m, between 43º40'N and

46º19'N, with the majority of sightings occurring over deep submarine canyons in the Southern Bay. A large group of northern bottlenose whales observed off the Pembrokeshire coast in 1960 accounts for the concentration in that area (see Fig. 12), which is not thought to represent a typical location for that species.

No detailed population estimates exist for the North Atlantic, but following the IWC North Atlantic sightings surveys (NASS) in 1987 and 1989, an approximate estimate of 40,000 northern bottlenose whales was made (Vikingsson, 1993; NAMMCO, 1993). The species appears to be still locally abundant in at least some areas (Gunnlaugsson and Sigurjönsson, 1990; Reeves *et al*., 1993). Sightings of this species in UK shelf waters are few, with no particular pattern or trend in the last 35 years (Fig. 56d).

In North European waters, the species mainly occurs from March to October (particularly in the months of August and September), with peak sightings in the Bay of Biscay between May and August, off northern Scotland in July-September, and in the Faroes in early March and again in August-September (Williams *et al*., 1999; Evans, 1992; Bloch *et al*., 1996; Fig. 51e). In the Atlantic Frontier region, sightings have occurred between March and May, in August, and in November (Weir *et al*., 2001). It has been suggested that they undergo latitudinal migrations, occurring most commonly between Iceland and Jan Mayen in late April to early June, and then moving southwards during June-July (Thompson, 1928; Bloch *et al*., 1996).

CUVIER'S BEAKED WHALE *Ziphius cavirostris*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982; but for this species, applied from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix II; one of species managed by the International Whaling Commission (completely protected). Status listed by IUCN (Hilton-Taylor, 2000) as data deficient. In UK, it receives special protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

Worldwide distribution mainly in tropical and warm temperate seas of both hemispheres probably occurring mainly along continental shelf slopes at depths of 500-3,000 m. It is rarely observed in northern European waters although there is one record from Iceland. Elsewhere, it is probably more common than records suggest, where recent surveys have revealed its regular presence in the Western Mediterranean, Bay of Biscay, and around the Iberian Peninsula. Although the depths to which this species dives have not been measured, they are likely to be of the same order as northern bottlenose whales, in the hundreds to low thousands of metres where pelagic squid are likely to be the main prey.

Table 8. Records of Cuvier's Beaked Whale since 1970			
Date	**Location**	**No. of animals**	**Comments (Source)**
21 Aug 1970	*Callernish, North Uist, Outer Hebrides, Scotland*	*1*	*stranded (1)*
Sept 1970	*North Uist, Outer Hebrides, Scotland*	*1*	*stranded (1)*
15 June 1973	*North Uist, north coast, Outer Hebrides*	*1*	*male, stranded (1)*
30 Jan 1978	*Rathlin Island, Co. Antrim, Northern Ireland*	*1*	*female, stranded (1)*
Aug 1980	Northern North Sea east of Orkney, Scotland	1	sighting (6)
End July 1981	*Brenish, Uig, Isle of Lewis, Outer Hebrides, Scotland*	*1*	*stranded (1)*
May 1982	Raghly, Co. Sligo, Ireland	1	sighting (6)
8 Apr 1983	*Streedagh, Co. Sligo, Ireland*	*1*	*male, stranded (5)*
Apr 1983	*Leebotten, Sandwick, Shetland*	*1*	*female, stranded (1)*
May (?) 1983	*Brandon, Co. Kerry, Ireland*	*1*	*stranded (5)*
Aug 1984	off Cape Clear, Co. Cork, Ireland	1	sighting (6)
July 1987	South-west of the Mizen Head, Co. Cork, Ireland	1	sighting (6)
Aug 1987	Off NW Ireland	2-3	in a mixed group of at least 50 long-finned pilot whales and 6 bottlenose dolphins (6)
21 Sept 1987	*Otter Cove, Exmouth, Devon*	*1*	*female, stranded (2)*
1 Dec 1987 (?)	*Griminish, Benbecula, Western Isles, Scotland*	*1*	*female, stranded (2)*
Sept 1988	Off Isle of Skye, Highland, Scotland	3	sighting (6)
14 Jan 1989	*Ballyconneely, Co. Galway, Ireland*	*1*	*female, stranded (5)*
25 Jan 1989	*Praa Sands, Lizard Peninsula, Cornwall*	*1*	*male, stranded (2)*
16 Mar 1989	*Lurgha Point, Co. Clare, Ireland*	*1*	*female, stranded (5)*
Jan 1993	*Woodwick, Unst, Shetland, Scotland*	*1*	*stranded (3, 4)*
29 Jan 1993	*Hushinish, Harris, Western Isles, Scotland*	*1*	*male, stranded (3,4)*
15 Dec 1993	Loch Nedd, Sutherland, Scotland	1	live-stranded, rescued (3,4)
17 Jan 1994	*Tolsta beach, Isle of Lewis, Western Isles*	*1*	*female, stranded (3, 4)*
16 June 1998	6 miles off Cape Clear, Co. Cork, Ireland	2	sighting (6)
7 Jan 1999	*Near Gyrn Goch, Lleyn Peninsula, Gwynedd, North Wales*	*1*	*female, stranded (3)*
27 Feb 1999	*Lagan Maskeir, near Knock an Torran, North Uist, Western Isles, Scotland*	*1*	*female, stranded (3, 4)*
12 Mar 2000	*Doolin, North Clare, Co. Clare, Ireland*	*1*	*female, stranded (3, 7)*
18 Mar 2000	*Ballyconnell, Co. Sligo, Ireland*	*1*	*male, stranded (7)*
25 Mar 2000	*Doonbeg, Co. Clare, Ireland*	*1*	*male, stranded (7)*
1 May 2000	*Dun-Na-Noir, Co. Kerry, Ireland*	*1*	*female, stranded (7)*
23 Mar 2001	*Doonbeg, Co. Clare, Ireland*	*1*	*unsexed, stranded (7)*
18 Mar 2002	*Saligo Bay, Islay, Strathclyde, Scotland*	*1*	*female, stranded (3, 4)*
20 June 2002	*South end of Ostend village, Walcott, near Happisburgh, Norfolk, England*	*1*	*male, stranded (3)*
2 July 2002	*Lislary, Co. Sligo, Ireland*	*1*	*female, stranded (7)*
7 July 2002	*Gwynver Beach, Whitesand Bay, Cornwall, England*	*1*	*stranded (3)*
Sources: 1 = Sheldrick, 1989; 2 = Sheldrick *et al*., 1994; 3 = The Natural History Museum UK Cetacean Strandings Project, Annual Reports 1990-2002; 4 = Bob Reid, SAC Veterinary Services; 5 = Berrow & Rogan, 1997; 6 = Sea Watch database; 7 = E. Rogan, *pers. comm.*			

Most records in UK waters come from the South-west Approaches to the English Channel, western Ireland, and the Western Isles of Scotland, with strandings in most months, but sightings mainly between May and September (Evans, 1992; see Table 8). In the Bay of Biscay, sightings are most common between February and May (with 50% of sightings observed in March and April - Williams *et al*., 1999) although the species has been seen year-round (Walker *et al*., 2001). Here, it is regularly recorded beyond the 1,000 m isobath, particularly over deep submarine canyons of the Southern Bay between 43º30' N and 44º35' N. It occurs at lower densities over the shelf slope of the Northern Bay between 45º30' N and 46º00' N (Walker *et al*., 2001).

SOWERBY'S BEAKED WHALE *Mesoplodon bidens*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982; but for this species, applied from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix II. Status listed by IUCN (Hilton-Taylor, 2000) as data deficient. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

Table 9. Records of Sowerby's Beaked Whale since 1970

Date	Location	No. of animals	Comments (Source)
Oct 1972	*Filey, Yorkshire, England*	*1*	*male, stranded (2)*
18 Nov 1972	*N.side Beauly, Moray Firth, Highland, Scotland*	*1*	*female, stranded (2)*
17 (?) Nov 1975	*Seaton, Looe, Cornwall*	*1*	*male, stranded (2)*
5 Jan 1977	*Gress Sands, Isle of Lewis, Western Isles, Scotland*	*1*	*female, stranded (2)*
Aug 1977	Minches, west of Ullapool, Highland, Scotland	1	Sighting (6); stranding reported a few days later
23 Aug 1977	*Strollomus, Isle of Skye, Scotland*	*1*	*female, stranded (2)*
11 Mar 1978	*Sinclairs Bay, Keiss, Highland, Scotland*	*1*	*male, stranded (2)*
20 Sept 1978	*Peterhead, Grampian, Scotland*	*1*	*male, stranded (2)*
11 Oct 1978	*Whitburn, Tyne & Wear, England*	*1*	*stranded (2)*
16 Oct 1978	*Boston Dock, Lincolnshire, England*	*1*	*female, stranded (2)*
Aug 1980	Channel approaches off NW France	4	Sighting (6); stranding 1 month later on Cornish coast (unconfirmed)
5 Oct 1981	*Society beach, 0.5 mile west of Firth of Forth road bridge, Forth, Scotland*	*1*	*male, stranded (2)*
End Feb 1982	*Crail, Fife, Scotland*	*1*	*female, stranded (2)*
24 Sept 1983	*5 miles east of Inverness, Highland, Scotland*	*1*	*male, stranded (2)*
23 Oct 1983	*Longis Bay, Alderney, Channel Islands*	*1*	*female, stranded (2)*
12 Aug 1984	*Brough of West Sandwick, Shetland*	*1*	*female, stranded (2)*

Table 9 (cont.). Records of Sowerby's Beaked Whale since 1970			
Date	**Location**	**No. of animals**	**Comments (Source)**
18 Sept 1986	*Lagg Bay, Isle of Jura, Strathclyde, Scotland*	*1*	*female, stranded (2)*
2 Feb 1987	*Minard, Loch Fyne, Strathclyde, Scotland*	*1*	*stranded (2)*
5 May 1987	*Northern Ness, St. Ninian's Isle, Shetland*	*1*	*female, stranded (2)*
10 Jan 1989	*Mavis Grind, Shetland Mainland*	*1*	*female, stranded (2)*
22 Sept 1989	*Shoebury Ness, Coryton, Essex, England*	*1*	*female, stranded (2)*
17 Aug 1990	*Templeboy, Co. Sligo, Ireland*	*1*	*female, stranded (3, 5)*
11 Oct 1991	St Just Creek, Fal estuary, Cornwall	1	live stranded, re-floated (6, 7)
15 June 1992	*Eye Peninsula, Isle of Lewis, Western Isles, Scotland*	*3*	*2 males and 1 female, stranded (2, 4)*
28 July 1992	*Near Claigan, Loch Dunvegan, Isle of Skye, Highland, Scotland*	*1*	*female, stranded (2, 4)*
19 Aug 1992	*Balintore, Highland, Scotland*	*1*	*female, stranded (2, 4)*
22 Nov 1992	*Peninver, Kintyre, Strathclyde, Scotland*	*1*	*male, stranded (2, 4)*
19 Apr 1994	*Quinish, Isle of Mull, Argyll, Scotland*	*1*	*male, stranded (3, 4)*
5 Aug 1994	*Hempriggs, Burghead Bay, Highland, Scotland*	*1*	*male, stranded (3, 4)*
29 Sept 1994	*St Kilda, Western Isles, Scotland*	*1*	*female, stranded (3, 4)*
4 Dec 1994	*St Ninians Bay, Shetland, Scotland*	*1*	*male, stranded (3, 4)*
29 July 1996	*Near Frobost, South Uist, Western Isles, Scotland*	*1*	*stranded (3, 4)*
5 Oct 1996 *6 Oct 1996*	*Pettycur beach, near Burntisland, Firth of Forth (female)* *Hound Point, South Queensferry, at Musselburgh (calf)*	*1* *1*	*1 female, stranded (poss. live stranding) on 5 Oct at Pettycur beach, and its calf live-stranded on 6th Oct at Musselburgh, then after re-floating, was found dead at Port Seton (nr Musselburgh) (3, 4)*
end of Nov 1997	north of Shetland, Scotland	6	sighting (6)
30 Apr 1998	*Mablethorpe, Lincolnshire, England*	*1*	*male, stranded (3)*
1998	110 miles WNW of Isle of Lewis, Western Isles, Scotland	1	sighting (6)
19 Apr 1999	*Rapness, Westray, Orkney, Scotland*	*1*	*stranded (3, 4)*
7 Jan 2000	*Kirkcaldy harbour, Fife, Scotland*	*1*	*female, stranded (3, 4)*
22 Mar 2000	*Near Holland, Papa Westray, Orkney, Scotland*	*1*	*stranded (3, 4)*
8 Sept 2000	*Marshes below Leverton, Near Boston, Lincolnshire*	*1*	*female, stranded (3)*
14 Apr 2001	*Brora beach, Highland, Scotland*	*1*	*female, stranded (3, 4)*
15 July 2001	*St Catherine's Bay, Stronsay, Orkney, Scotland*	*1*	*stranded (3, 4)*
18 Sept 2001	*Rosemarkie, Highland, Scotland*	*1*	*male, stranded (3, 4)*
7 June 2002	*Praa Sands, Mounts Bay, Cornwall, England*	*1*	*female, stranded (3)*
4 July 2003	*Eilean Dubh, Balnakiel, Highland, Scotland*	*1*	*female, stranded (4)*
Sources: 1 = Sheldrick, 1989; 2 = Sheldrick *et al*., 1994; 3 = The Natural History Museum UK Cetacean Strandings Project, Annual Reports 1990-2002; 4 = Bob Reid, SAC Veterinary Services; 5 = Berrow & Rogan, 1997; 6 = Sea Watch database; 7 = Stella Turk, Cornwall Biological Records Centre			

Although rarely recorded, the distribution of this species appears to be centred upon deep offshore Atlantic waters of Northern Europe, most records coming from the British Isles (although the species has been recorded recently off Madeira and specially around the Azores). All *Mesoplodon* species are likely to be deep divers going to depths of hundreds or low thousands of metres to feed upon oceanic squid. Their biology is so poorly known that at present we can only speculate on specific habitat preferences, but these are likely to be deep oceanic basins and the edges of abyssal plains.

In northern European waters, sightings have occurred south of Iceland, in the Norwegian Sea, west of Norway, around the Faroe Islands, north and west of the British Isles and Ireland, in the Channel Approaches, and Bay of Biscay (Evans, 1992, unpubl. data; Carlstrom *et al*., 1997; Bloch, 1998; Weir, 2001; Weir *et al*., 2001; Walker *et al*., 2001; see also Table 9). However, difficulties of specific identification at sea has resulted in only a handful of confirmed sightings. Although many strandings occur in the North Sea, this is probably due to passive drift of carcasses. Strandings have occurred in all months but with two-thirds of records between July and November, at the same time as most sightings.

In the Bay of Biscay, Walker *et al*. (2001) recorded the species with certainty on two occasions: 22nd August 1995 over Torrelavega Canyon (2 adults); and on 23rd October 2000 over the south-east edge of Santander Canyon, at a depth of 2,100 m (3 adults). Both sightings occurred over the shelf slope of the Southern Bay.

BLAINVILLE'S BEAKED WHALE *Mesoplodon densirostris*

A widely distributed beaked whale occurring in warm temperate and tropical waters of all oceans. In the eastern North Atlantic, it is recorded mainly from oceanic archipelagoes like Madeira and the Canaries where it is observed comparatively frequently. The only record in northern Europe is of a specimen which came ashore at Aberaeron on the coast of West Wales in July 1993 (Herman *et al*., 1994; Table 10).

Table 10. Records of Blainville's Beaked Whale

Date	Location	No. of animals	Comments (Source)
18 July 1993	*Aberaeron, Ceredigion, Wales*	*1*	*adult female, stranded (Herman et al., 1994)*

GERVAIS' BEAKED WHALE *Mesoplodon europaeus*

Although mainly a south-western North Atlantic species, there are a few records of Gervais' beaked whale from the eastern North Atlantic, from West Africa (Guinea-Bissau, Mauritania and the Canaries) north to Ireland (one stranding in Co. Sligo in January 1989 - Rogan and Berrow, 1997; Table 11).

Table 11. Records of Gervais' Beaked Whale

Date	Location	No. of animals	Comments (Source)
22 Jan 1989	*Ballysadare, Co. Sligo, Ireland*	*1*	*male, stranded (Berrow & Rogan, 1997)*

TRUE'S BEAKED WHALE *Mesoplodon mirus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II (strictly protected endangered and vulnerable animals) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982; but for this species, applied from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and is treated by the European Community as if it is on CITES Appendix II. Status listed by IUCN (Hilton-Taylor, 2000) as data deficient. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

A poorly known species, the True's beaked whale has been recorded in the eastern North Atlantic mainly from deep waters west of the European continental shelf (from western Ireland south to the Canaries). Of nine stranding records from Europe since 1899, eight of these have been from Western Ireland (Evans *et al*., in press; see Table 12). A record, originally identified as True's beaked whale from South Uist in Dec 1930 (Fraser, 1934) was later identified as Cuvier's beaked whale (Kitchener and Herman, 1995). The specimen from the Aran Islands, Co. Galway in 1903/04 was variously identified as Hector's beaked whale, then Cuvier's beaked whale, and finally True's beaked whale (Anderson, 1904; Harmer, 1918, 1924).

Table 12. Records of True's Beaked Whale

Date	Location	No. of animals	Comments (Source)
c. 1899	*Galway Bay, Co. Galway, Ireland*	*1*	*probable female, stranded (1, 4)*
c. 1903/04	*Aran Islands, Co. Galway, Ireland*	*1*	*stranded (2, 3, 5)*
9 June 1917	*Liscannor, Co. Clare, Ireland*	*1*	*male, stranded (6)*
22 Apr 1935	*Valentia Island, Co. Kerry, Ireland*	*1*	*male, stranded (7)*
6 Oct 1967	*Dingle, Co. Kerry, Ireland*	*1*	*stranded (8)*
July 1972	*Ballinskelligs, Co. Kerry, Ireland*	*1*	*female, stranded (10)*
5 Feb 1983	*Killadoon, Co. Mayo, Ireland*	*1*	*male, stranded (9, 10)*
19 Nov 1987	*Killadoon, Co. Mayo, Ireland*	*1*	*male, stranded (10)*
1 June 1997	*Ownahincha, Long Strand, Co. Cork, Ireland*	*1*	*female, stranded (11)*

Source: 1 = Anderson 1901; 2 = Anderson, 1904; 3 = Harmer, 1918; 4 = Harmer, 1919; 5 = Harmer, 1924; 6 = Harmer, 1927; 7 = Fraser, 1946; 8 = O'Riordan, 1972; 9 = Viney & Fairley, 1983; 10 = Berrow & Rogan, 1997; 11 = E. Rogan, *pers. comm.*.

Because of difficulties of specific identification, there are no fully confirmed sightings records from Europe, although possible sightings have been made in the Bay of Biscay, Azores, and north of the Canaries. Walker *et al*. (1999), for example, report two "probable sightings": one adult on 28th July 1997, and two adults on 9th September 1999, both over the shelf slope of the Southern Bay at a depth of c. 1,300 m; and Walker *et al*. (2001) present a photograph of a beaked whale, with features resembling a male True's beaked, seen in the southern Bay of Biscay (50 km north of Bilbao) on 9 July 2001, and photographs of another possible True's beaked whale were taken during a sighting in the same area in early September 2003 (H. Harrop, C. Martin, *pers. comm.*).

FAMILY Kogiidae

PYGMY SPERM WHALE *Kogia breviceps*

A poorly known, mainly warm temperate deep-water species occurring in all oceans of the world. In the eastern North Atlantic, pygmy sperm whales have been recorded mainly from West Africa (Mauritania and the Canaries) north to the British Isles and Ireland.

Table 13. Records of Pygmy Sperm Whale

Date	Location	No. of animals	Comments (Source)
24 Apr 1966	*Creggstrand, Co. Clare, Ireland*	*1*	*female, stranded (1)*
Aug 1979	North Sea off the Northumbrian coast	1	sighting (7)
22 Oct 1980	*Rhossili Bay, Glamorgan, Wales*	*1*	*stranded (2)*
June 1982	Deep waters off NW Ireland	1	two sightings on successive days (7)
6 Oct 1985	*Barna, Co. Galway, Ireland*	*1*	*male, stranded (6)*
3 Oct 1993	*Sillery One, Between Foreland Point and Lynmouth, Devon, England*	*1*	*stranded (3)*
12 Jan 1997	*Ladies Beach, Lundy Island, Devon, England*	*1*	*stranded (3)*
17 Oct 1997	Manorbier, Pembs, Wales	1	female, live-stranded, but died (3, 5)
1998	*Clew Bay, Co. Mayo, Ireland*	*1*	*stranded (3, 8)*
6 July 1999	*Bertragh Beach, Murrisk, Co. Mayo, Ireland*	*1*	*male, stranded* (8)
18 Oct 1999	Stranraer, Solway Firth, Scotland	2	mother and calf, live-stranded (3, 4)
20 June 2000	*Brandy Harbour, Killeeneran, Co. Galway, Ireland*	*1*	*female with foetus, stranded (8)*
3 Jan 2002	*Thurlestone beach near Kingsbridge, Devon, England*	*1*	*stranded (3)*
15 July 2002	*Castlegregory, Co. Kerry, Ireland*	*1*	*female, stranded (8)*

Sources: 1 = O'Riordan, 1972; 2 = Sheldrick, 1989; 3 = The Natural History Museum UK Cetacean Strandings Project, Annual Reports 1990-2002; 4 = Bob Reid, SAC Veterinary Services; 5 = R. Penrose, *pers. comm.*; 6 = Berrow & Rogan, 1997; 7 = Sea Watch database; 8 = E. Rogan, *pers. comm.*.

There are only a handful of records from Europe. Most of these are strandings - from Spain, Portugal, the Atlantic coast of France, the Netherlands, Wales, West Scotland, and Western Ireland; the few sightings are mainly from the Bay of Biscay, and Atlantic waters of Britain and Ireland (see Table 13 for UK & Irish records).

FAMILY Physeteridae. Sperm whales

SPERM WHALE *Physeter macrocephalus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix III (can be exploited so long as regulation keeps populations out of danger) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West

Greenland), although for Japan, Norway and Austria, Appendix II listing applies. One of the species managed by the International Whaling Commission. Status listed by IUCN (Hilton-Taylor, 2000) as vulnerable. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985).

The sperm whale has a worldwide distribution in tropical, temperate and sub-polar seas of both hemispheres. In the eastern North Atlantic, it occurs in small numbers in deep waters (200-2,000 m depth, but particularly over or near the 1,000 m isobath – see for example Weir *et al*., 2001) from Iceland and Norway south to the Iberian Peninsula, and east into the Mediterranean Sea. In near-shore waters, the species is mainly seen around Iceland, off western Norway (Andenes), west coast of Portugal, north coast of Spain, and the Azores. It also occurs along the shelf break north and west of the British Isles and Ireland, and in the Bay of Biscay (Evans 1992, 1997; Bloor *et al*., 1996; Pollock *et al*., 1997, 2000; Stone, 1997, 1998, 2000; Weir *et al*., 2001; Cresswell and Walker, 2001; Williams *et al*., in press; see Fig. 13).

There are no reliable population estimates for sperm whales in the North Atlantic, but past hunting is believed to have depressed its population size. Nevertheless, the species is generally the commonest large whale in deep waters, with major breeding areas including the Caribbean and waters around the Azores. The species also occurs in the Mediterranean Sea. Sperm whales are very deep divers, having been recorded to depths of over 3,000 m although they more typically dive to 400-600 m where they feed upon medium to large-sized mesopelagic squid. Two acoustic surveys of the Faroe-Shetland Channel reported by Swift *et al*. (2002) arrived at an estimate of sperm whale density of 1.26 whales per 1,000 km^2. It is likely that this comparatively narrow channel acts as a bottleneck thus accounting for the relatively high density in that region. Another high-density area is along the Ymir Ridge (Pollock e*t al*., 2000).

In northern European waters, sperm whales are either adult or adolescent males that have undergone extensive latitudinal migrations from subtropical and tropical breeding areas. Sightings occur throughout the year (Fig. 51f), and there is evidence that, increasingly, small groups are remaining at high latitudes into winter months, when mass-strandings may take place (Evans 1992, 1997c; Berrow *et al.*, 1993). In addition to a recent increase in strandings, (Evans, 1997c; Berrow *et al*., 1993), the number of sightings in UK waters was also much higher during the 1990s compared with the 1970s and 1980s (Fig. 56e). Recent acoustic surveys in northern Britain also indicate that sperm whales may be present in significant numbers during December and February (Lewis *et al*., 1998; Swift *et al*., 2002). Sightings off the shelf tend to peak in summer months whereas those on the shelf or in coastal waters (<12 nm) peak in winter (Evans, 1997c; Figs. 53c, 54d); spatial variation across the Faroe-Shetland Channel indicates a similar pattern (Swift *et al*., 2002). During the Scottish and Irish whale fisheries of the early twentieth century, most sperm whales were caught between June and August (Thompson, 1928; Fairley, 1981). Offshore surveys indicate a general southwards movement in the latter half of the summer, with 100% of sightings in May having a northerly component, compared with 57% in June, whilst the proportion of pods with a southerly component in their direction of travel increased from 29% in June to 64% in July (Stone, 2000).

FAMILY Monodontidae

WHITE WHALE or BELUGA *Delphinapterus leucas*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix III (can be exploited so long as regulation keeps populations out of danger) of BERN Convention on the Conservation of European Wildlife and Natural Habitats (1982); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it is on CITES Appendix I (trade strictly controlled, and not for primarily commercial purposes, with exception of West Greenland). Status listed by IUCN (Hilton-Taylor, 2000) as vulnerable. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

This circumpolar species occurs mainly in sub-arctic and arctic waters. On the eastern side of the North Atlantic, it occurs in the Barents and Greenland Seas. During the summer it is found in shallower bays around the islands of Svalbard, Jan Mayen, Bear Island, and Novaya Zemlya, but between autumn and spring the species occurs further south off the Scandinavian coast and occasionally in the North Sea. It is probable that some records from the North Sea involve small groups since sightings may occur in widely spaced localities within a short period of time (see Table 14).

Table 14. Records of Beluga (since1900)

Date	Location	No. of animals	Comments (Source)
1903	Rive Tyne, Northumberland	1	seen and killed (1)
Apr 1905	River Ouse, Yorks	1	seen and killed (1)
13 Oct 1932	*River Forth near Stirling, Scotland*	*1*	*stranded (1)*
Sept 1948	off Clare Island, Co. Mayo, Western Ireland	1	sighting (2)
1950	off the island of Soay, near Skye, Highland region, West Scotland	1	sighting (2)
Oct 1960	between Orkney and Burray, N. Scotland	1	sighting (3)
31 July 1961	59ºN, 3ºW, Orkney	1	sighting (3)
late summer 1964	Gourock Bay, Southwest Scotland	1	sighting (5)
Nov 1965	Arrochar, Loch Long, Southwest Scotland	1	possibly the same indiv. as in 1964 (2, 3)
June 1987	east of Scarborough in Yorkshire	1	sighting (4, 5)
June 1987	just off Whitby in Yorkshire	1	probably the same indiv. as off Scarborough (4)
Mar 1988	off Hadston, Northumberland	1	sighting (4, 5)
June 1988	off Balintore, Ross and Cromarty, Northeast Scotland	1	sighting (4, 5)
24 and 26 Apr 1995	Loch Duich and then off Applecross, Highland Region, Scotland	1	sighting (5)
4 Sept 1996	Hoswick Bay, Shetland, Scotland	1	sighting (5)
18 Aug 1997	Lund, Unst, Shetland, Scotland	1	sighting (5)

Source: 1 = Fraser, 1934; 2 = Fraser, 1974; 3 = Evans, 1980; 4 = Evans, 1992; 5 = Sea Watch database

NARWHAL *Monodon monoceros*

A high arctic circumpolar species, the narwhal rarely occurs on the eastern side of the North Atlantic south of Svalbard in the Barents Sea. During the summer it tends to occur in deep bays and fjords, but like the previous species, the white whale, it can range over large areas. A vagrant to continental Europe and the British Isles, the last confirmed records being all in 1949 when at least four individuals occurred - in Orkney (two individuals sighted in late June), Essex (one stranding in February), and Kent (one stranding in July) (Evans, 1992; Table 15).

Table 15 Records of Narwhal (since 1900)

Date	Location	No. of animals	Comments (Source)
Feb 1949	*Thames estuary, Essex coast, England*	*1*	*stranded (1)*
late June 1949	off Orkney	2	sighting. Presumably part of the group which included individuals stranding on the Essex and Kent coasts (1)
July 1949	*Thames estuary, Kent coast, England*	*1*	*stranded (1)*

Source: 1 = Fraser, 1974. There are two other sightings reports (one from St Kilda and the other from the Inner Hebrides in recent years, but neither of them is confirmed.

FAMILY Delphinidae. Dolphins

MELON-HEADED WHALE *Peponocephala electra*

A mainly tropical and sub-tropical deep-water species, which though poorly known, can be locally common around oceanic islands. It rarely occurs outside equatorial waters and there are very few records from Europe. The only record from Britain and Ireland is of a skull subsequently identified as of this species found in Cornwall in September 1949 (originally thought to have been white-beaked dolphin) (see Table 16). On 27 August 2003, two melon-headed whales live-stranded on the coast of France near La Rochelle (Olivier van Canneyt, *pers. comm.*.).

Table 16. Records of Melon-headed Whale

Date	Location	No. of animals	Comments (Source)
Sept 1949	*Charlestown, Cornwall, England*	*1*	*skull, (Mikkelsen & Sheldrick, 1992)*

KILLER WHALE or ORCA *Orcinus orca*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it

is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000; Reeves *et al*., 2203) as lower risk (conservation dependent). In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The killer whale has a worldwide distribution in tropical, temperate and polar seas in both hemispheres (with greatest abundance at higher latitudes). It is widely distributed on the Atlantic seaboard of Northern Europe, mainly around Iceland, the Lofoten Islands and off Andenes in western Norway, and in northern Scotland, but it is occasionally seen south to the Iberian Peninsula and east into the Mediterranean Sea. In UK, it is most common in northern and western Scotland, and the northern North Sea, but is also seen around the Farne islands (North-east England) and the Isle of Man (northern Irish Sea), off western and southern Ireland, St George's Channel and the south-west of England. It is rare in the central and southern North Sea, and much of the English Channel (Evans, 1988, 1992; Hammond *et* al., 1995; Bloor *et al*., 1996; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; Fisher *et al*., 1999; Weir *et al*., 2001; see Fig. 14).

No overall population estimates exist, but recent sightings surveys in the eastern North Atlantic mainly in sea areas from Iceland to the Faroes indicate a population in that region of somewhere between 3,500 and 12,500 individuals (Gunnlaugsson and Sigurjönsson, 1990). No trend or pattern exists in sightings rates or individual rates in UK shelf waters since 1990 (before that date, effort-related watches were largely confined to near-shore waters) (Fig. 57b).

Table 17. Seasonal Occurrence of Killer Whales

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	June-Aug	May-June (-Aug)	June, Aug	June-July
North Scotland	June (July-Aug)	June (Jan, May, July-Aug)	-	May-June
East Scotland	Aug	Aug	Feb (July)	Feb, July
East England	June-Aug	July-Aug	-	-
SW England	(Mar, May, July-Sept)	(Mar, May, Sept)	(May)	(May)
Wales	(Sept)	Sept	-	-
West Ireland	Aug	July-Aug	-	-
- = insufficient data				

On the UK and Irish continental shelf, the species is recorded in all months of the year, but particularly between May and September (Figs. 51g, 52c). This applies to all regions of Britain (Figs. 15-18; Table 17). Offshore, between Shetland and Norway, the species regularly occurs between November and March where it may be seen associating with purse seine fishing boats taking mackerel (Couperus, 1993; Sea Watch, unpubl. data).

Recent surveys north and west of Scotland suggest that the species concentrates along the continental slope north of Shetland (at depths of between 200 and 1,000 m depth) during

May and June (Pollock *et al*., 2000; Weir *et al*., 2001), at which time there may be an onshore movement around the Northern Isles and Hebrides (Evans, 1988, 1997a,b, 1999; Figs. 15-18; Table 17). This is borne out by a comparison of seasonal peaks in sightings and individuals *on* vs *off* shelf, numbers off the shelf declining after June (Figs. 53e, 54d). Most animals seen offshore west of Ireland are also in June (Pollock *et al*., 1997), whereas in coastal waters, peak numbers occur in July-August. Seasonal movements probably relate to distribution of particular prey, with pinnipeds being exploited (for example around Shetland and the Western Isles) particularly during the periods they are hauling out to breed (June-October), and pelagic fish like herring being taken in Norway off Møre in February-March and around the Lofoten Islands in April-May, and October-January (Similä *et al*, 1996; Ugarte, 2001; T. Similä, *pers. comm.*).

[**PYGMY KILLER WHALE *Feresa attenuata***
Although not recorded in British or Irish waters, there have been four confirmed sightings in the Bay of Biscay during April and May between 1995 and 1999 (Williams *et al*., 2002).]

FALSE KILLER WHALE *Pseudorca crassidens*
International protection includes Appendix II status of CITES, and Appendix II of BERN Convention (from 1987). Status listed by IUCN (Hilton-Taylor, 2000) as least concern.

Table 18. Records of False Killer Whale

Date	Location	No. of animals	Comments (Source)
Oct 1927	*Dornoch Firth, NE Scotland*	*c. 150*	*live-stranded, died (1)*
May 1934	*along Carmarthen and Glamorgan coasts, South Wales*	*c. 25*	*live-stranded, died (2)*
Nov and Dec 1935	*along the coasts of Norfolk, Lincs, Yorks, Northumberland, East Lothian, Fife, Angus, and Linlithgow*	*c. 75*	*live-stranded, died (2)*
Nov 1976	northern North Sea, east of Aberdeen	5-7	Sighting (3, 5)
Aug 1980	SW approaches to the English Channel, north of France	2	sighting (4, 5)
July 1981	east of Orkney	100-150	sighting (4, 5)
Aug 1989	west of Isle of Skye, Highland region, Scotland	1	sighting (4, 5)
Aug 1991	northern North Sea, north-east of Aberdeen	10-20	sighting (4, 5)

Source: 1 = Fraser, 1934; 2 = Fraser, 1946; 3 = Evans, 1980; 4 = Evans, 1992; 5 = Sea Watch database

A widely distributed but fairly uncommon species occurring mainly in deep oceanic waters of the tropics and warm temperate regions of both hemispheres. In the eastern North Atlantic, the false killer whale has been recorded only occasionally as far north as the British Isles, although it may occur more regularly west of the Iberian Peninsula.

In Britain and Ireland, strandings have been confined to a few occurrences, all involving large groups: in October 1927 (c. 150 in the Dornoch Firth, NE Scotland); May 1934 (c. 25 along Carmarthen and Glamorgan coasts, S Wales); and 1935 (c. 75 along the coasts of Norfolk (November), Lincolnshire (November-December), Yorkshire (November), Northumberland (December), East Lothian, Fife and Angus (November), and Linlithgow (December)) (Table 14). There have been no strandings since then. However, between 1976 and 2002, there have been five sightings: in the South-west Approaches of the English Channel, in the northern North Sea, and off western Scotland (Table 18). Sightings have taken place mainly in July-August but with one record in November.

LONG-FINNED PILOT WHALE *Globicephala melas*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and, since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). North Atlantic population status listed by IUCN (Hilton-Taylor, 2000) as not evaluated. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The long-finned pilot whale has a worldwide distribution in temperate and sub-polar seas of both hemispheres. It is common and widely distributed in deep North Atlantic waters (mainly 200-3,000 m depth) seaward and along the edges of continental shelves where bottom relief is greatest, although it may venture on occasions into coastal waters, even entering fjords and bays. In European seas, the species occurs from West Norway and the Faroes around northern and western Scotland, western Ireland, and South-west England (Fig. 19). It also occurs in the Bay of Biscay south to the Iberian Peninsula, and is common in the Mediterranean.

The species probably dives to a few hundred metres and its spatio-temporal distribution has been linked to its preferred prey of squid, particularly *Todarodes sagittatus* and *Gonatus* sp. (although fish and shrimps may also be taken seasonally).

Sightings surveys in the eastern North Atlantic in the late 1980s (Buckland *et al.*, 1993) estimated the population at 778,000 (CV=0.295), but the difficulty of accurately estimating group size and distance of the centre of the group from survey vessels imposes serious limitations to the accuracy of such estimates whilst the area of coverage did not extend fully into UK waters. Too few effort-related observations of this species have been made in UK shelf seas for any inference on trends (Fig. 57c).

Table 19 Seasonal Occurrence of Long-finned Pilot Whales				
Region	**Peak Number of Sightings**	**Peak Number of Individuals**	**Peak Sightings Rates**	**Peak Individual Rates**
West Scotland	Aug (Year-round)	Aug (Apr, June-July)	-	-
North Scotland	Year-round (Aug)	Jan, Nov	-	-
East Scotland	(July)	Apr	-	-
East England	(Aug)	(Aug)	-	-
SE England	May	May	-	-
SW England	Nov (Year-round)	Nov	(Aug)	(Aug)
Wales	(Apr-Nov)	Apr (Aug)	-	-
NW England	(July-Aug)	(June-Aug)	-	-
West Ireland	Aug	(June) Aug	-	-
- = insufficient data				

In British and Irish waters, long-finned pilot whales occur mainly along the continental shelf slope, particularly around the 1,000 metre isobath - in the Faroe Bank Channel, Faroe-Shetland Channel, Rockall Trough, Porcupine Bight, and South-west Approaches to the English Channel (Fig. 19). The species occurs year-round but with greatest numbers of sightings in July and August (Fig. 51h), although highest numbers of individuals on the shelf occur in November (Fig. 53f) and within 12 nm in January (Fig. 54e). This reflects apparent regional movements. In South-west England it is recorded in greatest numbers in November, and in the north of Scotland in November and January (Figs. 20-21; Table 19; see also Evans, 1992; Bloor *et al.*, 1996; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; Weir *et al.*, 2001).

RISSO'S DOLPHIN *Grampus griseus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000) as data deficient. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

Widely distributed in tropical and temperate seas of both hemispheres, Risso's dolphins occur in small numbers along the Atlantic European seaboard from the Northern Isles south to the Iberian Peninsula and east into the Mediterranean Sea (particularly the Ligurian Sea).

The major populations in northern European waters occur in the Hebrides but the species is regular also in the Northern Isles, in the Irish Sea, particularly the St George's Channel

(but also off North Wales and the Isle of Man), and in South-west Ireland; it is rare in the North Sea and all but the western end of the English Channel (Evans, 1992; Bloor *et al*., 1996; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; see Fig. 22). Elsewhere, it is present in North-west France, the southern Bay of Biscay, around the Iberian Peninsula, and in the Mediterranean Sea.

No population estimates exist for any region in the North Atlantic. However, a photo-ID study of Risso's dolphins in the Minches east of the Outer Hebrides, Scotland during August and September 1995, and May to October 1996, recognised at least 142 individuals, with at least 52 of these re-sighted between 1995 and 1996 (Atkinson *et al*., 1999). Between May and July, the species was generally seen offshore in deeper waters and in large groups. In August and September, however, it occurred regularly in coastal bays or near-shore, foraging solitarily or in small groups. Atkinson *et al*. (1999) thought this apparent change in behaviour was possibly linked to prey availability (lesser octopus, *Eledone cirrhosa*), with apparent peaks in June and August-October. Sightings rates and individual rates have fluctuated between years, with peaks in 1997 and 1999 (Fig. 57d).

Although present in UK waters throughout the year, Risso's dolphin numbers in shelf waters are greatest between May and October (particularly July-September) (Figs. 51i, 52e), with the species favouring slopes of 50-100 m depth (Evans, 1992), in contrast to other regions of Europe where it generally occurs on continental slopes at 400-1,200 m depth. There is some indication that the seasonal peak in numbers offshore (>12 nm) is slightly earlier than inshore (Fig. 54f). There are too few sightings off the shelf for an on-shelf vs off-shelf comparison (Fig. 53g). Seasonal patterns of occurrence are similar across regions, with the possible exception of South-west England, where sightings are more evenly distributed through the year (Figs. 23-26, Table 20). Casual sightings from Ireland are reported mainly from May to August (Berrow *et al*., 2001), similar to the pattern observed here. The species has also been recorded near the shelf edge between September and November (Weir *et al*., 2001).

Table 20. Seasonal Occurrence of Risso's Dolphins

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	Aug-Sept	Aug-Sept	Aug-Oct	Aug-Sept
North Scotland	Aug-Sept	Aug-Sept	(Jan)	(Jan)
East Scotland	(July-Aug)	June	(Nov-Jan)	Nov (Dec-Jan)
SW England	(July, Oct)	July	(Oct)	(Oct)
Wales	July-Sept	July-Sept	July-Aug	July-Aug
East Ireland	Aug	June, Aug	(Aug)	(Aug)
West Ireland	Aug (May-Aug)	July (May-Aug)	(May) Aug	Aug
- = insufficient data				

Effort-related sightings data between 1989 and 2002 indicate an increase since 1995, with higher sightings rates and individual rates in the period 1995-2002 compared with 1989-94 (Fig. 55e). No significant long-term trend was detected, however, after the Bonferroni adjustment (Cuzick's trend test, $z = 2.419$, two-sided $P = 0.0156$ for both sightings & individual rates).

ATLANTIC WHITE-SIDED DOLPHIN *Lagenorhynchus acutus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and, since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000) as least concern. In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The distribution of the Atlantic white-sided dolphin is confined to temperate and sub-polar seas (7-12^{o} C) of the North Atlantic. In European waters, it is widely distributed mainly offshore from Iceland and the western Barents Sea south to the Bay of Biscay (47^{o} N). It is less common on the continental shelf than on the slope (mainly around 100-300 m depth) and in deeper waters favouring areas of high bottom relief and around deep submarine canyons.

In UK waters, its distribution is concentrated around the southern end of the Sea of Hebrides, the Northern Isles and northern and central North Sea (Fig. 27). It also occurs regularly off South-west Ireland, occasionally entering the southern Irish Sea, and the English Channel, but is rare in the northern Irish Sea, the eastern English Channel and southernmost North Sea (Evans 1992; Bloor *et al*., 1996; Kinze *et al.*, 1997; Leopold and Couperus, 1995; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; see Fig. 27). Although apparently rare in the Bay of Biscay, a large school numbering c. 750 individuals was reported at c. 3,500 m depth in the northern part of the Bay in May 1995 (Leopold and Couperus, 1995). Offshore surveys conducted by JNCC in relation to oil and gas exploitation show the species to be more abundant north of 56^{o} N than south of this latitude, with greatest numbers in the Faroe Bank Channel, Faroe-Shetland Channel, and the Rockall Trough (Pollock *et al*., 1997, 2000; Weir *et al.*, 2001).

Table 21. Seasonal Occurrence of Atlantic White-sided Dolphins

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	June, Sept	Sept	(Sept)	(June, Sept)
North Scotland	July-Sept	May-Oct	(Aug)	(Aug)
East Scotland	July	July	(Feb)	(Feb)
East England	Mar-Sept, Nov	May	-	-
SW England	(Mar-Apr), (Sept-Oct)	Mar, Oct	-	-
Wales	Feb-Mar, Aug-Sept	Mar, Sept-Oct	(Sept)	(Sept)
West Ireland	Aug-Sept, Dec	Sept, Nov	-	-

- = insufficient data

No population estimate exists for the species, although a shipboard survey of the North Sea and adjacent waters in July 1994 gave an estimate of 11,760 (5,867-18,528) dolphins of *Lagenorhynchus* species (most of which are likely to have been white-beaked dolphins, but including those whose specific identity was not known) (Hammond *et al*., 1995). A survey of part of the Atlantic Frontier in July-August 1998 resulted in an estimate of 27,174 individuals (CV = 0.31) (Hughes *et al*., 1998). Too few effort-related observations of this species have been made in UK shelf seas for any inference on trends (Fig. 57e).

In British and Irish waters, Atlantic white-sided dolphins may occur on the continental shelf in all months of the year, but with peak sightings between June and September (in particularly large numbers in September) (Figs. 51j, 52f), when the species can enter fjords and inlets in depths of less than 50 m; it has been reported to move further offshore into deeper waters between November and May (Northridge *et al*., 1995, 1997; Leopold and Couperus, 1995), although this is not clear here from inshore *vs* offshore comparisons nor those between *on* shelf and *off* shelf sightings (Figs. 53h, 54g). However, such comparisons are hindered by limited sample sizes off the shelf in the Sea Watch database. An analysis of the stomach contents of Atlantic white-sided dolphins by-caught in the Dutch mid-water trawl fishery south-west of Ireland indicated that between January and April, the most important prey groups were mackerel, gadoid fish, and at least 12 species of meso-pelagic cephalopods (Couperus, 1997, 1999). The occurrence of both meso-pelagic species and mackerel in the stomachs suggests that the species combines a more oceanic distribution with excursions onto the continental shelf area, and this is reflected also in the sightings plot in Figure 26.

In northern Scotland and western Ireland, the species is recorded in most months of the year, but as with other regions, most sightings and numbers of animals in shelf waters occur in late summer (July-September) (Figs. 28-31; Table 21). In offshore regions north and west of Scotland, surveyed by JNCC, the species has been recorded in all months of the year but with higher numbers between June and August and during October–November; it is more frequent in waters less than 1,000 m depth during July and August, with twice as many recorded in August than in any other month (Weir *et al*., 2001). Casual sightings in Ireland within the IWDG database occur mainly in July (Berrow *et al*., 2001).

WHITE-BEAKED DOLPHIN *Lagenorhynchus albirostris*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000) as least concern. In UK, it receives protection under The

Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The white-beaked dolphin is restricted to temperate and sub-polar seas of the North Atlantic. It occurs over a large part of the northern European continental shelf (mainly in waters of 50-100 m depth, and almost entirely within the 200 m isobath), its distribution extending northwards to northern Norway, Iceland, the Greenland Sea and central west Greenland. Sightings rates and individual rates in UK shelf waters have fluctuated since 1990, but with a strong peak in 2000 (before 1990, effort-related watches were largely confined to near-shore waters) (Fig. 57f).

From line transect surveys in July 1994 (Hammond *et al.*, 1995), a population estimate of 7,856 white-beaked dolphins (4,032-13,301) was made for the North Sea and Channel. An abundance estimate of 11,760 (5,867-18,528) dolphins was obtained when all *Lagenorhynchus* sightings were combined (including those whose specific identity was not known). All records were made in the North Sea and the area directly NW of Scotland, between c. 54^{o}-60^{o} N, 6^{o} W-7^{o} E.

The species is common in British and Irish waters, and is found most abundantly in the central and northern North Sea across to north-west Scotland (particularly the north Minch and western Sea of Hebrides), although it also occurs occasionally in Western and Southern Ireland, St George's Channel, English Channel, and northern Bay of Biscay (Evans 1992; Northridge *et al*., 1995; 1997; Hammond *et al.*, 1995; Bloor *et al*., 1996; Kinze *et al.*, 1997; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; Berrow *et al*., 2001; Cresswell and Walker, 2001; Williams *et al*., in press; see Fig. 30).

Table 22. Seasonal Occurrence of White-beaked Dolphins

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	June-Sept	Aug	June, Sept (July-Aug)	June, Sept (July-Aug)
North Scotland	Aug-Sept	Aug	(June)	(June)
East Scotland	July-Aug	Aug	Aug (June-July)	(Aug, Dec)
East England	May-June	May-June	-	-
SE England	(Aug-Sept)	(Aug-Sept)	-	-
SW England	(Feb-Nov)	(Feb-Nov)	-	-
West Ireland	(Oct)	Aug-Oct	-	-

- = insufficient data

Although recorded in every month of the year, the species is most common between June and September, with overall numbers peaking in August (Figs. 51k) and individual rates in June and August (Fig. 52g). A similar pattern of peak sightings and numbers between June and September occurs across most regions, although in the southern North Sea (eastern England), the seasonal peak is earlier, in May-June, and in western Ireland, peak numbers have been recorded in August-October (Figs. 31-34, Table 22). There are too

few data off the shelf for this species for *on* shelf vs *off* shelf comparisons (Fig. 53i); numbers of sightings beyond 12 nm of the coast peak in August, at the same time as those within 12 nm (Fig. 54h).

Effort-related sightings rates show a steady increase from 1990-2002, and higher individual rates occur for the period 1999-2002 compared with 1990-98 (Fig. 55f), although there was no significant long-term trend after the Bonferroni adjustment (Cuzick's trend test, $z = 2.028$, two-sided $P = 0.0426$ for sightings rates; and $z = 2.478$, two-sided $P = 0.0132$ for individual rates).

SHORT-BEAKED COMMON DOLPHIN *Delphinus delphis*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000) as least concern. In UK, it receives protection in respect of particular methods of killing or taking under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The common dolphin has a worldwide distribution in oceanic and shelf-edge waters of tropical, subtropical and temperate seas, occurring in both hemispheres. It is abundant and widely distributed in the eastern North Atlantic, mainly occurring in deeper waters from the Iberian Peninsula north to the Faroe Islands. Its distribution appears to be associated with the Gulf Stream in seas of 10-28^{o} C temperature, although it generally occurs in shallower waters closer to the continental shelf edge than the striped dolphin.

On the UK continental shelf, the species is common in the western half of the English Channel and the southern Irish Sea (particularly around the Celtic Deep) and in the Sea of Hebrides and southern part of the Minch (Evans, 1992; Northridge *et al*., 1995; Bloor *et al.*, 1996; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; Brereton *et al*., 1999; see Fig. 35). It is also common south and west of Ireland, whilst off the edge of the continental shelf it can be found north to a latitude of about 65^{o} N (though rare north of 62^{o} N). In some years, the species occurs further north and east in shelf seas - in the northern Hebrides, around Shetland and Orkney, and in the northern North Sea. It is generally rare in the central and southern North Sea and eastern portion of the English Channel. In near-shore waters of Ireland, the greatest number of sightings reported to the Irish Whale and Dolphin Group has been from Galway Bay, around the Aran Islands, and along the south Cork coast (Berrow *et al*., 2001). It is also abundant in the Bay of Biscay (Brereton *et al*., 1999; Cresswell and Walker, 2001).

The species tends to occur along or seaward of the 200 m contour (mainly 200-500 m), although it will also come seasonally onto the continental shelf, occurring in waters of 50-100 m depth (Evans, 1992; Northridge *et al*., 1995; Pollock *et al*., 1997, 2000). Its distribution has frequently been correlated with prominent undersea topography such as sea mounts and escarpments.

No overall population estimate exists, but the population around the Celtic Deep was estimated in July 1994 at 75,449 (95% CI 22,900-248,900, and uncorrected for animals missed on the transect line or for responsive movement) (Hammond *et al*., 1995). To the south, a survey of an area of the continental shelf extending south-west of Ireland to France (excluding the Bay of Biscay) and north-west Spain, and westwards to 20^{o} W provided a population estimate of 61,888 (SE: 17,945) (Goujon *et al*., 1994).

Although present year-round, there appears to be a seasonal movement into UK waters between May and October (see Fig. 52l). Nevertheless, numbers of sightings in adjacent waters off the shelf peak at the same time as on the shelf (Fig. 53j), but slightly earlier within 12 nm than beyond 12 nm (Fig. 54i). In West Scotland, peak numbers of sightings and individuals occur in June-July, after which numbers decline markedly (Figs. 36-37, Table 23). In South-west England south to the Bay of Biscay, the species occurs year-round, but with lower numbers of sightings and lower sighting rates between January and May (see Figs. 36-39, Table 23; Brereton *et al*., 1999). In the Bay of Biscay, there is some indication that the species moves into deep waters between April and June, being largely absent in the shallower northern part of the Bay where concentrations occur at other times of the year (Brereton *et al*., 1999).

Table 23. Seasonal Occurrence of Short-beaked Common Dolphins

Region	**Peak Number of Sightings**	**Peak Number of Individuals**	**Peak Sightings Rates**	**Peak Individual Rates**
West Scotland	June-July (May-Aug)	June-July	(June-Aug)	(June-Aug)
East Scotland	(July-Aug)	May, July-Aug	-	-
East England	(June)	June	-	-
SE England	Oct	Aug, Oct	-	-
SW England	Year-round	Year-round	Year-round	Feb, June, Sept
Wales	Aug (June-Sept)	Aug (May-Sept)	June	June
East Ireland	May (May-Sept)	May-June	May	May
West Ireland	Aug	Aug, Oct	(May) July, Nov	July
- = insufficient data				

Acoustic monitoring elsewhere also indicates that there may be an offshore migration in winter, although there are few winter visual surveys of those areas (Goold, 1998; Swift *et al*., 2002). Concentrations on the West Hebrides Shelf north-west of the Hebrides have been reported during October and November (Pollock *et al*., 2000; Weir *et al*., 2001), and south of Ireland (mostly between the 100 m and 200 m isobaths during November and December (Pollock *et al*., 1997). Casual sightings reported to the Irish Whale and Dolphin Group were concentrated in the south and west of Ireland, with 36% of all sightings occurring >10 km from shore (Berrow *et al*., 2001). A steady increase in

sightings was observed from a minimum in March-April to a peak in August, before declining through autumn and winter.

Effort-related sightings rates and individual rates are higher for the periods 1995-98 and 1999-2002 compared with 1990 and 1991-94, the main change occurring from 1995 onwards, although no significant long-term trend was detected (Fig. 55g; Cuzick's trend test, z = 0.647, two-sided P = 0.5175 for sightings rates; and z = 0.638, two-sided P = 0.5233 for individual rates).

STRIPED DOLPHIN *Stenella coeruleoalba*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000; Reeves *et al*., 2003) as lower risk (conservation dependent). In UK, it receives protection under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The striped dolphin has a worldwide distribution, occurring in both hemispheres mainly in tropical, subtropical and warm temperate seas. In the eastern North Atlantic, it occurs mainly offshore west of the Iberian Peninsula and France, as well as in the Mediterranean.

The only striped dolphin population estimate existing for the eastern North Atlantic is 73,843 (SE 27,526) for an area of the continental shelf extending south-west of Ireland to France (excluding the Bay of Biscay) and north-west Spain, and westwards to 20^{o} W (Goujon *et al*., 1994).

In UK and Irish waters, the species is rare, recorded mainly from the South-west Approaches to the English Channel and Celtic Sea south into the Bay of Biscay, although occasional sightings and strandings have occurred as far north as Shetland, and the species has been seen off the continental shelf north to 62^{o} N (Evans, 1992; Bloch *et al.*, 1996; Stone, 1997; Collet and Evans, in press; see Fig. 40). An oceanic warm water species, the striped dolphin tends to occur well beyond the continental shelf in depths of 1,000 m or more, although it will occasionally come onto the shelf where it has been recorded in waters of 60 m depth or less.

Striped dolphins have been recorded in most months of the year, although on the UK continental shelf, the species occurs mainly between July and September, with a strong peak in August, both on and off the shelf (Figs. 51m, 53k). Effort-related sighting rates also peak in August, and animal rates in July to August.

There has been an increase in frequency of sightings and strandings of striped dolphin on the North European continental shelf since 1990 (see Fig. 56f; Berrow and Rogan, 1997; Muir *et al*., 2000), with records even in Norwegian waters (at a latitude of 66.5^{o} N) (Isaksen and Syvertsen, 2002); this has been linked to an extension of warm oceanic currents and corresponding increases in sea temperatures (Isaksen and Syvertsen, 2002; Collet and Evans, in press).

FRASER'S DOLPHIN *Lagenodelphis hosei*

This poorly known deep water species probably has a pan-tropical distribution. In the eastern North Atlantic it has been recorded from the Canaries, but the only records from continental Europe are of a mass-stranding on the north Brittany coast of France in May 1984 (van Bree *et al*., 1986), and a single male washed ashore dead on the coast of South Uist, Outer Hebrides in September 1996 (Bones *et al*., 1998; Table 24).

Table 24. Records of Fraser's Dolphin

Date	Location	No. of animals	Comments/Source
3 Sept 1996	*Nr Croic A Tuath, Bornish, South Uist, Western Isles, Scotland*	*1*	*male, washed ashore dead (Bones et al., 1998)*

BOTTLENOSE DOLPHIN *Tursiops truncatus*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex II of the EC Habitats Directive (1992) (prohibiting all forms of deliberate capture, killing or disturbance, especially during breeding, rearing or migration; bans the keeping, sale, or exchange of such species; and requiring that member states monitor the incidental capture and killing of all cetaceans, and carries out research on conservation measures to prevent such accidents). Like all cetacean species, it is also listed on Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and, since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000) as data deficient. In UK, it receives special protection in respect of particular methods of killing or taking under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The bottlenose dolphin has a worldwide distribution in tropical and temperate seas in both hemispheres. Along the Atlantic seaboard of Europe, the species is locally fairly common near-shore off the coasts of Spain, Portugal, north-west France, western Ireland (particularly Galway Bay and the Shannon Estuary), North-east Scotland (particularly Moray Firth south to the Firth of Forth), South-west Scotland, in the Irish Sea

(particularly Cardigan Bay), and in the English Channel (Evans, 1992; Hammond *et al*., 1995; Rogan and Berrow, 1996; Pollock *et al.*, 1997; Berrow *et al*., 2001; Lahaye and Mauger, 2001; Pineau *et al*., 2001; see Fig. 41). Smaller groups of bottlenose dolphins have also taken up residence at other localities – for example, around the islands of Barra, Islay, Mull, Coll, Tiree and southern Isle of Skye in the Hebrides of west Scotland. The species also occurs offshore in the eastern North Atlantic (often in association with long-finned pilot whales), as far north as the Faroe Islands and even Svalbard (Evans, 1992; Bloor *et al*., 1996; Pollock *et al.*, 1997, 2000; Stone, 1997, 1998, 2000; Bloch, 1998).

In coastal waters, bottlenose dolphins often favour river estuaries, headlands or sandbanks where there is uneven bottom relief and/or strong tidal currents (Lewis and Evans, 1993; Liret *et al*., 1994; Wilson *et al*., 1997; Rogan *et al*., 2000; Ingram and Rogan, 2002).

Although overall population estimates do not exist, studies indicate a resident population of 129 bottlenose dolphins (95% CI = 110-174) in the Moray Firth (Wilson *et al.*, 1999), whilst the population in Cardigan Bay (within the Special Area of Conservation extending south to Fishguard) has been estimated at 213 bottlenose dolphins (95% CI = 183-279) (Baines *et al*., 2002; Evans *et al*., 2002). Neither population is closed, and individuals may join up for periods of time from elsewhere. In Western Ireland, an estimate of 113 individuals (95% CI = 94-161) occupy the Shannon Estuary (Ingram *et al*., 1999; Rogan *et al*., 2000). Between Normandy (North-west France) and Jersey in the Channel Islands, at least 66 individuals have been recognized by photo-ID, with 12 of these identified three years (1997-99) in succession (Lahaye and Mauger, 2001).

Table 25. Seasonal Occurrence of Bottlenose Dolphins

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	June-Nov	Jan (Year-round)	Mar, Oct-Dec	Oct-Dec
North Scotland	(Aug)	Aug	-	-
East Scotland	Aug (May-July, Sept)	July-Aug (May-June)	May-Sept, Dec (Year-round)	May-Sept, Dec
SE England	May, Aug-Sept	May, Aug-Sept	(May)	(May)
SW England	Year-round (Mar-May, O ct)	May, Oct (Year-round)	(Jan-May, Nov)	(Jan-May, Nov)
Wales	July-Aug	July-Aug	July-Aug	May, July-Aug
NW England	(Aug)	Aug, (Dec)	-	-
East Ireland	Year-round	May, Sept	(Jan)	(Jan)
West Ireland	Aug (July-Aug)	Aug	-	-

- = insufficient data

Numbers at most UK coastal sites are greatest between May and September, although some animals are present near-shore in every month of the year (Evans, 1992; Figs. 51n, 52i). Seasonal variation on a regional basis is depicted in Figs. 42-45 and Table 25. Taking the three main areas where bottlenose dolphins are concentrated, and using effort-related observations for comparison, each locality shows a different seasonal pattern. In Wales, sightings rates and individual rates increase through the summer, peaking in July-August, with a low between October and April. In East Scotland, sightings rates and

individual rates do not vary markedly through the year, although they are higher between May and September and again in December. In South-west England, on the other hand, sightings rates and individual rates are generally higher between January and May. In the Shannon Estuary, western Ireland, there is a marked increase in numbers per unit effort between May and September, compared with the rest of the year (Ingram *et al*., 1999; Rogan *et al*., 2000). Casual sightings from Ireland also show a rapid increase from April to May, suggesting there may be an inshore movement at this time, with a peak in May through to August (Berrow *et al*., 2001).

The species also occurs along the shelf edge close to 1,000 m isobath, with sightings south-west of Ireland and north-west of Scotland (and deep-water sightings along the Wyville-Thomson and Ymir Ridges) between September and November (Pollock *et al*., 1997, 2000; Weir *et al*., 2001). In the Sea Watch database, sightings off the shelf peak in July and August, at the same time as those on the shelf (Fig. 53l), and similar patterns exist within 12 nm compared with beyond 12 nm, although numbers of individuals additionally show a spring peak in April offshore (Fig. 54j).

In the Moray Firth, North-east Scotland, an intensive study of the bottlenose dolphins showed consistent seasonal fluctuations, again with greatest numbers from May to September and lowest from October to April (Wilson *et al*., 1997), whilst further south off the Aberdeenshire coast, sightings and numbers were greatest between February and May (Weir and Stockin, 2001). A long-term land-based study (1989-96) at New Quay in Cardigan Bay, West Wales found that 92% of all sightings occurred between April and November, with 48% between June and August; sightings rates were lowest in March and highest in July (Bristow and Rees, 2001). These findings were similar to those reported from a shorter study (1987-90) from the same locality, where numbers were highest between June and August, although in that study there was a secondary peak in November and December (Evans, 1992; Lewis and Evans, 1992).

In southern England, there is some evidence for a general east-west seasonal migration (Williams *et al*., 1997). During winter, most sightings occur only around Cornwall. During spring, sightings occur eastwards as far as the east Sussex coast. At Durlston in Dorset, peaks in numbers occur in March and April, and again in autumn (October to November) (Owens *et al*., 2001). These authors attributed the decline in numbers in July to August to the corresponding peak in boat traffic levels in the area (recreational leisure craft: yachts, motor boats, jet skis and rigid inflatable boats). By summer, most sightings along the south coast occur from Lyme Bay eastwards. During autumn, most sightings are off the Dorset coast east to the Isle of Wight (Hampshire) (Williams *et al*., 1997).

Around the island of Jersey (Channel Islands) and along the west coast of the Cotentin Peninsula (Carteret to Jobourg) in Normandy, the species is seen year-round, but with peak numbers in July and August at the same time as groups are seen also in Cherbourg Harbour and on the eastern coast of the Cotentin Peninsula, and in Mont-Saint-Michel Bay to the south (Lahaye and Mauger, 2001; Pineau *et al*., 2001). Most sightings occur around Chausey and Minquiers reefs, south and east of Jersey, and west of Cotentin.

Further south off the north coast of Brittany, two distinct groups are associated with the Molène Archipelago and Ile de Sein (Liret *et al*., 1998). In the Molène Archipelago, 24 individuals have been photo-identified between Jan 1992 and July 1997, representing an estimated 60% of this population. These occupy a home range of only c. 6km^2. In the second group around Ile de Sein, 20 individuals were photo-identified between April 1992 and September 1997 (in April 1992, the group comprised 14 individuals, and, by September 1997, 17 animals frequented the area, with six calves being born and three individuals disappearing) (Liret, 2001). Both groups are resident year-round in the region.

Young calves were observed in the Moray Firth mainly between July and September, although new young were first seen in all months except March, April and December (Grellier, 2000), off Aberdeenshire, Scotland, between March and May (Weir and Stockin, 2001), in Cardigan Bay, Wales, between May and October, but particularly July and August (Baines *et al*., 2000; Bristow and Rees, 2001; Reichelt, 2002), and in the Shannon Estuary, western Ireland, between June and September (Rogan *et al*., 2000).

Examination of effort-related sightings data during the 1990s show variable trends in different regions of UK: in Wales, both sightings and individual rates remain similar between 1989 and 1998, but with higher rates between 1999 and 2001 (Fig. 55i). In Eastern Scotland, sightings and individual rates are lower between 1995 and 2002, compared with 1991-94 (Fig. 55j). A photo-ID study of bottlenose dolphins in the Moray Firth indicated that the population may be declining at a rate of over 5% per annum (Sanders-Reed *et al*., 1999), although a recent increase in bottlenose dolphin sightings off the Aberdeen coast (particularly around Aberdeen Harbour) from the late 1990s (Weir and Stockin, 2001) may indicate a geographical shift of part of the population, with some individuals from the inner Moray Firth being re-identified off Aberdeen (K. Stockin, S. Canning, and P. Thompson, *pers. comm.*.); since 2000, the species has been seen regularly off the Fife and Northumbrian coasts (Sea Watch, unpublished data).

In most areas of south-west England, bottlenose dolphins were scarce or absent from the late 1970s until autumn 1991 (Tregenza, 1992; Evans, 1992; Fig. 55k), but since then have been seen regularly from Somerset in the north to Dorset in the east, with more sporadic sightings concentrated in the summer months further east as far as Sussex and Kent (Williams *et al*., 1997; Wood, 1998; Owens *et al*., 2001). A study of bottlenose dolphins observed at Durlston in Dorset between 1988 and 2000 showed that the number of bottlenose dolphin sightings (per unit effort) generally increased from 1988 to 1996, with a peak in 1994 (Owens *et al*., 2001). From 1996 onwards, however, there was a general reduction in the number of dolphin sightings per unit effort, with, in 1999, the replacement of a semi-resident group of five individuals by a new group of individuals. This apparent decline is reflected also more generally for South-west England (see Fig. 55k). A long-term land-based study conducted at New Quay Bay in Cardigan Bay (West Wales) showed no consistent change in the numbers of sightings between 1989 and 2000 (Bristow and Rees, 2001; Bristow *et al*., 2001).

Cuzick's trend tests revealed no significant general trends in bottlenose dolphins over the period 1989-2002 after the Bonferroni adjustment ($z = 2.047$, two-sided $P = 0.0407$ for sightings rates; and $z = 0.744$, two-sided $P = 0.4568$ for individual rates).

FAMILY Phocoenidae. Porpoises

HARBOUR PORPOISE *Phocoena phocoena*

International protection includes Appendix II of CMS Agreement on the Conservation of Migratory Species of Wild Animals (BONN Convention, 1983); Appendix II of BERN Convention on the Conservation of European Wildlife and Natural Habitats (applied to this species, from 1987); and Annex II of the EC Habitats Directive (1992) (prohibiting all forms of deliberate capture, killing or disturbance, especially during breeding, rearing or migration; banning the keeping, sale, or exchange of such species; and requiring that member states monitor the incidental capture and killing of all cetaceans, and carries out research on conservation measures to prevent such accidents). Like all cetacean species, it is also listed on Annex IV Animal and Plant Species of Community Interest in Need of Strict Protection of the EC Habitats Directive (1992). It is listed on List C1 of Council Regulation and, since 1985, has been treated by the European Community as if it is on CITES Appendix II (trade controlled to prevent overexploitation). Status listed by IUCN (Hilton-Taylor, 2000) as vulnerable. In UK, it receives special protection in respect of particular methods of killing or taking under The Wildlife and Countryside Act (1981) and the Wildlife (Northern Ireland) Order (1985). One of the species for which the Agreement on the Conservation of Small Cetaceans in the Baltic and North Seas (ASCOBANS) (1992), applies.

The distribution of the harbour porpoise is restricted to temperate and sub-arctic (mainly 11-14^{o} C) seas of the northern hemisphere. In the eastern North Atlantic, it is common and widely distributed on the continental shelf (mainly at depths of 20-200 m) from the Barents Sea and Iceland south to the coasts of France and Spain, although in the last thirty years it has become scarce in the southernmost North Sea, English Channel, and Bay of Biscay. Nevertheless, it remains the most frequently observed (and stranded) cetacean in British and Irish waters where it is most abundant around North-west and North-east Scotland, in western and southern Ireland, most of Wales and off South-west England (Evans, 1992; Pierpoint *et al*., 1994; Northridge *et al*., 1995; Hammond *et al*., 1995; Rogan and Berrow, 1996; Evans and Wang, 2003; see Fig. 46).

Although porpoises can be found in deep waters off the edge of the continental shelf (for example within the Faroe Bank Channel – see Pollock *et al*., 2000), they are comparatively rare in waters exceeding 200 metres. The species may use tidal conditions for foraging: in Mousa Sound, Shetland, porpoises orient against strong tidal currents at the head of a basin, feeding particularly two hours after high water, specially during spring tides (Evans, 1997); in Ramsey Sound, Pembrokeshire, the species feeds in a similar manner, occurring mainly at or around the head of a benthic trench, almost entirely during the ebb tidal phase (Pierpoint, 2003).

Metrical studies using skeletal material, along with studies of tooth ultra-structure and genetics together suggest that subpopulations of harbour porpoises may exist in the North Sea and adjacent waters, with possible separate populations occurring in the Irish Sea

(Wales), northern North Sea, and southern North Sea (Netherlands) (Kinze, 1985, 1990; Walton, 1997; Lockyer, 1999; Andersen *et al*., 1999). Genetic evidence from the UK and elsewhere also indicates that males disperse more widely than females (Walton 1997; Lockyer, 1999; Andersen *et al*., 1999; Tolley *et al*., 1999).

From line transect surveys in July 1994 (Hammond *et al*., 1995, 2002), a population estimate of 341,366 porpoises (95% CI: 260,000-449,000) was made for the North Sea, Channel, and Baltic. Within the Celtic Sea, the corresponding estimate was 36,280 (CV = 0.57). In Norwegian waters, estimates of 11,000 porpoises (95% CI: 4,790-25,200) for the Barents Sea and Norwegian waters north of 66^{o} N, and 82,600 (95% CI: 52,100-131,000) for southern Norway and the northern North Sea were made during July 1989 (Bjørge and Øien, 1995). Using a strip transect approach, Leopold *et al*. (1992) arrived at an estimate of 19,210 porpoises (CV = 0.34) for the continental shelf off South-west Ireland during the month of July.

In the main parts of its present range, it is recorded in all months of the year, but in many coastal localities around the UK, Faroe Islands, and Norway, there is a distinct seasonal peak between July and September (Evans, 1992; Northridge *et al*., 1995; Bjørge and Øien, 1995; Bloch, 1998; Figs. 51o, 52j).

Table 26. Seasonal Occurrence of Harbour Porpoises

Region	Peak Number of Sightings	Peak Number of Individuals	Peak Sightings Rates	Peak Individual Rates
West Scotland	July-Aug	Aug (July-Sept)	Sept (June-Aug)	Sept (June-Aug)
North Scotland	Aug	Aug	May-Sept	Mar, May-Oct
East Scotland	July-Aug	Aug	Year-round (Feb-Mar, Aug-Dec)	(Nov) Dec
East England	Aug-Sept (Oct)	Aug-Sept	Year-round (Feb-Mar)	Year-round (Feb-Mar, Aug-Sept)
SE England	Apr, (June-July)	Apr, (Aug, Oct)	-	-
SW England	Jan-Mar (Year-round)	Jan-Mar, Oct, Dec (Year-round)	Year-round (Jan-Mar)	Feb, Oct (Year-round)
Wales	May, July-Sept	Aug-Sept	Year-round (Mar, May, July, Nov)	Aug-Oct (July)
NW England	Year-round	Jan, Apr	-	-
East Ireland	Aug (May-Sept)	Aug	Aug-Sept	(Aug) Sept
Northern Ireland	(Aug)	Aug	(July-Aug)	(July-Aug)
West Ireland	Aug (-Oct)	Aug-Sept	Aug-Sept	(Aug)

- = insufficient data

Seasonal variation on a regional basis is depicted in Figs. 47-50 and Table 26, using overall sightings and numbers of individuals counted, as well as effort-related observations for comparison. Peak numbers of sightings and individuals occur in December-March off South-west England, and in April off South-east England, and a similar pattern exists even after corrections are made for variation in effort. Eastern England shows peaks in numbers of sightings and individuals in August-September, with

lows during January-April (although when corrected for effort, there is a secondary peak in sightings and individual rates in February-March). In West Scotland, there is very little effort-related winter coverage but an increase to peak sighting and individual rates around July-September. In North Scotland, numbers of sightings and of individuals peak in August, or May-October when corrected for effort. In East Scotland, peak numbers of sightings and individuals occur in July or August, or when corrected for effort, in February-March or August-December. In Wales, there is little seasonal variation, with lower sighting rates and individual rates only in December-February (although this may be a function of poorer sighting conditions, since acoustic monitoring in West Wales suggests peak activity in December - Pierpoint *et al*., 1999). In Ireland, effort-related sightings data are too limited to draw conclusions but both overall and effort-corrected sightings and numbers of individuals peak around August. Data from the Irish Whale and Dolphin Group also indicate peaks from June to August, with maxima in August (Berrow *et al*., 2001).

Although patterns of seasonal variation in sightings and numbers of individuals within and beyond 12 nm were similar (Fig. 54k), peak numbers occur off the shelf in May and June, two months earlier than on the shelf (Fig. 54m). This may reflect behaviour in relation to breeding, with an offshore movement associated with calving.

In the British Isles, and adjacent seas, calves have been observed between February and September, particularly during May to August with a peak in June (Evans, 1992; Sea Watch, unpublished data), and this coincides with the findings from reproductive studies conducted upon stranded or by-caught animals (Møhl-Hansen, 1954; Fisher and Harrison, 1970; Sørensen and Kinze, 1994; Lockyer, 1995; Addink and Smeenk, 1999).

Examination of long-term trends in effort-related sightings data show some interesting patterns, which are similar across regions although they differ in the timing (Fig. 55l-q). For all regions together, they show a significant increase in harbour porpoise numbers between the 1980s and the 1990s (Fig. 55l; Cuzick's trend test, $z = 3.609$, two-sided $P = 0.0003$ for sightings rates; and $z = 3.553$, two-sided $P = 0.0004$ for individual rates). In North Scotland, sightings and individual rates are higher for the period 1991-2001 compared with 1980-90 (Fig. 55m). An increase is also observed in West Scotland, where sightings and individual rates are higher for the period 1995-2002 compared with 1991-94 (Fig. 55n), and in East Scotland where sightings and individual rates are also higher for the period 1995-2002 compared with 1990-94 (Fig. 55p). In Wales, there has been an increase in sightings and individual rates for the period 1991-2002 compared with the period 1984-90 (Fig. 55o). Finally, in South-west England, sightings and individual rates remained low from 1988-98, but have increased during the period 2001-02 (the amount of effort for the years 1999 and 2000 in the database is as yet insufficient for analysis) (Fig. 55q). Other regions have insufficient effort data for analysis of long-term trends: In Eastern England, sightings and individual rates are much higher in 1998-2002 than for previous years; in Ireland, sightings rates are high in 1988 and 1996 with an apparently decreasing trend in 1998-2002 although this could be due to variable effort/annual rates; individual rates show a similar pattern.

In the Shetland Islands (north Scotland), declines in porpoise numbers were observed between 1982 and 1990, followed by an increase, at least in the southern part of Shetland between 1990 and 1995 (Evans *et al*., 1997). The southern region contained a greater abundance of individuals throughout the study period with a substantial increase in numbers since 1991. The north-west and north-east regions showed uneven fluctuations over the 6-year period, although the north-west population showed evidence of a decline during 1994 and 1995. Changes in harbour porpoise abundance were related to annual variation in sand-eel populations. Sand-eel spawning stock biomass declined markedly from 1984-92, when coastal summer porpoise populations also apparently declined. During 1993 and 1994, sand-eel spawning stock biomass was relatively high and harbour porpoise abundance was also higher (Evans *et al*., 1997).

Evans (1992) reported widespread declines in porpoise sightings rates and individual rates at coastal sites around the UK during the 1970s and 1980s. A major conservation threat has been that of incidental capture in fishing nets involving fishing fleets from various nations and a variety of gear, although bottom-set gill nets were identified as of particular concern (Northridge, 1988). During the 1990s, independent observer schemes indicated an annual porpoise by-catch of 6,785 in the central and northern North Sea (Vinther, 1999), 4.0% of the estimated population size of 170,000 (Hammond *et al*., 2002); and 2,200 in the Celtic Sea (Tregenza *et al*., 1997), 6.2% of the estimated population size of 36,280 (Hammond *et al*., 2002). If these removal rates are correct, they would be unsustainable for the populations, and one would expect declines in both regions during the 1990s. The fact that this is not apparent in any long-term comparisons of porpoise abundance indices from the Sea Watch database (Fig. 55l-q) suggests one or more of the following: 1) the trends observed from these effort-related observations are not reflecting actual population trends; 2) there may be local population shifts spatially which one or other of the studies is not picking up; and 3) the by-catch values may be too high (or have declined since those estimates) and/or the population size estimates may be too low. At present, we do not know which applies. A repeat of the SCANS survey should certainly throw some light on this, whilst further exploratory analyses of the effort-related data sets would also be very useful, so as to determine whether some variables are confounding the results. It should, however, be noted that trend analysis indicated a significant increase from values obtained during the 1980s and those during the 1990s. It does not identify a trend over the last ten years.

3.1 DISCUSSION and CONCLUSIONS

Twenty-eight species of cetaceans have been recorded in British and Irish waters, of which 26 have been since 1980, and 25 since 1990 (Gervais' beaked whale stranded in Ireland in 1989). This represents one-third of global cetacean biodiversity. Many of these species, however, occur only as rare or accidental visitors, their normal distribution being to the north (e.g. narwhal, beluga), west (e.g. blue whale, True's beaked whale), or south (e.g. Blainville's beaked whale, pygmy sperm whale, false killer whale, melon-headed whale, and Fraser's dolphin) of the British Isles. One species, the northern right whale, has suffered from a long history of human exploitation so that in the eastern North

Atlantic only a relict population survives, which itself may derive from the western side of the Atlantic.

Fifteen species are either resident or at least annual visitors to the North-west European continental shelf. These are: humpback whale, fin whale, sei whale, minke whale, sperm whale, northern bottlenose whale, killer whale, long-finned pilot whale, Risso's dolphin, Atlantic white-sided dolphin, white-beaked dolphin, short-beaked common dolphin, striped dolphin, bottlenose dolphin and harbour porpoise. Several of these species live normally in deeper waters along or beyond the edge of the continental shelf, so that they venture onto the shelf either on a seasonal or irregular basis. The eight most frequently observed species in British and Irish shelf waters are (in decreasing order of occurrence): harbour porpoise, bottlenose dolphin, minke whale, short-beaked common dolphin, long-finned pilot whale, white-beaked dolphin, Risso's dolphin, and killer whale (Table 2). [In terms of numbers of individuals recorded, they are (in decreasing order): harbour porpoise, bottlenose dolphin, long-finned pilot whale, short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale.]

Most cetacean species recorded in coastal waters of Britain and Ireland show peak numbers in various regions in late summer (July – September). This is clearly partly the result of increased effort in those areas at that time. Notwithstanding that obvious bias, after correcting for effort, sightings rates and individual rates also frequently show peaks at this same period of the year. The protocol for effort-related watching has been to largely watch in sea states of 3 or less so as to reduce the bias of lower sightability at high sea states. If such seasonal peaks truly reflect an immigration to coastal waters by various species, then one obvious explanation would be the increased biological productivity at this time, with large quantities of spawning or young fish (which at the same time are being exploited by breeding seabirds). In some regions, seasonal peaks in sightings rates and individual rates occur at other times of the year, for example winter and early spring for bottlenose dolphins and harbour porpoises in South-west England, whilst some regional populations of these species are clearly present year-round.

The analyses conducted for this Review have focused upon the status of cetaceans within national waters of England, Wales, Scotland and Ireland. This has meant that for species that live largely offshore such as long-finned pilot whale, killer whale, and Atlantic white-sided dolphin, effort-related sightings are generally too few for meaningful examination for long-term trends in abundance. The application of Cuzick trend tests to six species (minke whale, Risso's dolphin, white-beaked dolphin, short-beaked common dolphin, bottlenose dolphin, and harbour porpoise) indicates significant trends only for the minke whale and harbour porpoise, in both cases the trend being one of increased numbers between the 1980s and the present day.

The goal of any mammal monitoring scheme should be to have robust estimates of abundance and to be able to track changes in these both spatially and over time. Unfortunately, for cetaceans this is an expensive and logistically challenging task. Sightings schemes using a network of volunteer observers are useful to detect gross changes in distribution and abundance at low cost, but finer-scale status changes require

more refined monitoring techniques (Evans and Hammond, in press). At the very least, these should take account of variation in effort, preferably also examining a suite of variables affecting sightability. A first attempt at a Distribution Atlas for the commoner species has now been published, making use of the combined datasets of Sea Watch, JNCC, and the 1994 SCANS survey co-ordinated by SMRU, and correcting for variation in effort and sea state conditions (see Reid *et al*., 2003). The Status Review here aims to complement that Atlas using the network of observers contributing to Sea Watch, to examine seasonal and longer-term trends in relative abundance.

Since the previous Status Review was published, interest in cetaceans in UK has burgeoned: there has been a marked increase in the number of people conducting surveys and other research projects, and much progress has been made in increasing our knowledge of particular populations. The first large-scale attempts to estimate absolute abundance of the commoner cetacean species such as harbour porpoise were conducted in July 1994 with the SCANS survey centred upon the North Sea (Hammond *et al*., 2002). Photo-ID studies have been conducted on bottlenose dolphins in the Moray Firth (Wilson *et al*., 1997, 1999) and Cardigan Bay (Baines *et al*., 2001; Evans *et al*., 2002), with local population estimates derived; and acoustic techniques have been combined with visual surveys particularly to investigate certain species (Pierpoint *et al*., 1999) or offshore areas that hitherto have received little attention (Charif and Clark, 2000; Swift *et al*., 2002). Greatest emphasis has been given to the harbour porpoise, partly because it is the commonest and most widely distributed cetacean species in the region, and partly because it is known to face important conservation pressures, such as accidental capture in fishing gear (Tregenza *et al*., 1997; Vinther, 1999). Most recently, the continental shelf slope has started to receive more attention in the face of oil and gas exploratory activities along what has become termed the Atlantic Frontier or Atlantic Margin (see, for example, Murray and Simmonds, 1998; Weir *et al*., 2001).

Prior to 1990, greatest emphasis in cetacean recording in the UK came from land-based sites, and, as a consequence, our knowledge of seasonal and longer-term changes in abundance was largely confined to species (notably harbour porpoise and bottlenose dolphin) that spend at least a portion of their lives in near-shore waters. Although emphasis remains on surveys conducted in coastal waters within 12 nm of the shore, the last ten years has seen several more wide-ranging surveys and a greater use of platforms of opportunity such as ferries and offshore vessels involved in the oil and gas industry. This has given us a more balanced picture of the relative status and distribution of cetacean species in the region. The results of combined efforts of European Seabirds at Sea projects (conducted by JNCC and other continental European groups), the 1994 SCANS survey organised by SMRU, and those contributing to the Sea Watch database are presented as a Distribution Atlas (Reid *et al*., 2003). Nevertheless, the opportunity for large-scale monitoring of British and Irish seas on a routine basis has not been realised, largely because of lack of resources.

The analyses presented in this Review are very much of an exploratory nature, and there is much scope for further work. First, there are recent data sets from within regions like North-west England, Eastern England, and Ireland, collected independently by other

individuals and groups, which have yet to be incorporated into this database. To do so would greatly enhance conclusions that can be drawn from those areas in a national context. Likewise, the inclusion of JNCC data in our analyses would also be very beneficial. Second, the effort-related data used here for some analyses needs to be examined further, to identify co-variates that may influence sightings rates. The effect of sea state is one obvious co-variate, but additional ones that merit attention include platform type (particularly height and speed), and various other attributes of the watches undertaken. Adjustments for these should reduce potential biases in the data sets.

3.2 STATUS SUMMARY The present status and distribution of each cetacean species recorded in British and Irish waters is summarised below:

NORTHERN RIGHT WHALE *Eubalaena glacialis*
Relict eastern North Atlantic population comprising probably no more than low tens of individuals. Since 1980, there have been only two documented sightings in British and Irish waters both in 2000 – one on the Hatton Bank north-west of Rockall in June, and the second north of the Shetland Islands in July.

HUMPBACK WHALE *Megaptera novaeangliae*
Rare, but with signs of increase in presence in British and Irish waters since 1980, with sightings concentrated in three main regions: Shetland to eastern Scotland; South-west Scotland to northern Irish Sea, and Southern Ireland south to Cornwall. In coastal waters, mainly from April to September, but present offshore throughout the year. Acoustic evidence for a southwards migration in autumn.

BLUE WHALE *Balaenoptera musculus*
Very rare deep-water species, with only four sightings in British and Irish waters since 1980, all between May and September, and all off the edge of the continental shelf. In mid-Atlantic, the species has been recorded acoustically throughout the year, particularly in November and December (probably reflecting a peak in vocal activity in relation to breeding). No obvious evidence for any systematic latitudinal seasonal migration.

FIN WHALE *Balaenoptera physalus*
Uncommon, mainly in deep waters (200-2,000 m depth, particularly around 1,000 m isobath) north and west of Scotland and off Southern Ireland to the Bay of Biscay. Most sightings in northern Britain occur between May and August, whereas in southern Britain and the Bay of Biscay they occur year-round. The species has been recorded acoustically in all months of the year with peak vocal activity in October but no obvious seasonal latitudinal trends in movement. No obvious trend in numbers since the 1980s.

SEI WHALE *Balaenoptera borealis*
Rare, deep-water species (apparently with a more offshore distribution than the fin whale, mainly between 500 and 3,000 m depth), occurring in British and Irish waters mainly between June and December, with some evidence of a northwards migration into higher latitudes in early summer. Numbers observed fluctuate from year to year.

MINKE WHALE *Balaenoptera acutorostrata*
Common and widely distributed on the North-west European continental shelf (in depths of 200 m or less), with numbers greatest off the west coast of Scotland, around the Hebrides, and in the northern and central North Sea as far south as Yorkshire; it is occurs in small numbers in the Irish Sea and western English Channel, but is rare in the southernmost North Sea and eastern half of the English Channel. Although recorded in every month of the year in British and Irish waters, it is mainly seen near the coast from May to October, with peak numbers between June and September. An increasing trend in sightings rates and individual rates observed since the 1980s.

NORTHERN BOTTLENOSE WHALE *Hyperoodon ampullatus*
Uncommon North Atlantic species, occurring mainly at high latitudes in deep ocean trenches (1,000-4,000 m depth). In waters adjacent to the British Isles and Ireland, it is sighted primarily in the Faroe-Shetland Channel, Rockall Trough, and southern Bay of Biscay, occasionally coming onto the shelf from March to October, with peak sightings in the Bay of Biscay between May and August, off northern Scotland in July-September, and in the Faroes in early March and again in August-September. Possibly undergoes latitudinal migrations northwards in spring and southwards in late summer and autumn. No obvious trend in numbers since the 1980s.

CUVIER'S BEAKED WHALE *Ziphius cavirostris*
Widely distributed in tropical and warm temperate seas, probably occurring mainly along continental shelf slopes at depths of 500-3,000 m. Rarely observed in northern European waters although there is one record from Iceland. Most records in UK waters come from the South-west Approaches to the English Channel, western Ireland, and the Western Isles of Scotland, with strandings in most months, but sightings mainly between May and September. In the southern Bay of Biscay, sightings are most common between February and May.

SOWERBY'S BEAKED WHALE *Mesoplodon bidens*
The global distribution of this species appears to be centred upon deep offshore eastern North Atlantic waters (deep ocean basins and the edges of abyssal plains), with most records coming from the Bay of Biscay, British Isles and Ireland, although the species has been recorded recently to the south off Madeira and specially around the Azores. Strandings on the North Sea coasts are probably due to passive drift of carcasses. In UK waters, the species has been reported in all months but particularly between July and October.

BLAINVILLE'S BEAKED WHALE *Mesoplodon densirostris*
Widely distributed in warm temperate and tropical waters, rarely north of Madeira and the Canaries. Only one record from northern Europe – a live stranding on the coast of West Wales in July 1993.

GERVAIS' BEAKED WHALE *Mesoplodon europaeus*
Mainly a south-western North Atlantic species, but with a few records from the eastern North Atlantic - from West Africa (Guinea-Bissau, Mauritania, and the Canaries) north to Ireland (one stranding in Co. Sligo, Ireland, in January 1989). There are no records from Britain.

TRUE'S BEAKED WHALE *Mesoplodon mirus*
Distribution poorly known but apparently centred upon the warm temperate Atlantic. In the eastern North Atlantic, it occurs mainly from deep waters west of the continental shelf from the Canaries north to Atlantic Ireland. In Britain and Ireland, there have been nine strandings, all from western Ireland. No verified sightings but a probable one from the Bay of Biscay in July 2001, and another in the same area in September 2003.

PYGMY SPERM WHALE *Kogia breviceps*
A mainly warm temperate deep-water species reaching its northern limits of eastern North Atlantic distribution in the British Isles and Ireland. Since 1980, there have been seven strandings and two sightings including one of two animals that live-stranded. The species is more regularly observed in the Bay of Biscay.

SPERM WHALE *Physeter macrocephalus*
Worldwide distribution in tropical, temperate and sub-polar seas, occurring in small numbers in the eastern North Atlantic in deep waters (200-2,000 m depth, but particularly over or near the 1,000 m isobath). Major breeding areas occur in the Caribbean, around the Azores, and in the Mediterranean, from which adult or adolescent males wander northwards to northern European waters including west, north, and south of the British Isles. Recorded year-round, but with some indication of an on-shelf (and possibly southwards) movement in autumn winter involving groups of adolescent males, leading to a recent increase in sightings and mass strandings between November and March.

WHITE WHALE or BELUGA *Delphinapterus leucas*
Circumpolar species occurring mainly in sub-arctic and arctic waters. Individuals from the eastern North Atlantic population summering in the Greenland and Barents Seas move south in the autumn, and some individuals may wander as far south as the British Isles, where seven sightings have occurred since 1980.

NARWHAL *Monodon monoceros*
High arctic species with no confirmed strandings or sightings since 1949 when a total of four individuals were recorded in Orkney, Essex and Kent.

MELON-HEADED WHALE *Peponocephala electra*
Mainly tropical and sub-tropical deep-water species, occurring as a vagrant in Europe. The only record from Britain and Ireland is of a skull subsequently identified as of this species found in Cornwall in September 1949. Two animals live-stranded near La Rochelle, France in August 2003.

KILLER WHALE *Orcinus orca*

Regular but uncommon in British and Irish waters, mainly in northern and western Scotland; rare in the Irish, central and southern North Seas, and the English Channel. Recorded in all months of the year, but with most sightings between April and October, with peaks in June-September, varying slightly between regions. The species is seen along the continental slope north of Shetland during May and June, at which time there is an apparent onshore movement to around Shetland, Orkney, and northern Scotland. Offshore, between Shetland and Norway, the species regularly occurs between November and March, where it associates with purse seine fishing boats taking mackerel. No obvious trend in numbers since the 1980s.

FALSE KILLER WHALE *Pseudorca crassidens*

Widely distributed but fairly uncommon species occurring mainly in deep oceanic waters of the tropics and warm temperate regions. Mass strandings in the UK have occurred in 1927, 1934, and 1935, but there has been no stranding since then. There have been five sightings in British and Irish waters since 1976, in the South-west Approaches of the English Channel, the northern North Sea, and off western Scotland, four of which were in July or August.

LONG-FINNED PILOT WHALE *Globicephala melas*

Common and widely distributed in deep North Atlantic waters (mainly 200-3,000 m depth) seaward and along the edges of continental shelves, although it may venture on occasions into coastal waters, even entering fjords and bays. In British and Irish waters, it occurs particularly in the Faroe-Shetland Channel, Rockall Trough, Porcupine Bight, and South-west Approaches to the English Channel. Greatest numbers offshore occur in August, although on the shelf in the north of Scotland, numbers are greatest in November and January, and off South-west England in November. No obvious trend in numbers since the 1980s.

RISSO'S DOLPHIN *Grampus griseus*

Widely distributed in small numbers along the Atlantic European seaboard, occurring in the British Isles most regularly and in greatest numbers in the Hebrides of Scotland; also present around Orkney and Shetland (close to its northern limit of distribution), in the Irish Sea, and western and southern Ireland, but rare in the North Sea and all but the western end of the English Channel. Although recorded year-round, in coastal waters numbers are greatest between May and October (particularly July-September), with the species favouring slopes of 50-100 m depth. No trend in numbers detected since the 1980s.

ATLANTIC WHITE-SIDED DOLPHIN *Lagenorhynchus acutus*

Confined to temperate and sub-polar seas of the North Atlantic. In European waters, it is widely distributed mainly offshore, occurring less commonly on the continental shelf than on the slope (mainly around 100-300 m depth) and in deeper waters where it favours areas of high bottom relief and around deep submarine canyons. In the British Isles, its distribution is concentrated around the southern end of the Sea of Hebrides, the Northern Isles, and northern and central North Sea. It also occurs regularly off South-west Ireland,

occasionally entering the southern Irish Sea, and the English Channel, but is rare in the northern Irish Sea, the eastern English Channel and southernmost North Sea. Offshore, greatest numbers occur to the north and north-west of Britain - in the Faroe Bank Channel, Faroe-Shetland Channel, and the Rockall Trough. The species comes onto the continental shelf between June and October (with largest numbers in September), with some evidence of a movement offshore into deeper waters between November and May. No obvious trend in numbers since the 1980s.

WHITE-BEAKED DOLPHIN *Lagenorhynchus albirostris*

Restricted to temperate and sub-polar seas of the North Atlantic. It occurs over a large part of the northern European continental shelf (mainly in waters of 50-100 m depth, and almost entirely within the 200 m isobath). The species is common in British and Irish waters, and is found most abundantly in the central and northern North Sea across to north-west Scotland (particularly the north Minch and western Sea of Hebrides), although it also occurs occasionally in Western and Southern Ireland, St George's Channel, and western part of the English Channel. Although recorded in every month of the year, the species is most common nearer shore between June and September, with numbers peaking in August, especially in the northern North Sea. No trend in numbers detected since the 1980s.

SHORT-BEAKED COMMON DOLPHIN *Delphinus delphis*

Widely distributed in oceanic and shelf-edge waters of tropical, subtropical and temperate seas. It is abundant and widely distributed in the eastern North Atlantic, where its distribution appears to be associated with the Gulf Stream. The species tends to occur along or seaward of the 200 m contour (mainly 200-500 m), although it will also come onto the continental shelf, mainly between May and October, where it is common in the western half of the English Channel and the southern Irish Sea (particularly around the Celtic Deep), south and west of Ireland, and, between May and July, in the Sea of Hebrides and southern part of the Minch. In some years, it may occur further north and east into the northern North Sea. It is generally rare in the central and southern North Sea and eastern portion of the English Channel. No trend in numbers detected since the 1980s.

STRIPED DOLPHIN *Stenella coeruleoalba*

Widely distributed in tropical, subtropical and warm temperate oceanic seas, tending to occur well beyond the continental shelf in depths of 1,000 m or more. In British and Irish waters, the species is rare, recorded mainly from the South-west Approaches to the English Channel and Celtic Sea south into the Bay of Biscay, although occasional sightings or strandings have occurred as far north as Shetland, and the species has been seen off the continental shelf north to 62^{o} N. Recorded in most months of the year, although mainly between July and September, with a strong peak in August. There has been an increase in frequency of records since 1990; this has been linked to an extension of warm oceanic currents and corresponding increases in sea temperatures.

FRASER'S DOLPHIN *Lagenodelphis hosei*
Pan-tropical deep-water species occurring as a vagrant in European waters. Only one record from Britain and Ireland: a male stranded in South Uist, Outer Hebrides in 1996.

BOTTLENOSE DOLPHIN *Tursiops truncatus*
Worldwide distribution in tropical and temperate seas. Locally fairly common near-shore where it often favours river estuaries and bays, headlands or sandbanks along the Atlantic seaboard of Europe, including western Ireland (particularly Galway Bay and the Shannon Estuary), eastern Scotland (particularly Moray Firth south to the Firth of Forth), South-west Scotland, the Irish Sea (particularly Cardigan Bay), and the English Channel (particularly western portion, and Channel Islands). Smaller groups have also taken up residence at other localities – for example, around the islands of Barra, Islay, Mull, Coll, Tiree, and southern Isle of Skye in the Hebrides of west Scotland. It also occurs offshore along the shelf edge close to 1,000 m isobath (often in association with long-finned pilot whales).

Although present year-round, numbers in most coastal localities are greatest between May and September. In southern England, there is some evidence for a general east-west seasonal migration. During winter, most sightings occur only around Cornwall. During spring, sightings occur eastwards as far as the east Sussex coast. In Dorset, peaks in numbers occur in March and April, and again in autumn (October to November). By summer, most sightings along the south coast occur from Lyme Bay eastwards. During autumn, most sightings are off the Dorset coast east to the Isle of Wight. Around the island of Jersey (Channel Islands) and along the west Normandy coast in France, the species is seen year-round, but with peak numbers in July and August. No trend in numbers detected since the 1980s.

HARBOUR PORPOISE *Phocoena phocoena*
Common and widely distributed in temperate and sub-arctic seas on the continental shelf (mainly at depths of 20-200 m). Despite becoming scarce in the southernmost North Sea and English Channel in the last 30 years, it remains the most frequently observed (and stranded) cetacean in British and Irish waters where it is most abundant around North-west and North-east Scotland, in western and southern Ireland, most of Wales and off South-west England. Sub-populations may exist in the North Sea and adjacent waters, with possible separate populations occurring in the Irish Sea (Wales), northern North Sea, and southern North Sea (Netherlands).

In the main parts of its present range, it is recorded in all months of the year but in many coastal localities around the UK, there is a distinct seasonal peak between July and September; in the southern North Sea and South-west England, sightings rates and numbers are greatest in January-March and, in the south-west, in late autumn (October-December). There is some indication of an offshore movement in early summer (May – June), possibly associated with calving. An increasing trend in sightings rates and individual rates is observed between the 1980s and 1990s.

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Appendix 1: Data Codes for the Effort Database

Field Name	Code	Variable
Effort_ID	Alpha-numeric	Unique identifier for effort records (see text for further explanation)
Effort_leg	Numeric	Consecutive legs of survey
Geog_accuracy	5	Accurate to within 50km (e.g. regional estimation based on start/end)
	4	Accurate to within 5km (e.g. estimated ferry route)
	3	Accurate within 1.5km (degrees and minutes or decca/dead-reckoning)
	2	Accurate within 150m (pre1999 GPS)
	1	Accurate within 50m (e.g. post 1999 GPS recorded in DMS or degrees and decimal minutes)
Day	dd	Day in which record was made
Month	mm	Month in which record was made
Year	yyyy	Year in which record was made
Start_time	hh:mm	Time at start of watch/leg
End time	hh:mm	Time at end of watch/leg
Duration	hh:mm	Duration for watch or leg
Effort_int	CW	Casual watching
	DWNC	Dedicated watch of sea but not for cetaceans
	IDNC	Inexperienced dedicated watch but not for cetaceans
	EDNC	Experienced dedicated watch but not for cetaceans
	IDFC	Inexperienced dedicated watch for cetaceans
	EDFC	Experienced dedicated watch for cetaceans
	LTFC	Experienced line-transect survey for cetaceans
Lat_start	Numeric	Latitude at start of watch/leg expressed in decimal degrees (usually to 4 decimal places).
Long_start	Numeric	Longitude at start of watch/leg expressed in decimal degrees (usually to 4 decimal places).
Lat_end	Numeric	Latitude at end of watch/leg expressed in decimal degrees (usually to 4 decimal places).
Long_end	Numeric	Longitude at end of watch/leg expressed in decimal degrees (usually to 4 decimal places).
Vessel_speed	Integer	Speed in knots of vessel (leave blank if not moving)
Vessel_course	BLANK	Not recorded
		Preferably in degrees if given. Otherwise:
	NW	NW (292-339)
	N	N (340-22)
	NE	NE (23-67)
	E	E (68-112)
	SE	SE (113-157)
	S	S (158-202)
	SW	SW (203-247)
	W	W (248-292)
	VAR	Variable/no direction

Effort Database continued

Field Name	Code	Variable
Observer_code	Numeric	Unique identifier allocated to each observer (See Observer table in database)
Platform_Code	BLANK	None given
	AC	Aircraft
	FI	Fishing vessel
	FR	Ferry
	H	Headland/spit
	IS	Island
	LA	Land
	LI	Lighthouse
	OR	Oil rig
	VE	Other/unspecified vessel
	YA	Yacht
	SE	Seismic survey ship
Observer_height	Numeric	Eye height above sea level (metres)
Field_of_view	0	Not recorded
	1	180° forward
	2	90° left
	3	90° right
	4	360°
Wind_force	BLANK	Not recorded
	0	Calm (0 kn)
	1	Light air (2 kn)
	2	Light breeze (5 kn)
	3	Gentle breeze (9 kn)
	4	Moderate breeze (13 kn)
	5	Fresh breeze (18 kn)
	6	Strong breeze (24 kn)
	7	Near gale (30 kn)
	8	Gale (37 kn)
	9	Strong gale (44 kn)
	10	Storm (52 kn)
Wind_direction	BLANK	Not recorded
	NW	NW (292-339)
	N	N (340-22)
	NE	NE (23-67)
	E	E (68-112)
	SE	SE (113-157)
	S	S (158-202)
	SW	SW (203-247)
	W	W (248-292)
	VAR	Variable/no direction

Code followed by individual platform identifier number

Effort Database continued

Field Name	Code	Variable
Precipitation_type	BLANK	Not recorded
	N	None
	R	Rain
	SN	Snow
	F	Fog/mist
	H	Hail
	SL	Sleet
Precipitation_intensity	BLANK	Not recorded
	CL	Continuous light
	CH	Continuous heavy
	IL	Intermittent light
	IH	Intermittent heavy
	CM	Continuous moderate
	IM	Intermittent moderate
Visibility	BLANK	Not recorded
	1	Less than 1km/at night
	2	1-10 km (moderate/fair)
	3	More than 10 km (good/excellent)
Sea_state	BLANK	Not recorded
	0	Mirror calm
	1	Slight ripples, no foam crests
	2	Small, short wavelets, glassy crests no whitecaps
	3	Large wavelets, crests begin to break, few whitecaps
	4	Small waves becoming longer, many whitecaps
	5	Moderate waves of longer form, some spray
	6	Large waves, whitecaps everywhere, more spray
	7	Sea heaps up, breaking waves blown in streaks
	8	Moderately high waves, well marked-foam streaks
Swell	BLANK	Not recorded
	N	None
	L	0-1 m light (slight/low/gentle)
	M	1-2 m moderate
	H	2 m + heavy
Sea_surface_temp	Numeric	Input only if recorded in the field (degrees C).
Salinity	Numeric	Input only if recorded in the field (ppm).
Depth	Numeric	Depth in metres recorded by echo-sounder.
Assoc_sight_ID	Text	Sightings IDs of any sightings made during this watch/leg (list separated by commas if more than 1.
Boat_activity	N	None
	FI	Fishing boat
	FR	Ferry
	JS	Jet ski
	SB	Speed boat
	VE	Unspecified vessel
	YA	Yacht
	SV	Seismic survey vessel
	TA	Tanker

Field Name	Code	Variable
No_sightings	Numeric	Number of sightings seen within watch/leg
Effort_type	Point	For fixed point or stationary watches = Point
	Line	For each leg from moving platform = Line

Appendix 2: Data Codes for the Sightings Database

Field Name	Code	Variable
Sighting_ID	Alpha-numeric	Unique identifier for sighting record
Assoc_effort_ID	Alpha-numeric	Record ID for associated effort record
Input_by	Alpha-numeric	Code for person inputting data
Record	Alpha-numeric	Data provider's record number
No_sights _same_session	Numeric	Number of sightings of the same group of animals within the period of watching
Geog_accuracy	VII	Accurate within 50km
	VI	Accurate within 10km
	V	Accurate within 5km (e.g. Rough estimation of position or no distance and bearing to big whale)
	IV	Accurate within 2 km (e.g. from land but no distance and bearing)
	III	Accurate within 1km (e.g. GPS of vessel; or from land estimated distance to animals > 1000m)
	II	Accurate within 500m (e.g. GPS of vessel + distance and bearing but animals > 1000m)
	I	Accurate within 50m (e.g. GPS + bearing and distance to animals where distance is reliable)
Species	Numeric	See Appendix 2
Effort_intensity		See Effort table
Best_est	Numeric	Best estimate of number of animals – median value if range given, round down if median is a fraction.
No_adults	Numeric	Number of adults within the group
No_juveniles	Numeric	Number of juveniles within the group
No_calves	Numeric	Number of calves within the group
Max_No	Numeric	Maximum estimate of number of animals
Min_No	Numeric	Minimum estimate of number of animals
Time	hh:mm	Time of observation
Day	dd	Date of observation
Month	mm	Month of observation
Year	yyyy	Year of observation
Latitude	Numeric	Decimal degrees (usually to 4 decimal places)
Longitude	Numeric	Decimal degrees (usually to 4 decimal places)

Sightings Database continued

Field Name	Code	Variable
Animal_heading	BLANK	Not recorded
	NW	NW (292-339)
	N	N (340-22)
	NE	NE (23-67)
	E	E (68-112)
	SE	SE (113-157)
	S	S (158-202)
	SW	SW (203-247)
	W	W (248-292)
	VAR	Variable/no direction
Behaviour_1	BLANK	Not recorded
	norm_swim	Slow/normal swimming/cruising
	fast_swim	Fast swimming/swimming purposefully
	blow_porp	Blowing/surfacing/porpoising
	feed_fish	Feeding/chasing fish (if circling or associated with birds)
	forage	Apparently looking for food - quartering an area, making repeat dives
		Breaching/playing/belly flopping/leaping/rolling on back
	jump_play	Sky-pointing/spyhopping
	spy_hop	Tail /flipper slapping/tail waving/standing on tail
	tail_slap	Response to platform/bow-riding
	bow_ride	Resting/loafing/lying on sea surface
	rest_lay	Sexual
	sex	
Behaviour_2	As above	As Behaviour_1
Assoc_bird_species	Text	See Appendix 3
Description_supplied	BLANK	None
	WORD	Written
	PHOT	Photograph
	DRAW	Drawing
Obs_code	Numeric	Numeric code allocated to observer (See Observer Database)
Platform_code	See Effort	See effort table
Vessel_speed	Numeric	Speed in knots
Vessel_course	Text	Course over ground in degrees (true) or compass points
Boat_hdg_at_obs	Degrees	Heading of boat at point of observation
Wind_force	See effort	See effort table for coding of environmental variables
Wind_direction	See effort	See effort table for coding of environmental variables
Precip_type	See effort	See effort table for coding of environmental variables
Precip_intensity	See effort	See effort table for coding of environmental variables
Visibility	See effort	See effort table for coding of environmental variables
Sea_state	See effort	See effort table for coding of environmental variables
Swell	See effort	See effort table for coding of environmental variables
Sea_surface_temp	See effort	See effort table for coding of environmental variables
Salinity	Numeric	Only if measured in the field (ppt)
Depth	Numeric	Reading from echo sounder (metres)
Distance_to _animal	Numeric	Estimated distance to animal from platform (metres)
Bearing_to_animal	Numeric	Degrees true bearing (i.e. not angle from boat's heading)
Repeat_sighting?	0	No – this is the first sighting of this group
	1	Yes – this group has already been sighted

First_sighting	Text	Record number of first sighting of this sequence
No_of_sub-groups	Numeric	Number of sub-groups associated with the one sighting
Boat_activity	See effort	See effort table
Additional_information	Text	Any relevant information not covered by above fields

Appendix 3: Species Codes

Dolphins	**Codes**
Atlantic spotted dolphin	ASD
Bottlenose dolphin	BND
Short-beaked common dolphin	SBCD
Pantropical spotted dolphin	PSD
Risso's dolphin	RD
Rough-toothed dolphin	RTD
Striped (Euphrosyne) dolphin	SD
White-beaked dolphin	WBD
Atlantic white-sided dolphin	AWSD
Fraser’s dolphin	FD
Long-snouted spinner dolphin	SPD

Baleen whales	
Blue whale	BW
Bryde's whale	BRW
Fin whale	FW
Humpback whale	HW
Minke whale	MW
Northern right whale	NRW
Sei whale	SW

Large Delphinids	
Beluga	BEL
False killer whale	FKW
Killer whale	KW
Long-finned pilot whale	LFPW
Narwhal	NARW
Pygmy killer whale	PKW
Short-finned pilot whale	SFPW
Melon-headed whale	MHW

Porpoises	
Harbour (common) porpoise	HP

Beaked whales	
Blainville's beaked whale	BBW
Cuvier's beaked whale	CBW
Gervais' beaked whale	GBW
Northern bottlenose whale	NBW
Sowerby's beaked whale	SBW
True's beaked whale	TBW

Sperm whales	
Dwarf sperm whale	DSPW
Pygmy sperm whale	PSPW
Sperm whale	SPW

Ambiguous sightings	
Cetacean sp.	UNCE
Beaked whale sp.	UNBW
Dolphin sp.	UNDO
Large whale	UNLW
Patterned dolphin sp.	UNPD
White-beaked/white-sided	UNBS
Common/striped	UNCS
Fin/sei	UNFS

Species Codes continued

Pinnipeds	
Seal sp.	UNSE
Grey seal	GRS
Common (harbour) seal	COS
Walrus	WALR
Bearded seal	BES
Harp seal	HAS
Hooded seal	HOS
Ringed seal	RIS
Sealion	SELI

Others	
Sunfish	SUFI

Sharks	
Shark sp.	UNSH
Basking shark	BASH
Porbeagle shark	POSH
Hammerhead shark	HASH
Blue shark	BLSH

Turtles	
Turtle sp.	UNTU
Loggerhead turtle	LOTU
Leatherback turtle	LETU

Appendix 4: Associated Bird Species Codes

Associated seabirds	Seabird code
Not recorded	
None	N
Cory’s shearwater	CS
Greater shearwater	GS
Manx shearwater	MS
Shearwater	SW
British Storm petrel	BSP
Leach’s storm petrel	LSP
Petrel	PE
Shag	SH
Cormorant	CO
Gannet	GA
Kittiwake	KI
Herring gull	HG
Lesser black-backed gull	LBB
Greater black-backed gull	GBB
Black-headed gull	BHG
Gulls	GU
Arctic skua	ASK
Great skua	GSK
Pomarine skua	PS
Long-tailed skua	LTS
Atlantic puffin	AP
Common guillemot	CG
Black guillemot	BG
Guillemot	GL
Razorbill	RA
Auk	AU
Arctic tern	AT
Common tern	CT
Little tern	LT
Sandwich tern	ST
Tern	TE
Fulmar	FU
Phalarope	PH
Other	Specify

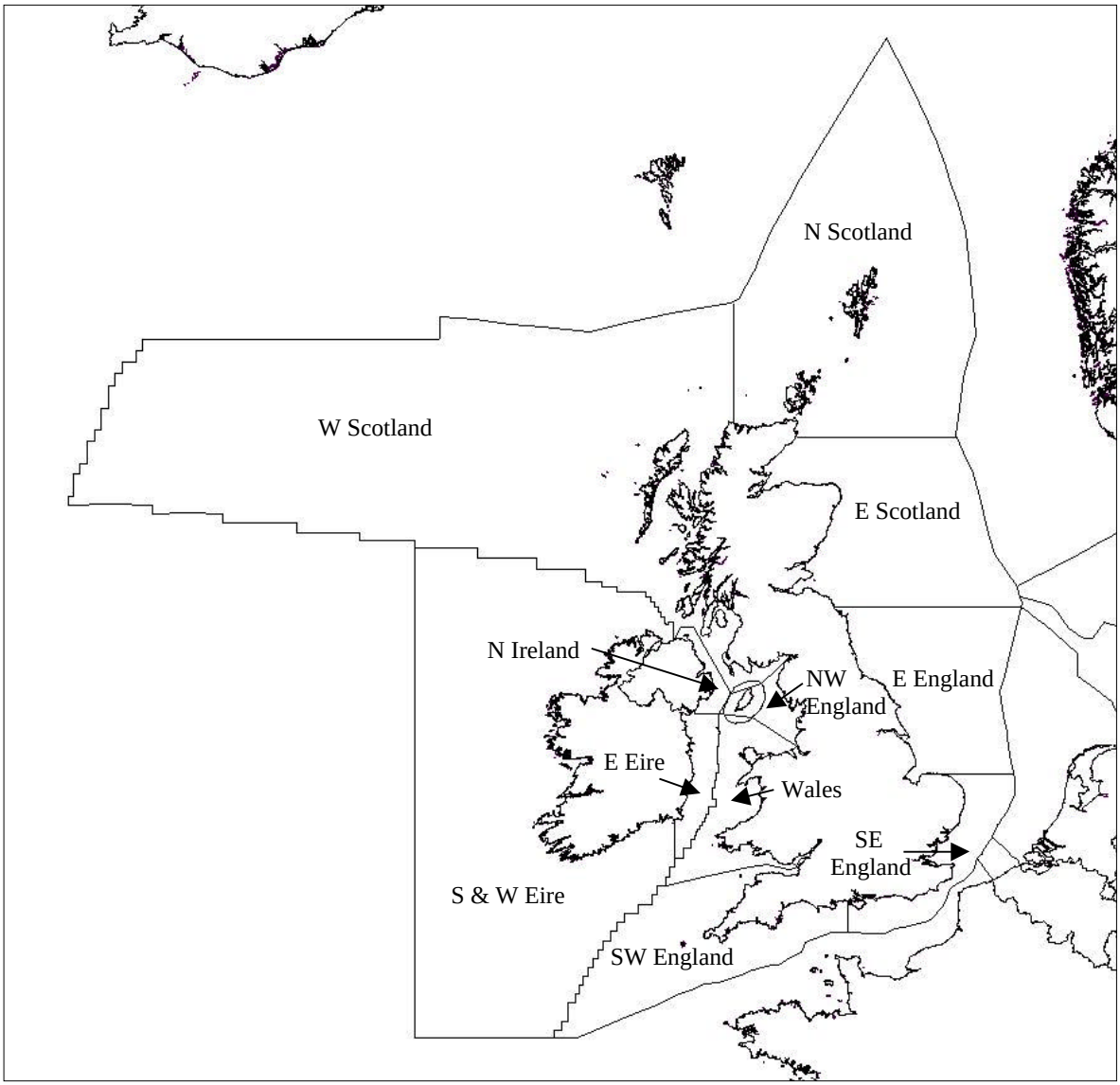


Fig. 2. Map of Regional Divisions

(Note: additional analyses were conducted using data from offshore sectors, west of Ireland, north and west of Scotland and south-west of England towards Bay of Biscay)

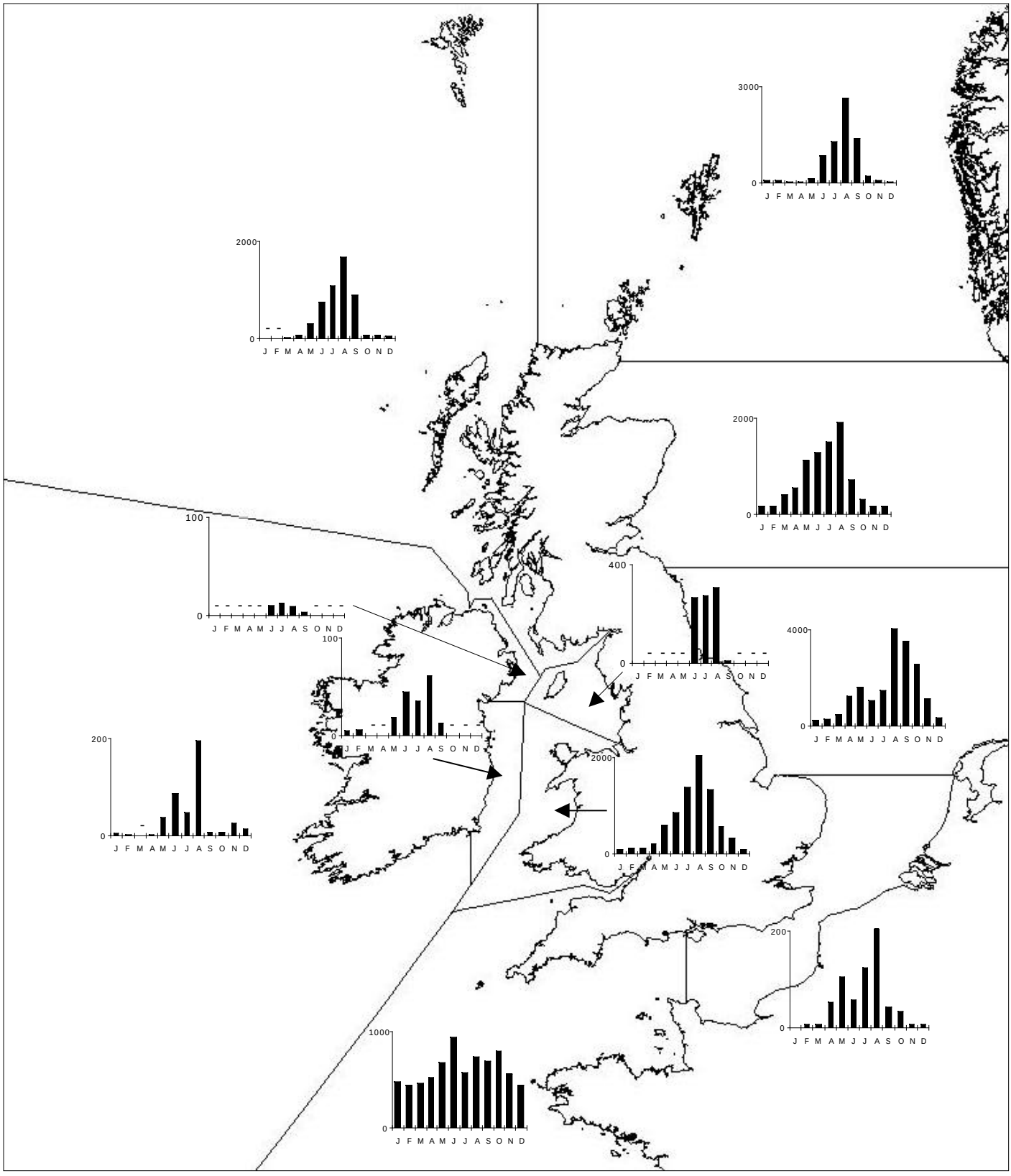


Fig. 3. Map showing Seasonal Distribution of Effort (number of hours of observation)

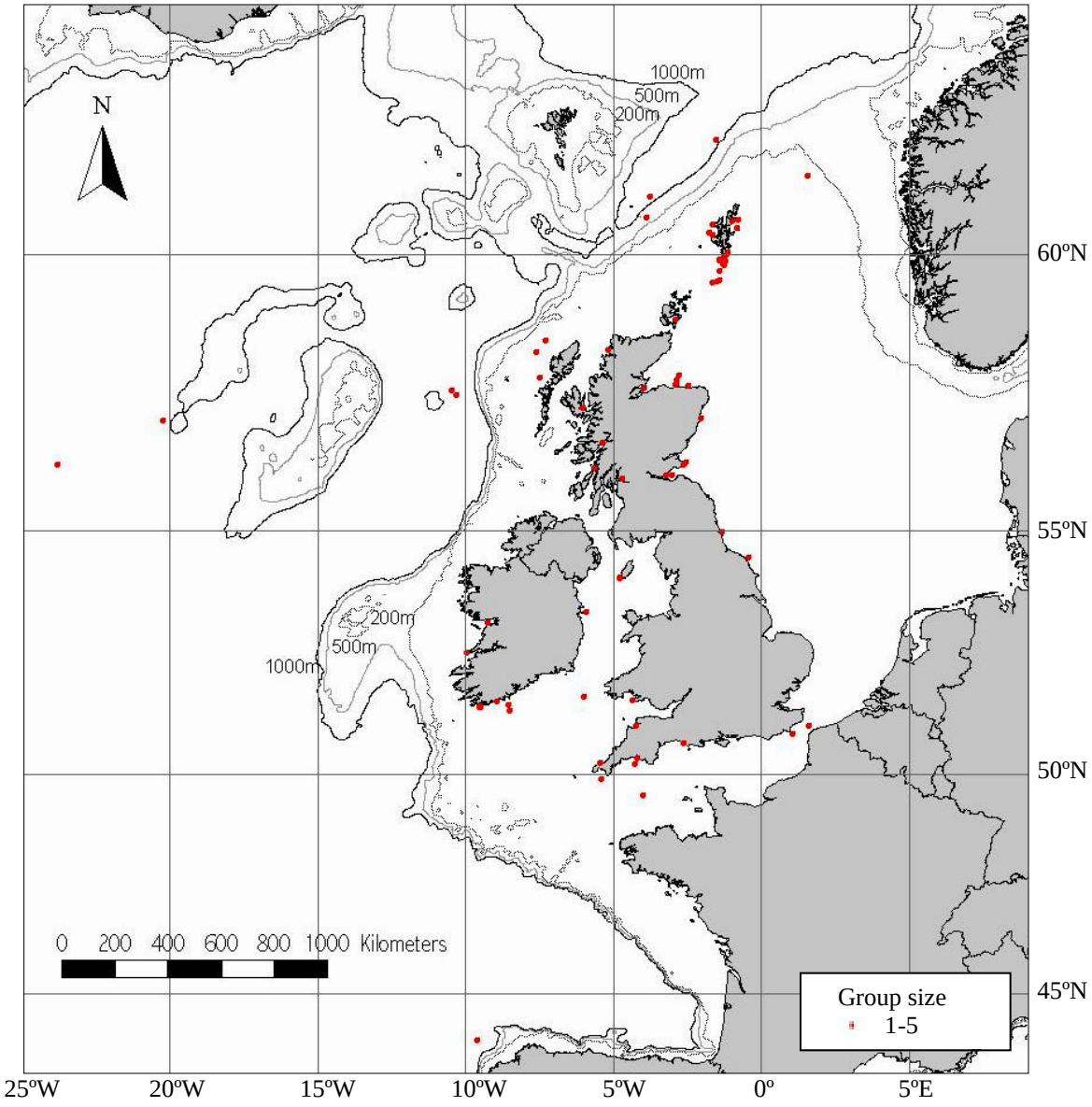


Fig. 4. Map of Humpback Whale Sightings

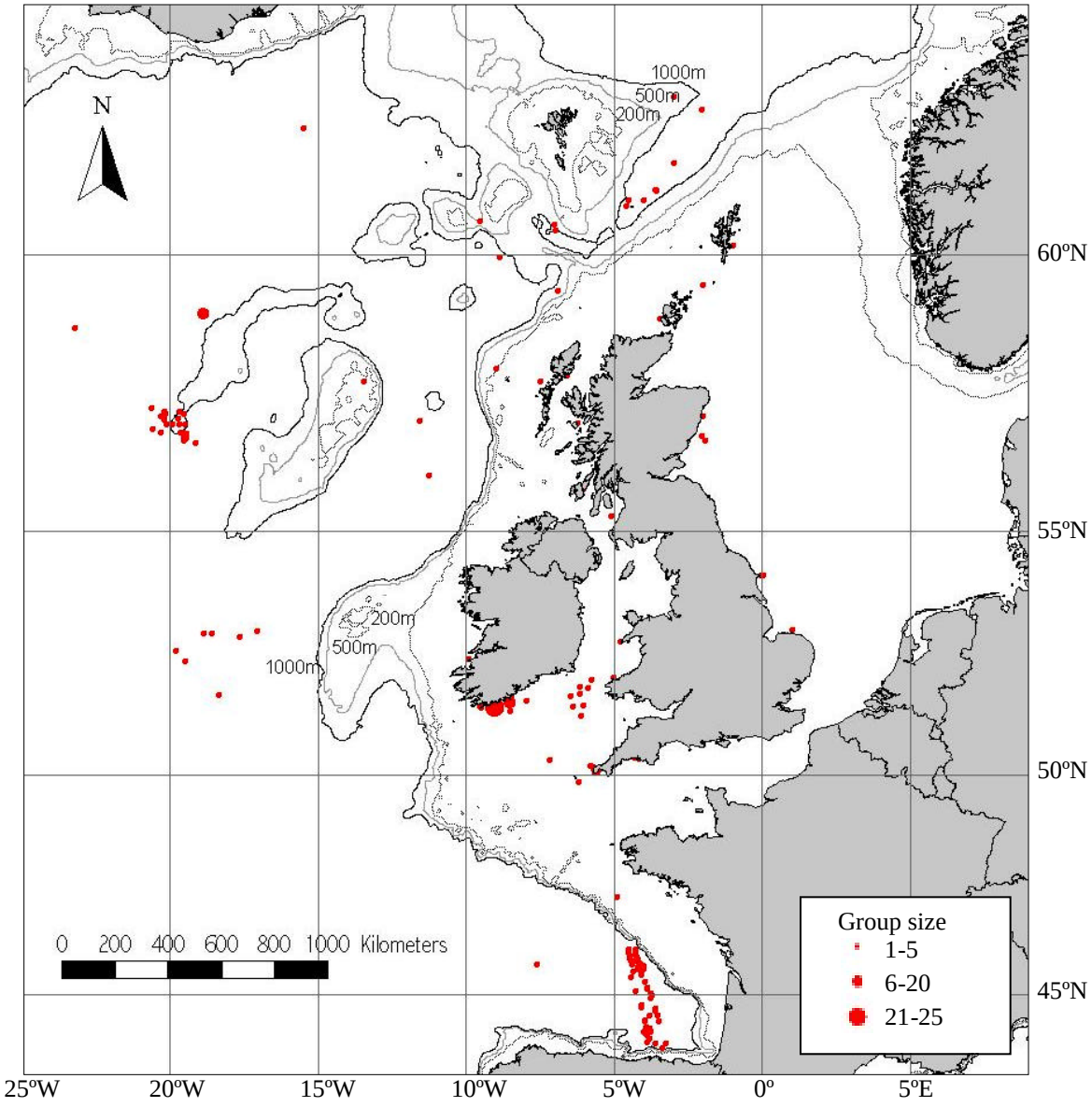


Fig. 5. Map of Fin Whale Sightings

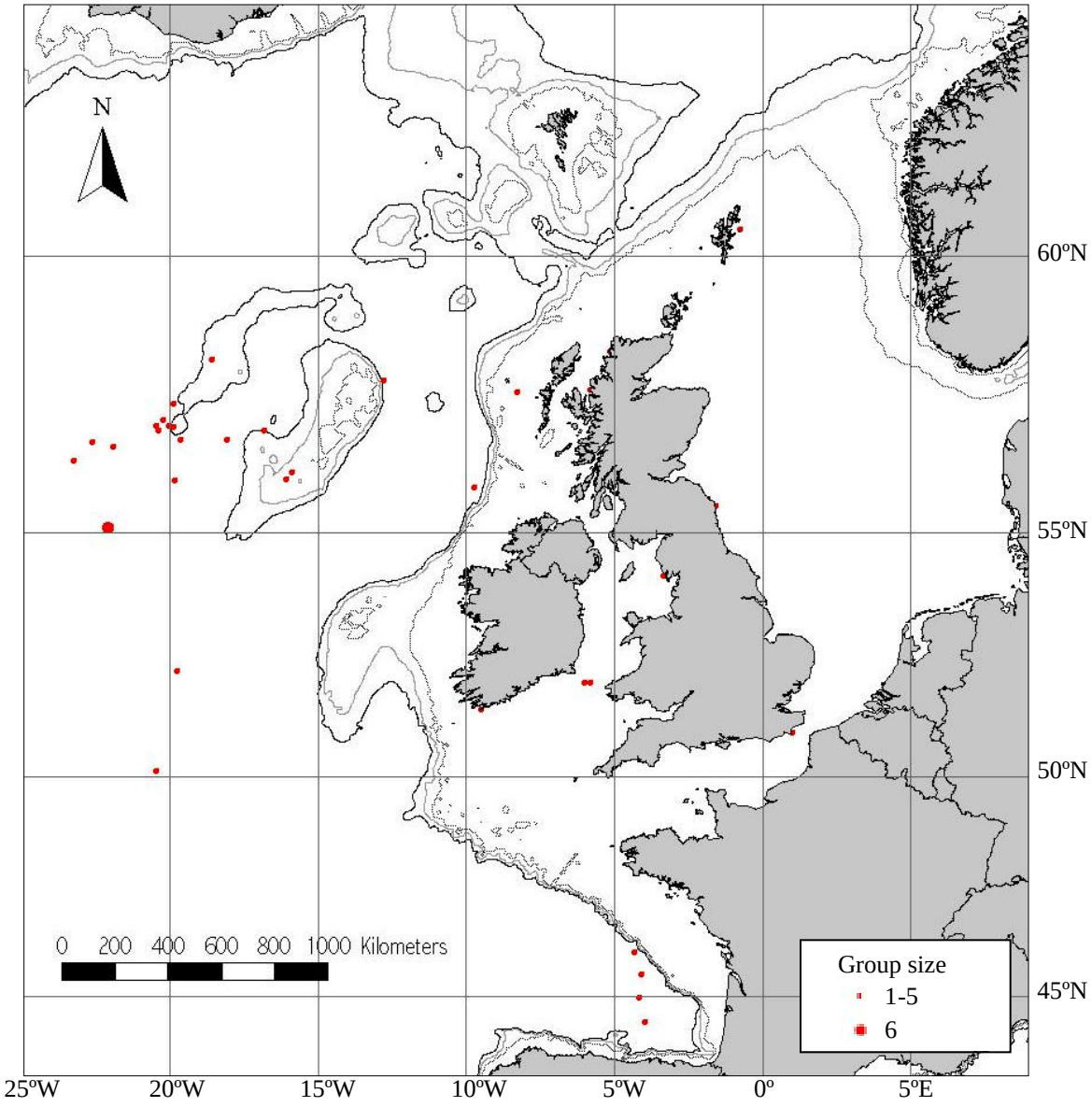


Fig. 6. Map of Sei Whale Sightings

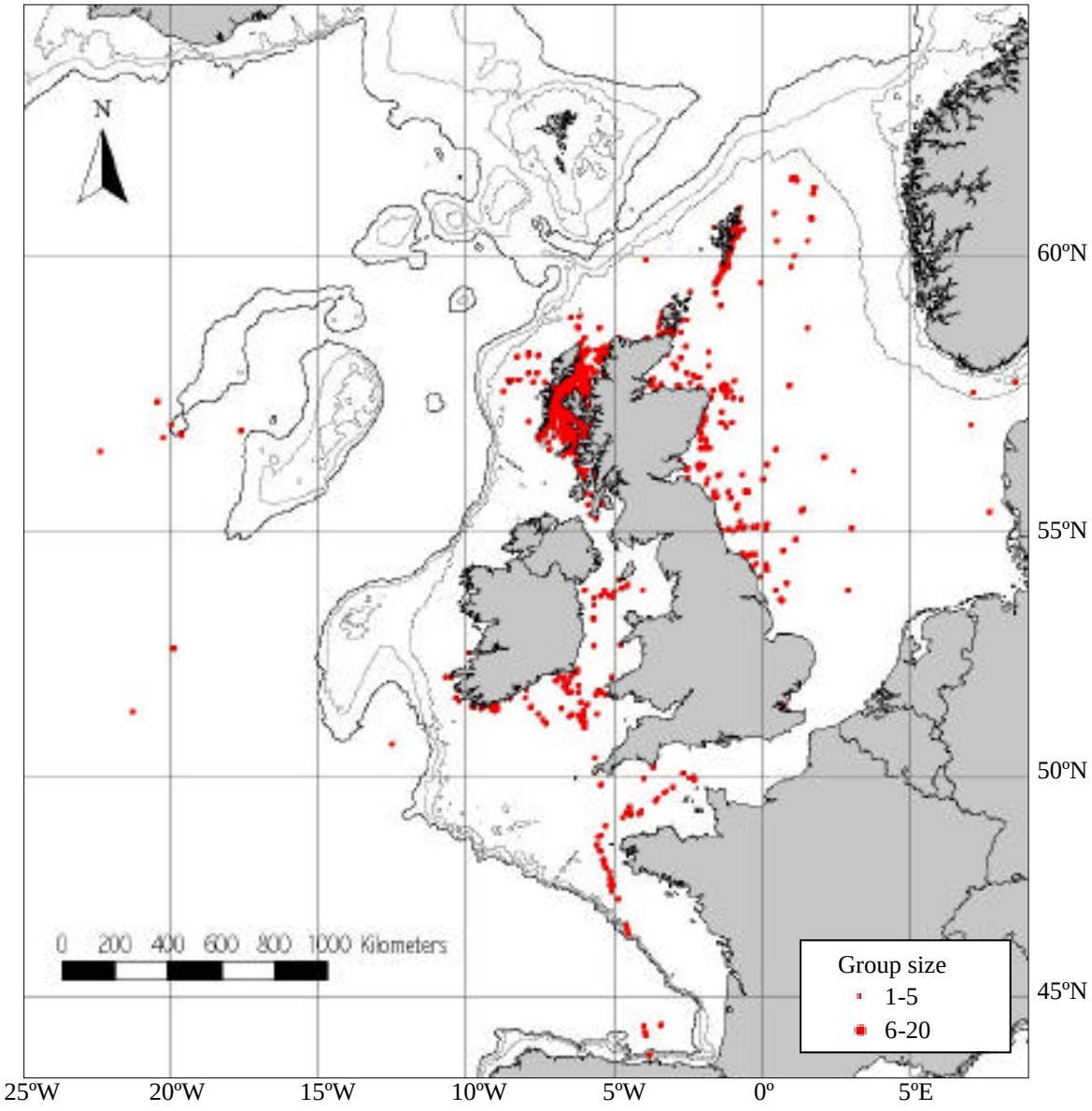


Fig. 7. Map of Minke Whale Sightings

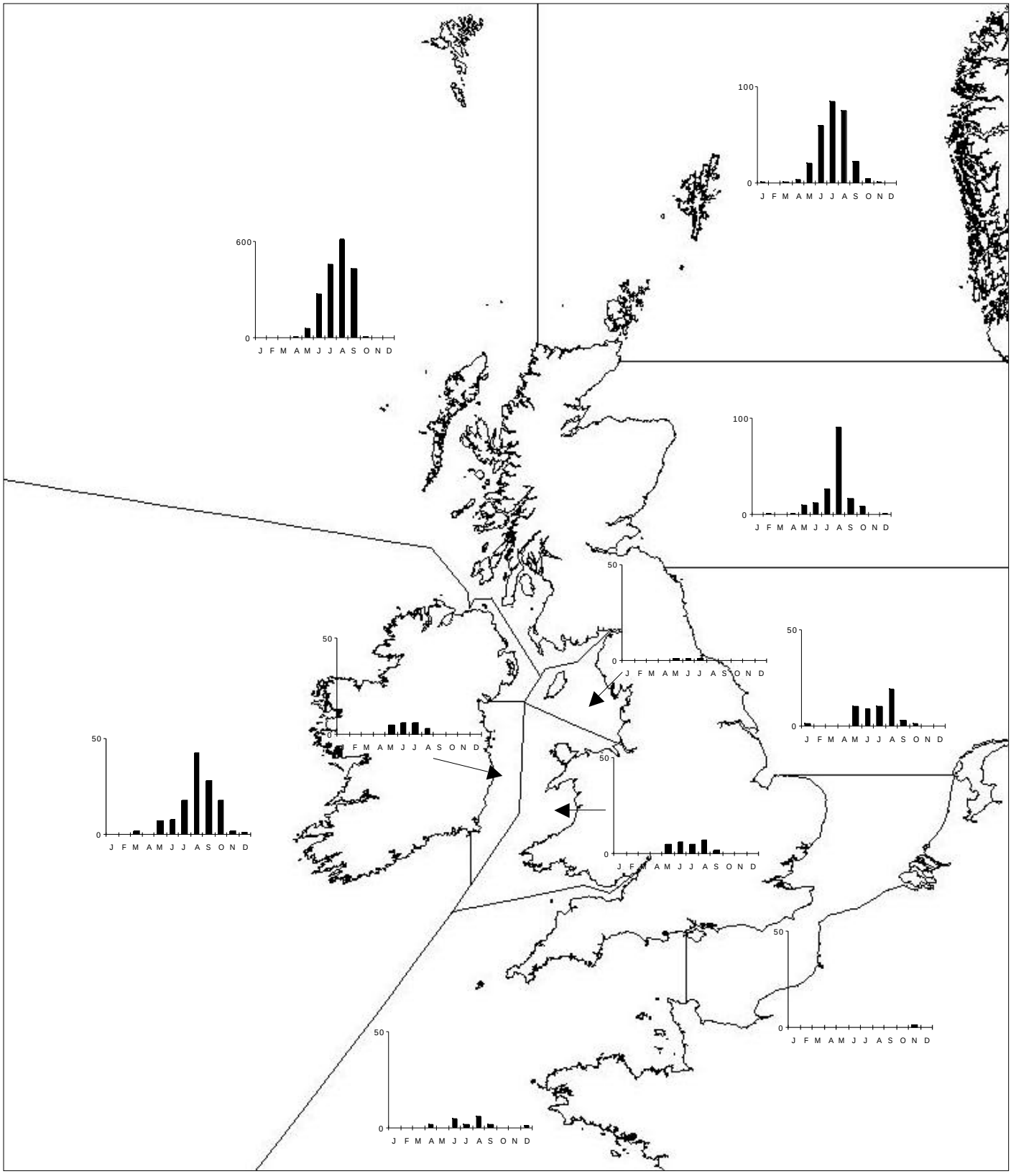


Fig. 8. Seasonal distribution of Minke Whale sightings (all sightings)

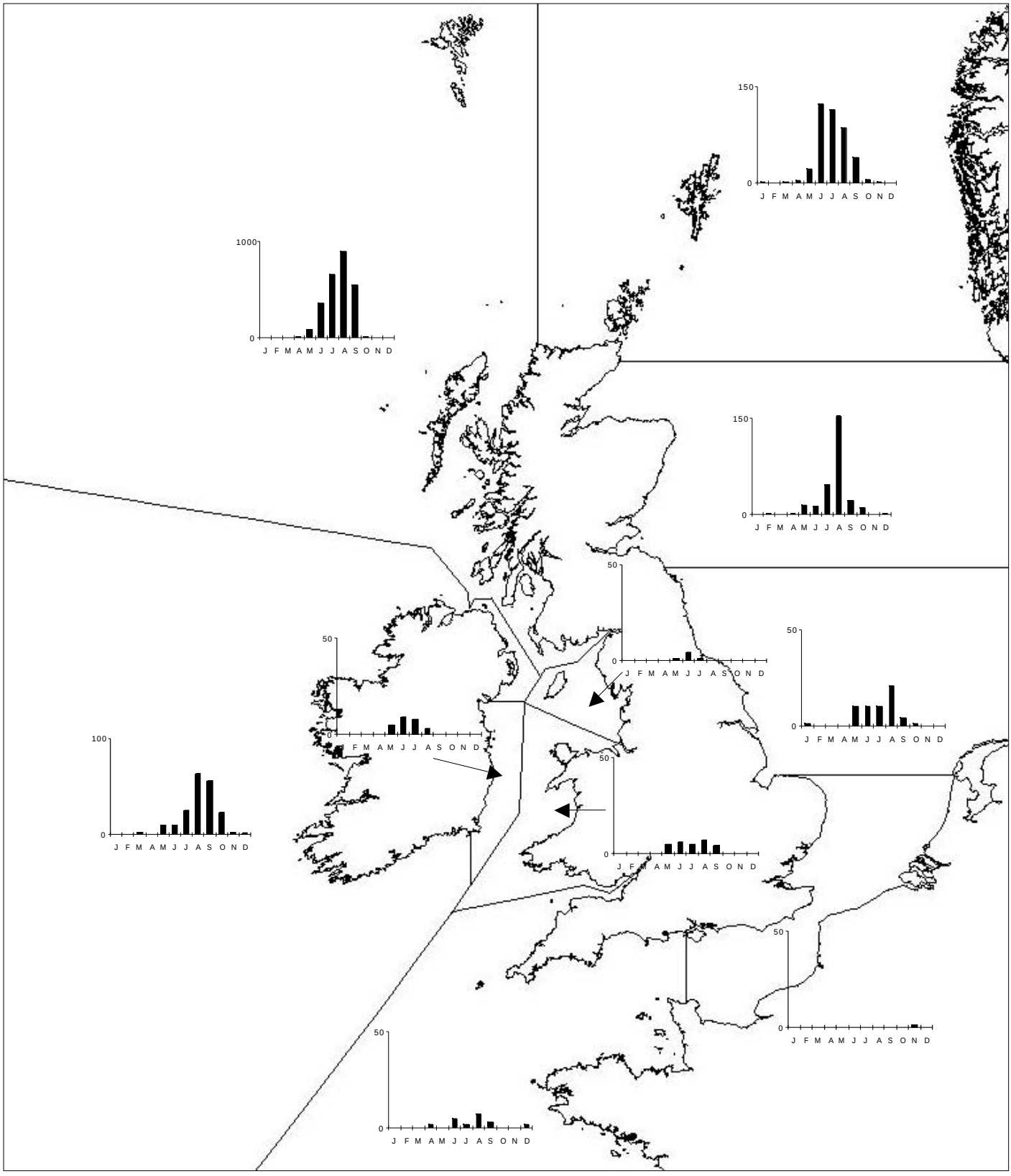


Fig. 9. Seasonal distribution of Minke Whale individuals (all sightings)

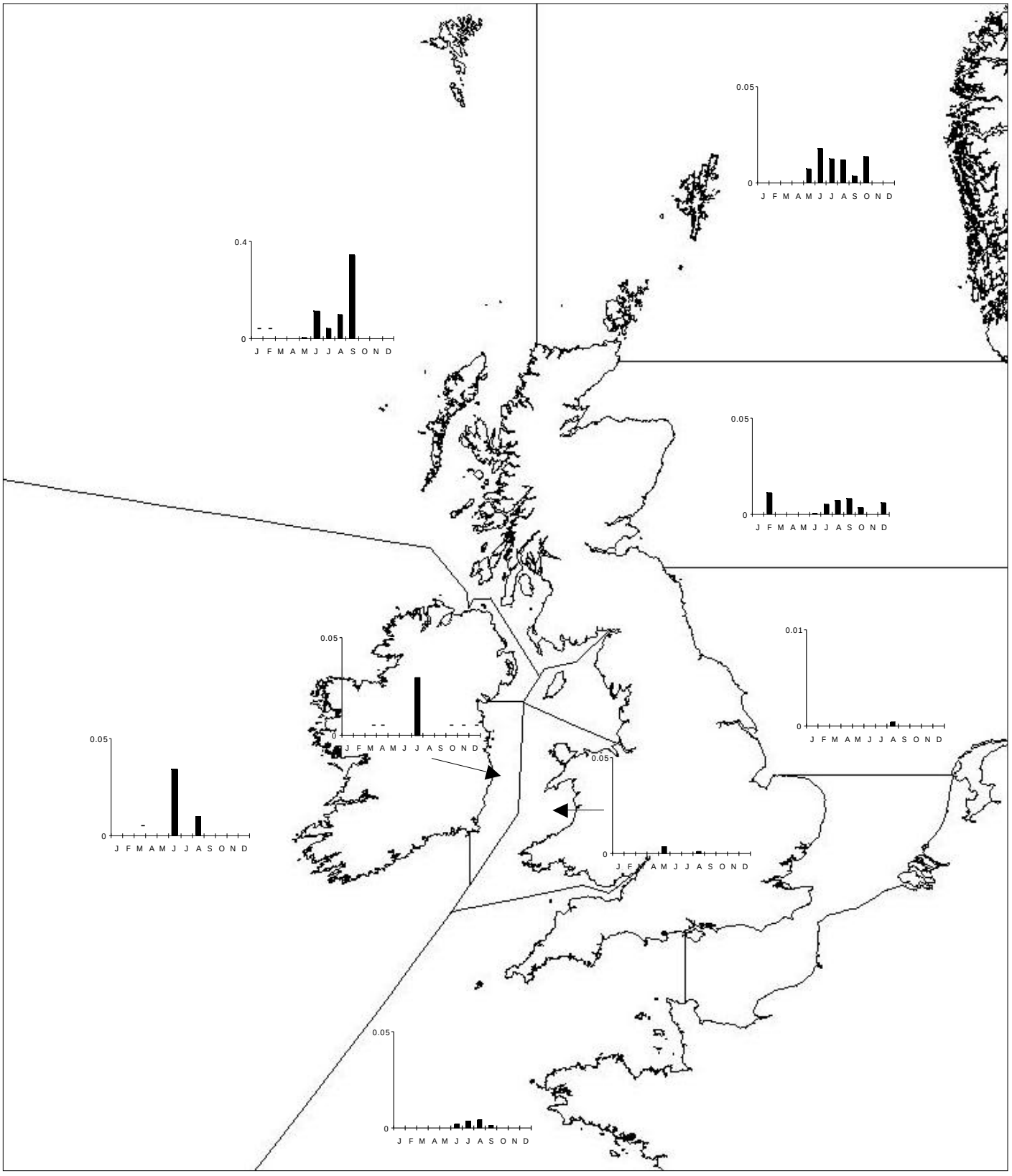


Fig. 10. Seasonal distribution of Minke Whale sightings / hour (effort-related sightings only)

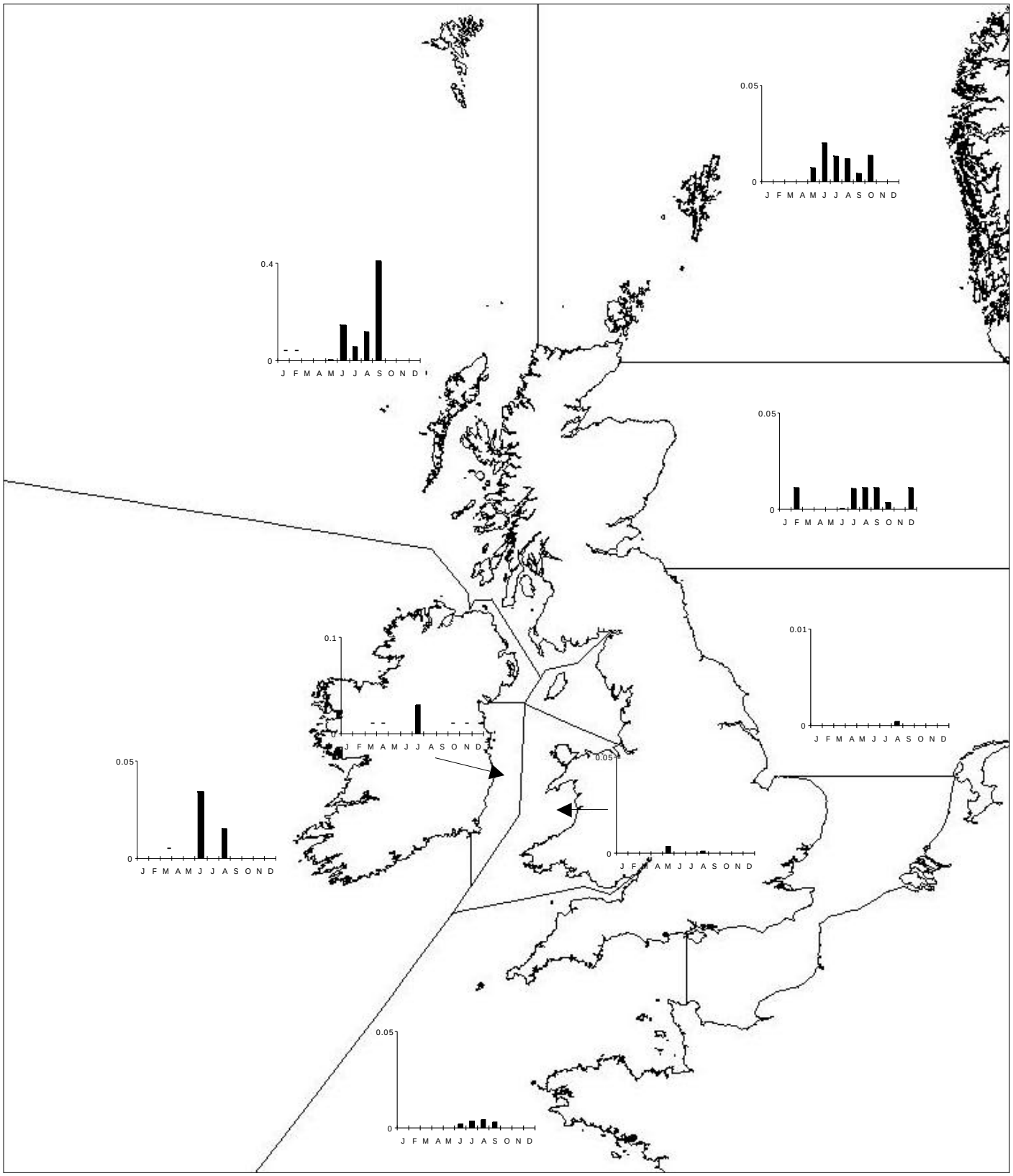


Fig. 11. Seasonal distribution of Minke Whale individuals / hour (effort-related sightings only)

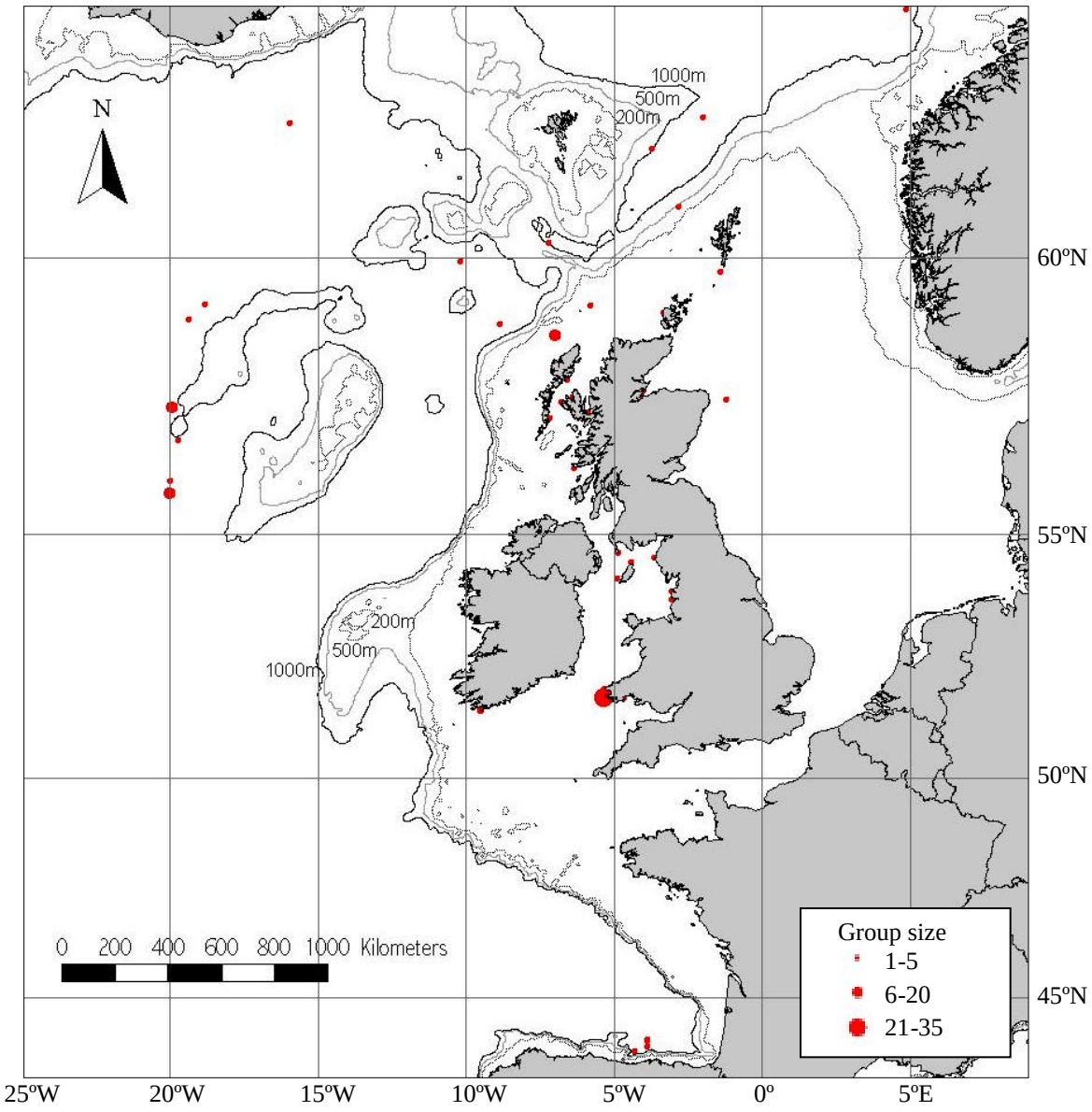


Fig. 12. Map of Northern Bottlenose Whale Sightings

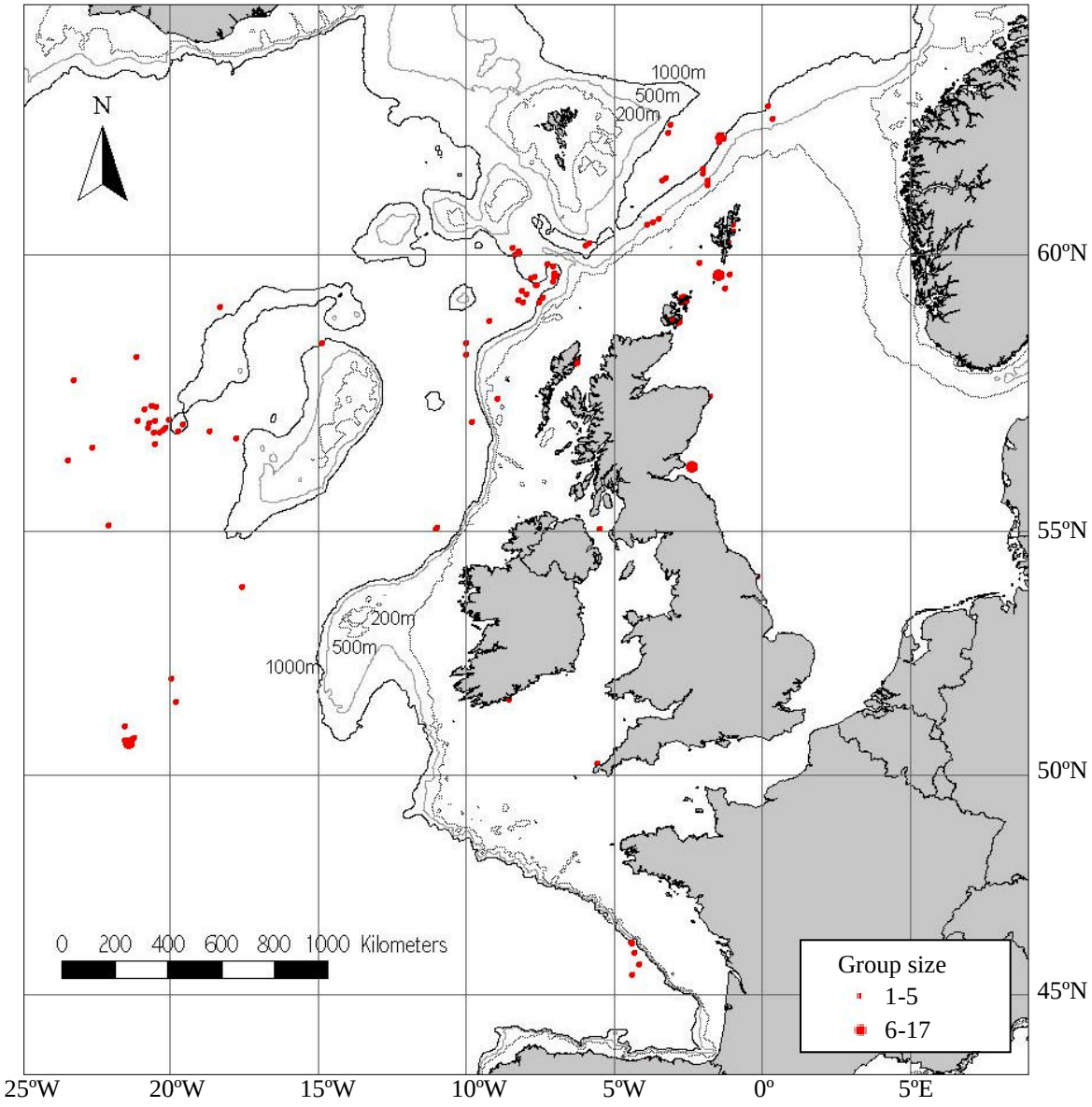


Fig. 13. Map of Sperm Whale Sightings

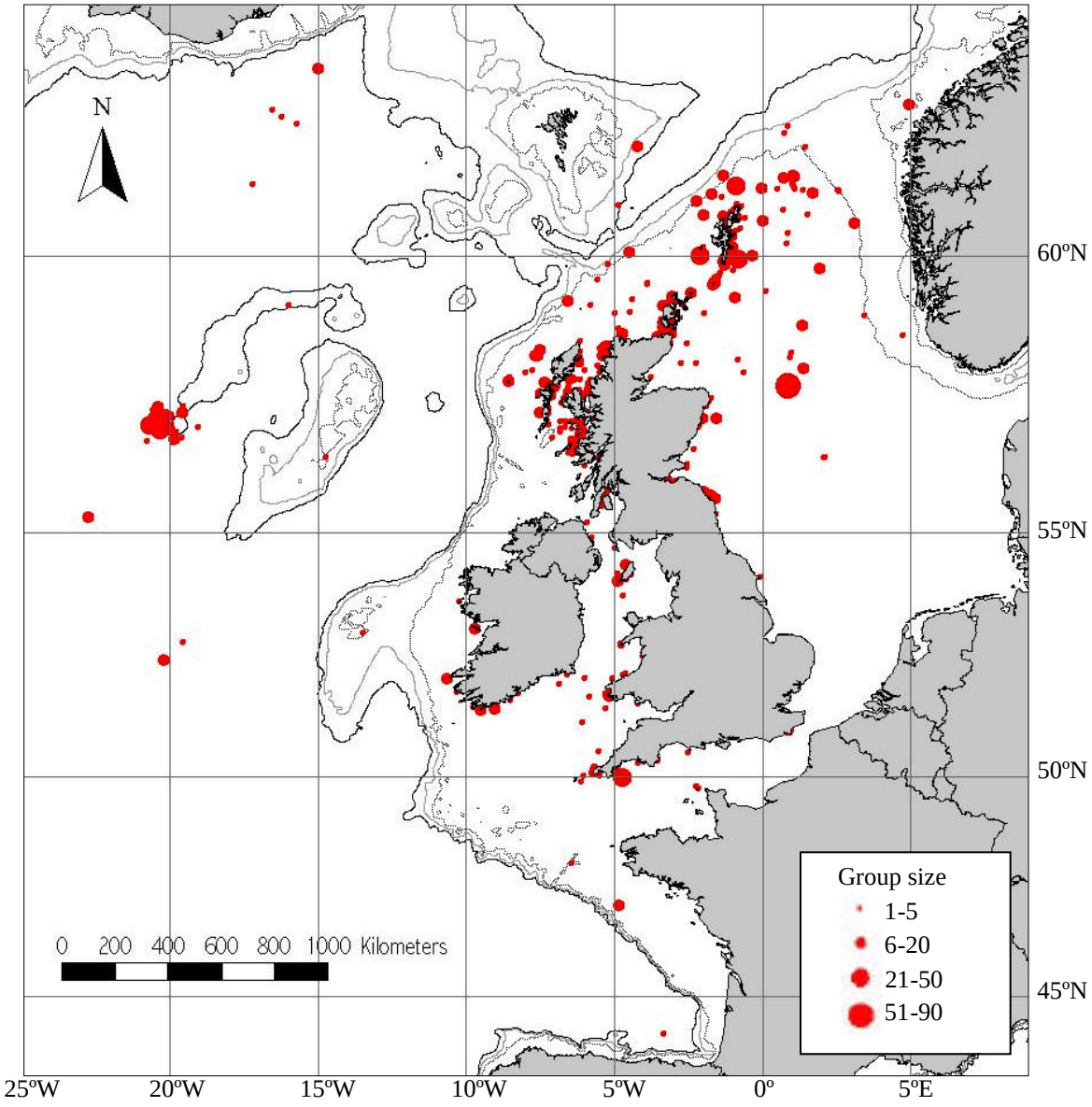


Fig. 14. Map of Killer Whale Sightings

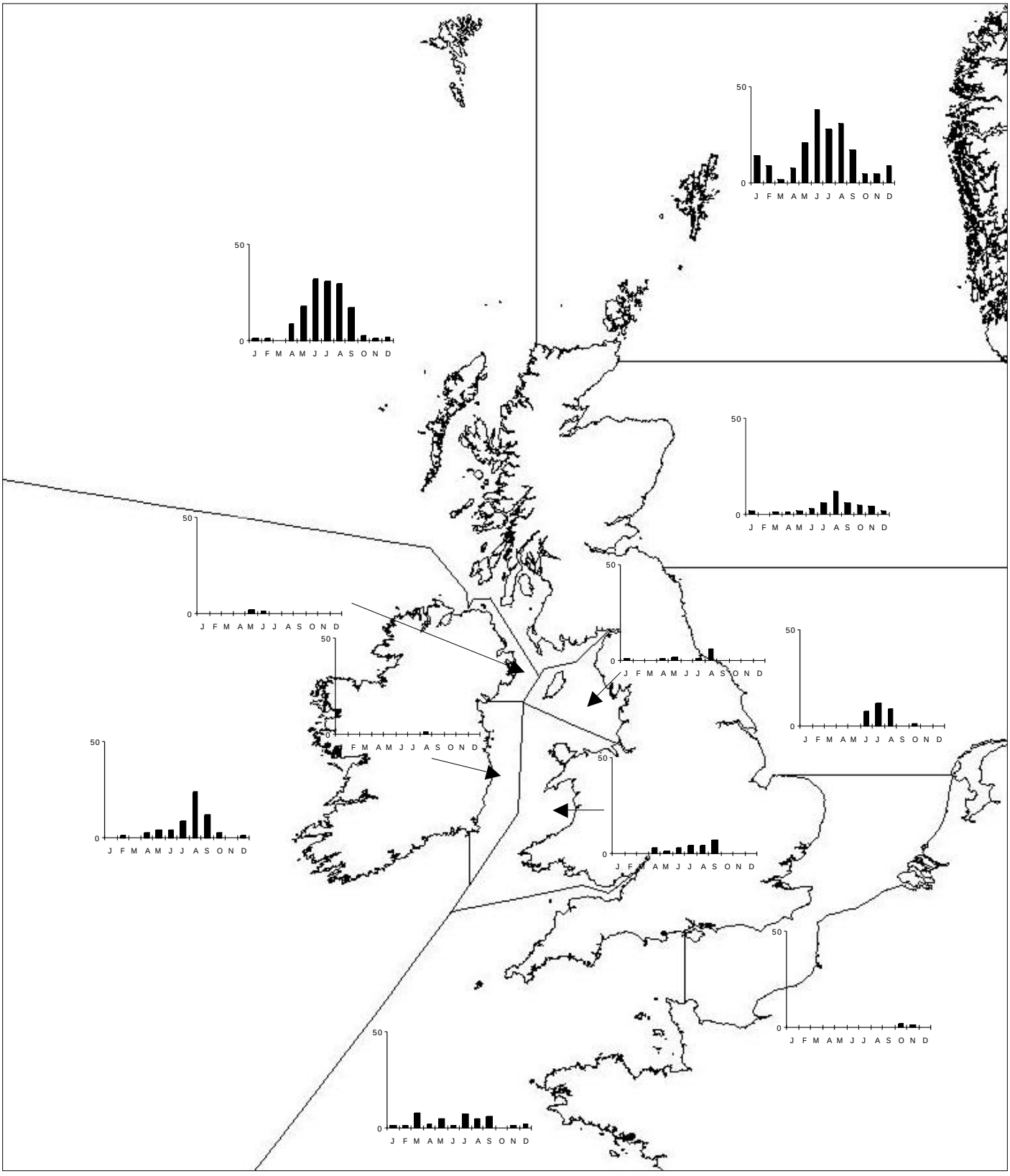


Fig. 15. Seasonal distribution of Killer Whale sightings (all sightings)

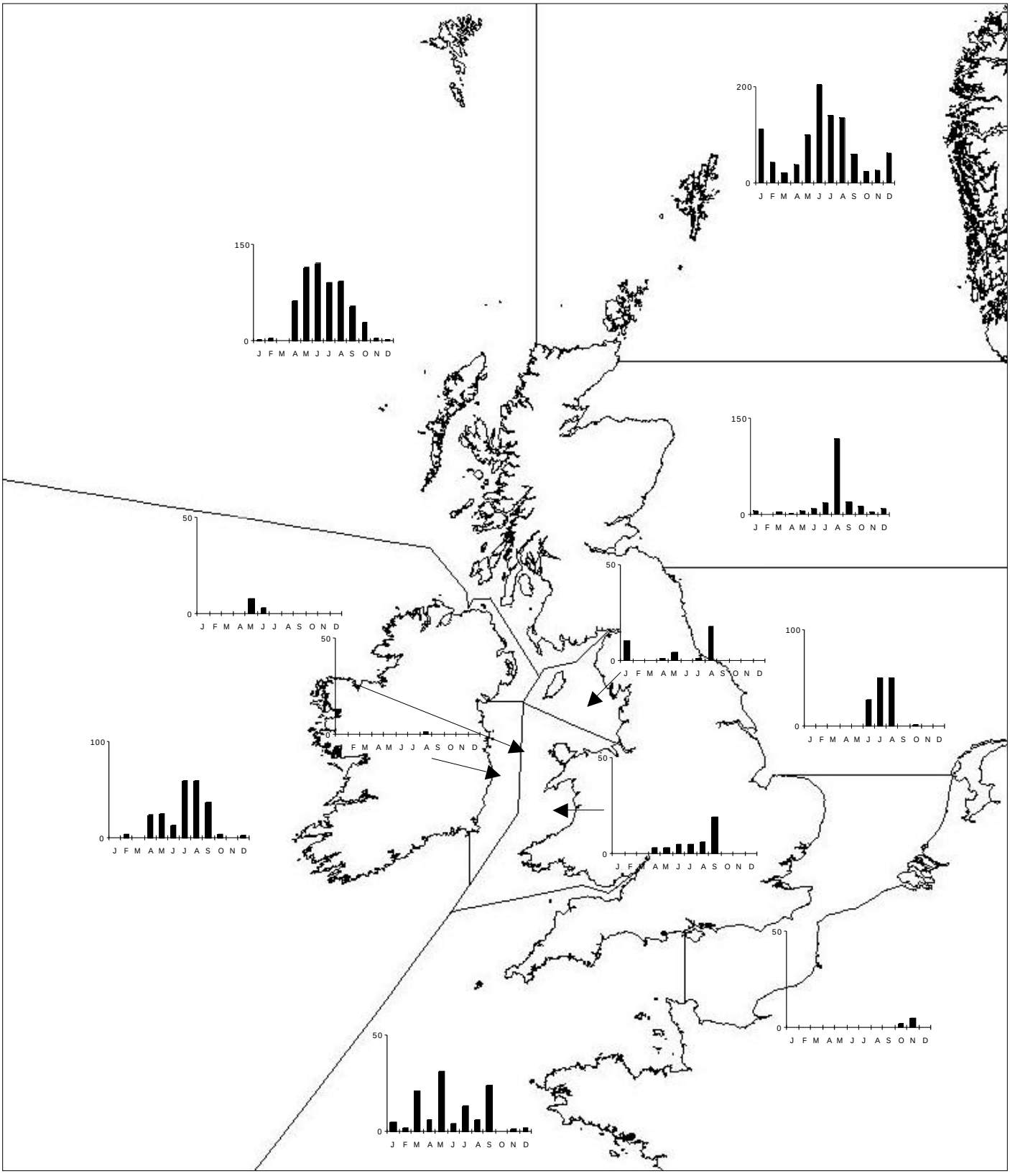


Fig. 16. Seasonal distribution of Killer Whale individuals (all sightings)

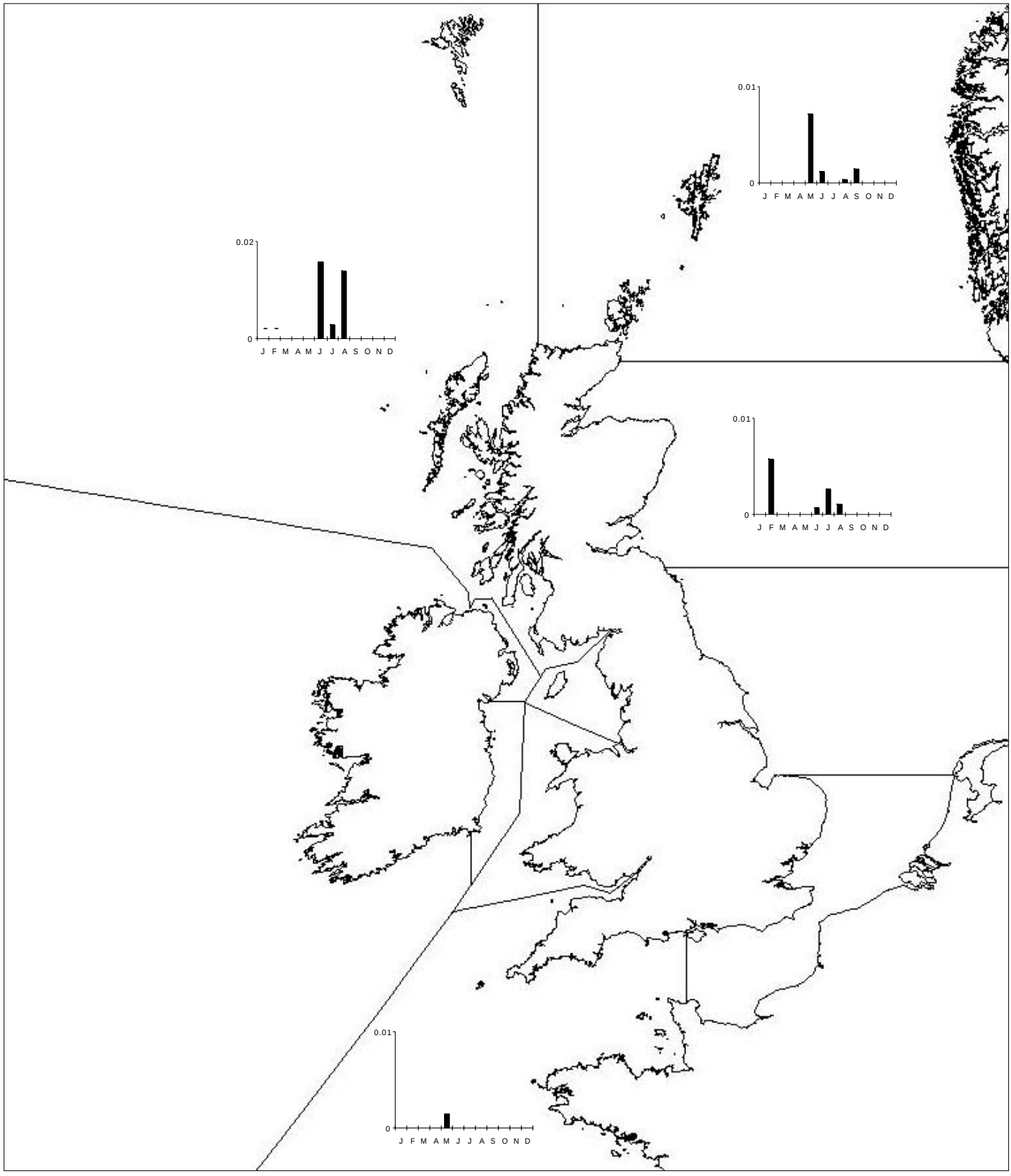


Fig. 17. Seasonal distribution of Killer Whale sightings / hour (effort-related sightings only)

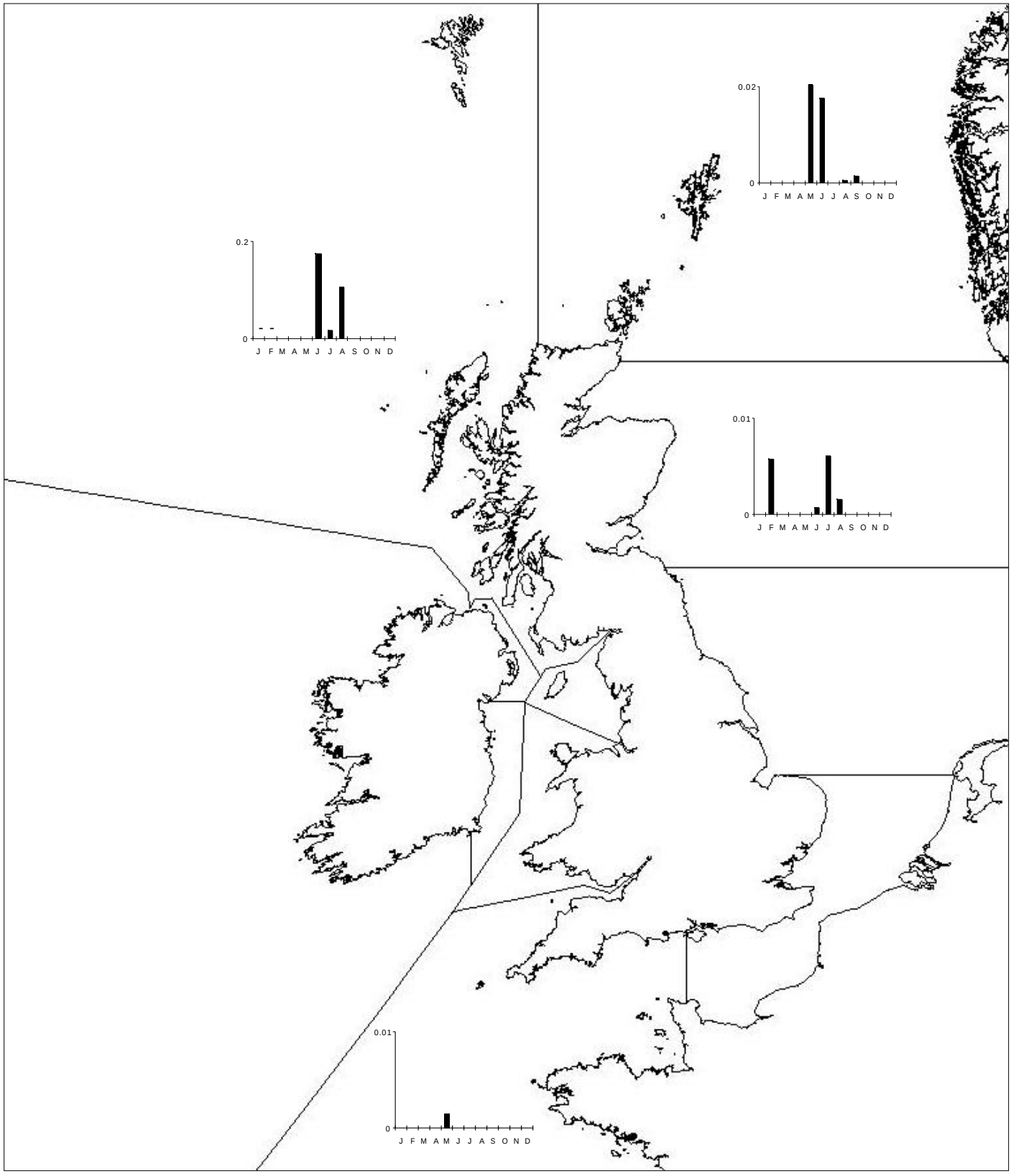


Fig. 18. Seasonal distribution of Killer Whale individuals / hour (effort-related sightings only)

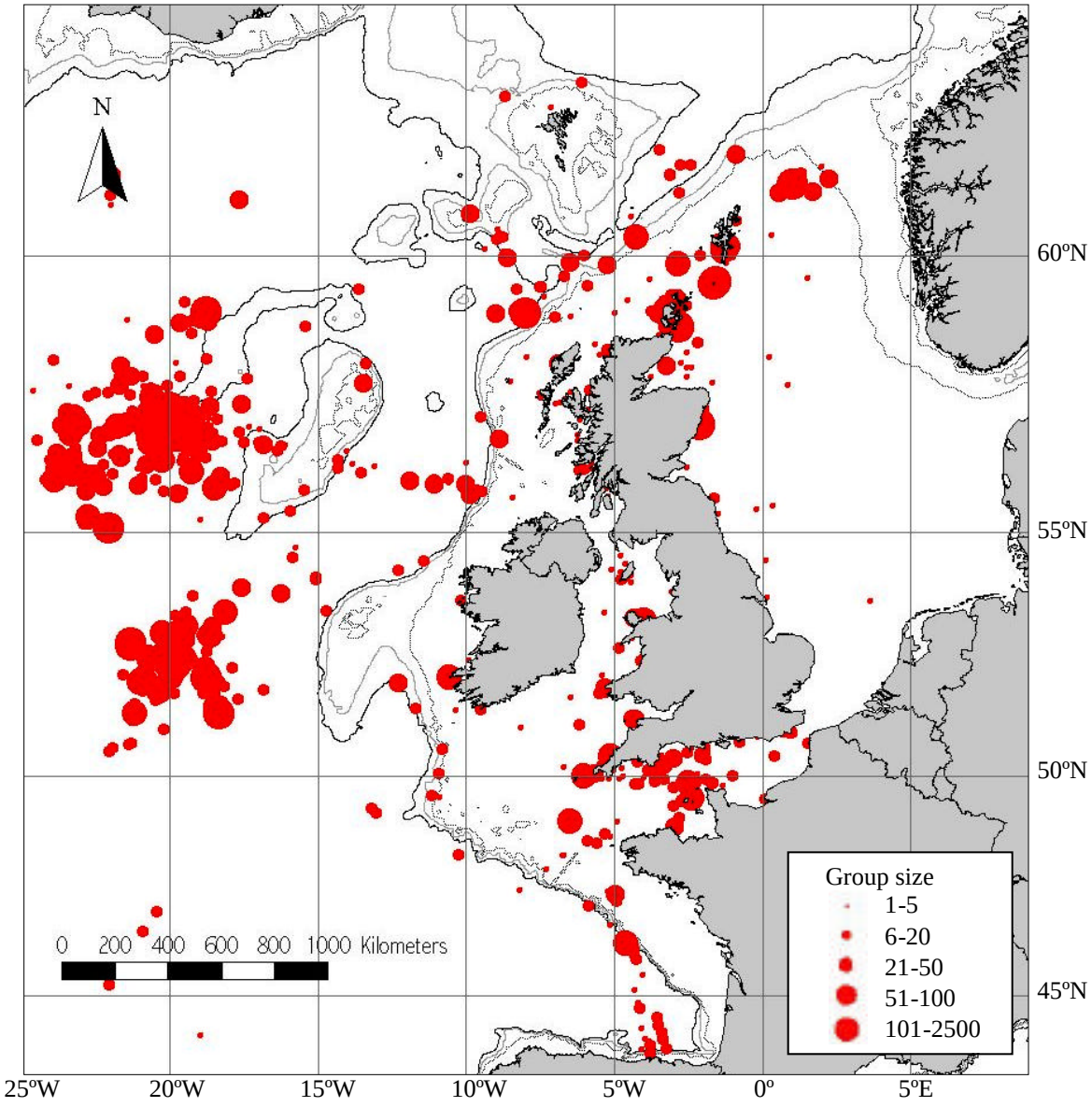


Fig. 19. Map of Long-finned Pilot Whale Sightings

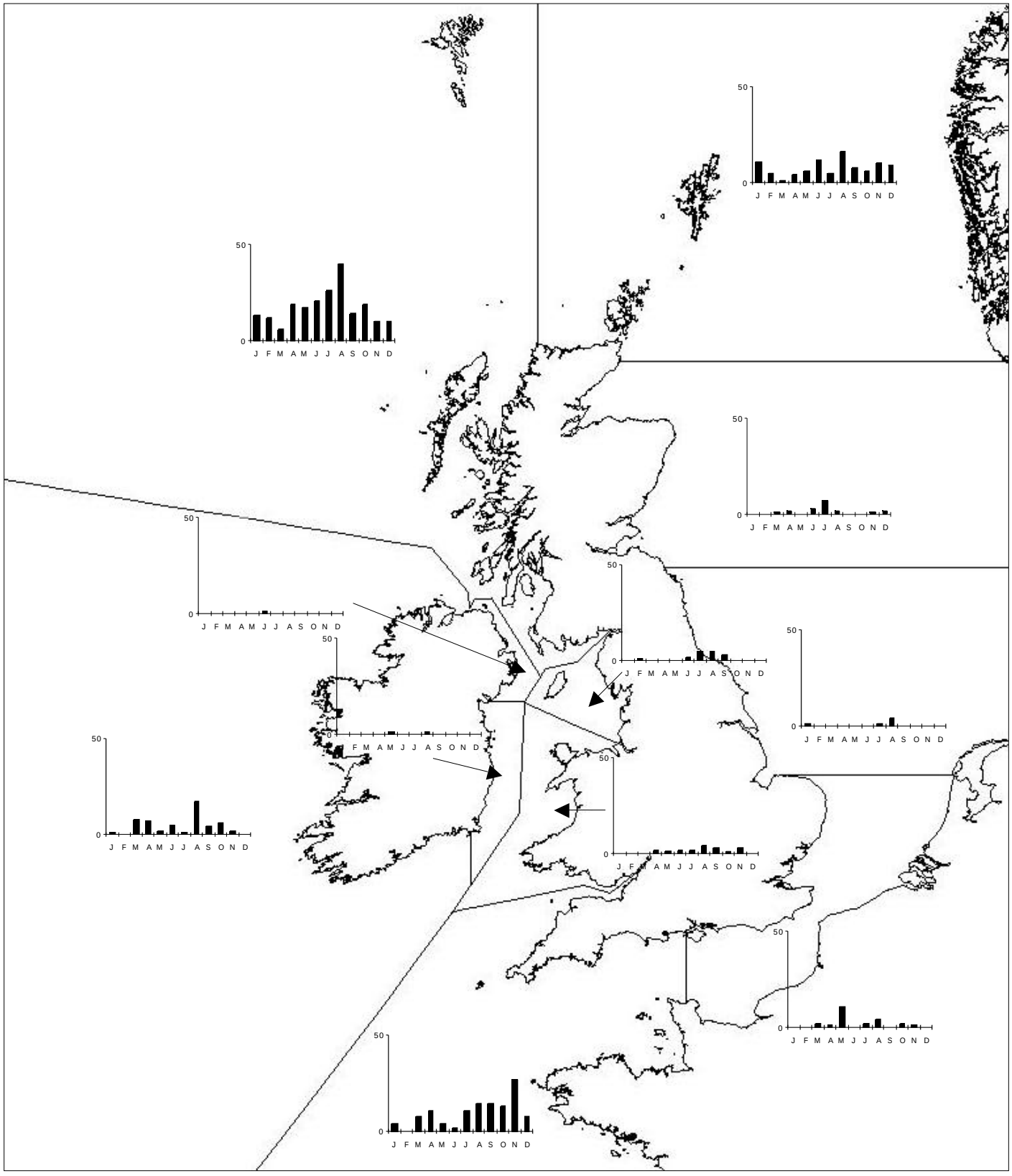


Fig. 20. Seasonal distribution of Long-finned Pilot Whale sightings (all sightings)

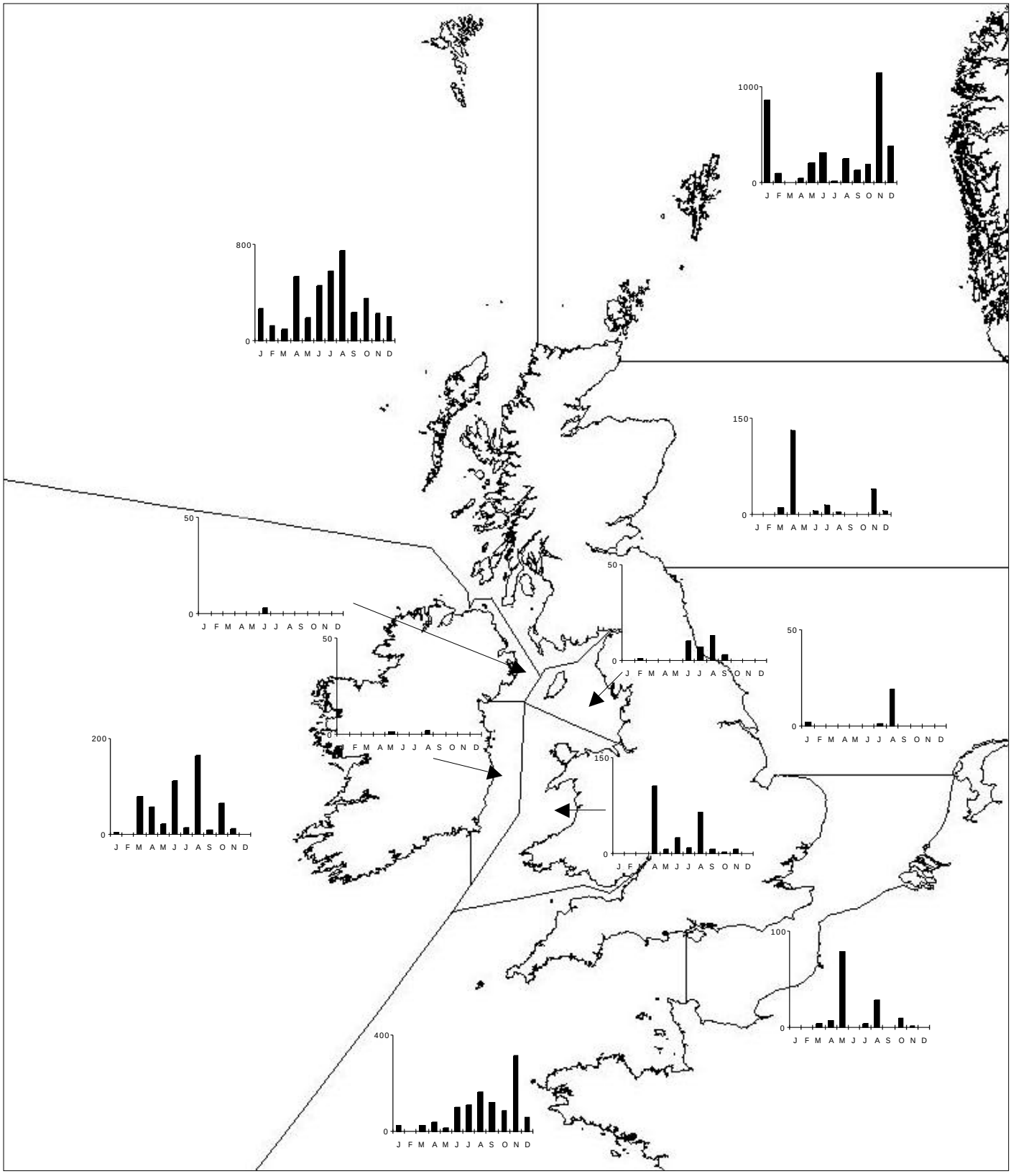


Fig. 21. Seasonal distribution of Long-finned Pilot Whale individuals (all sightings)

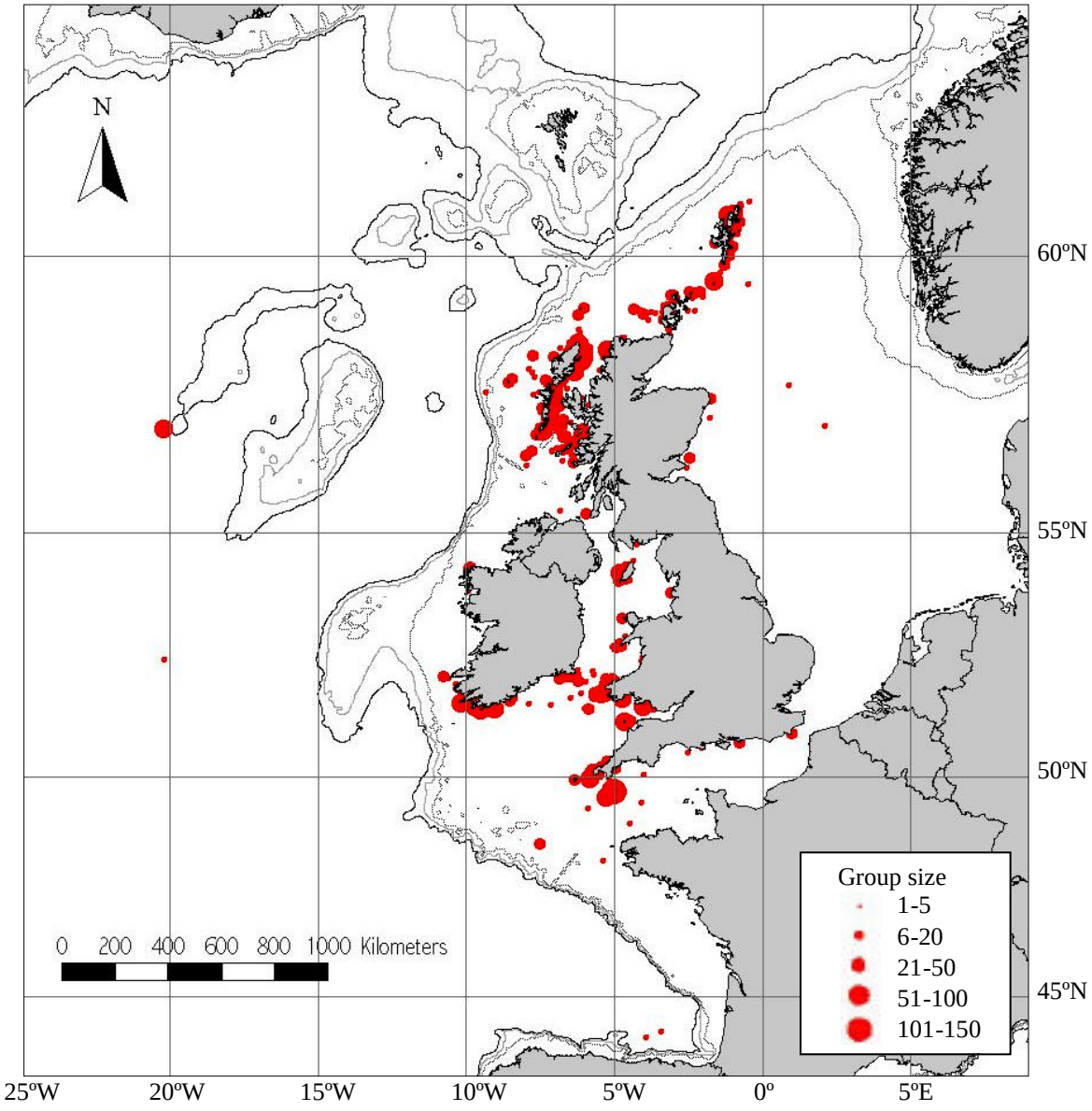


Fig. 22. Map of Risso's Dolphin Sightings

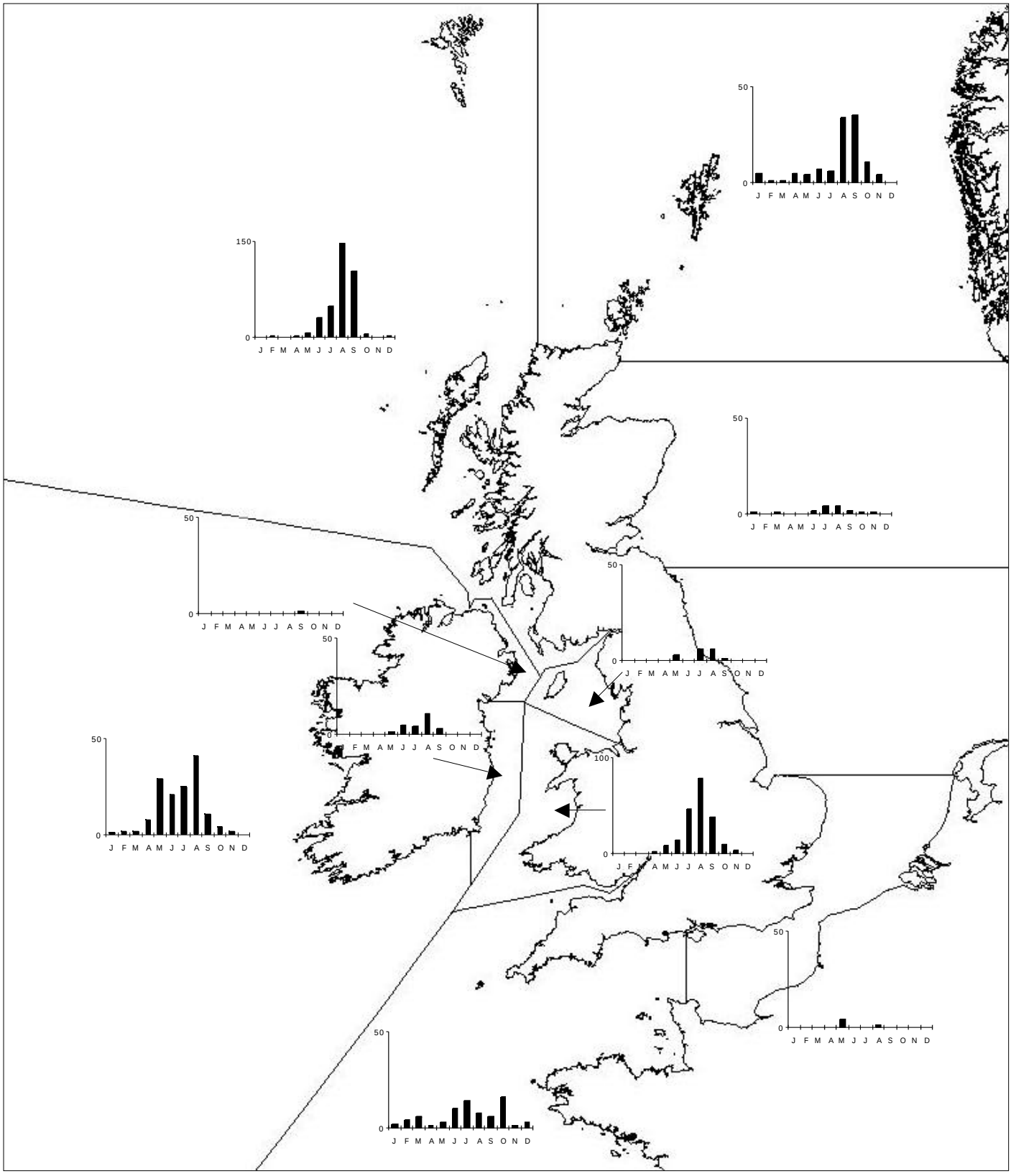


Fig. 23. Seasonal Distribution of Risso's Dolphin Sightings (all sightings)

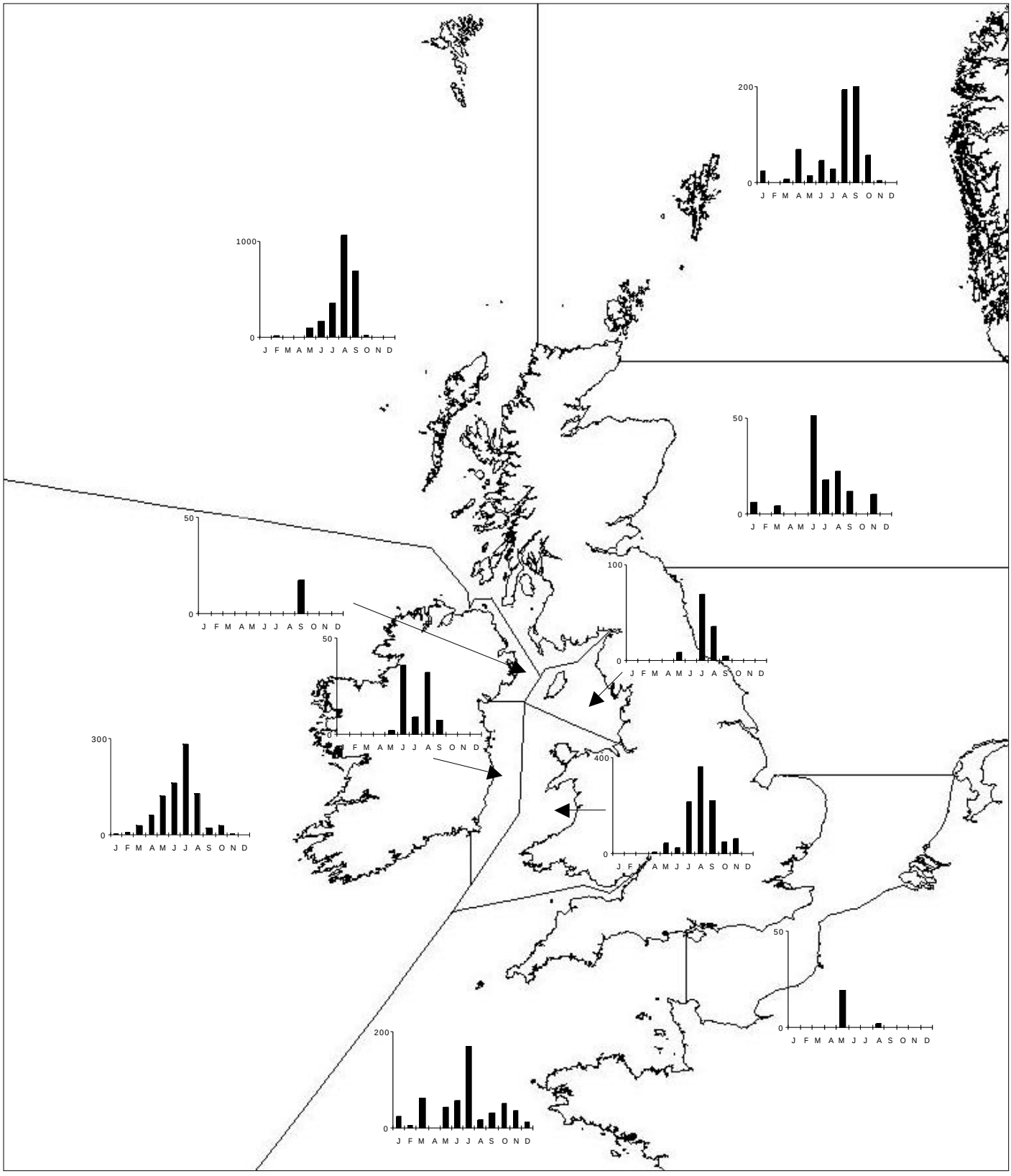


Fig. 24. Seasonal Distribution of Risso's Dolphin Individuals (all sightings)

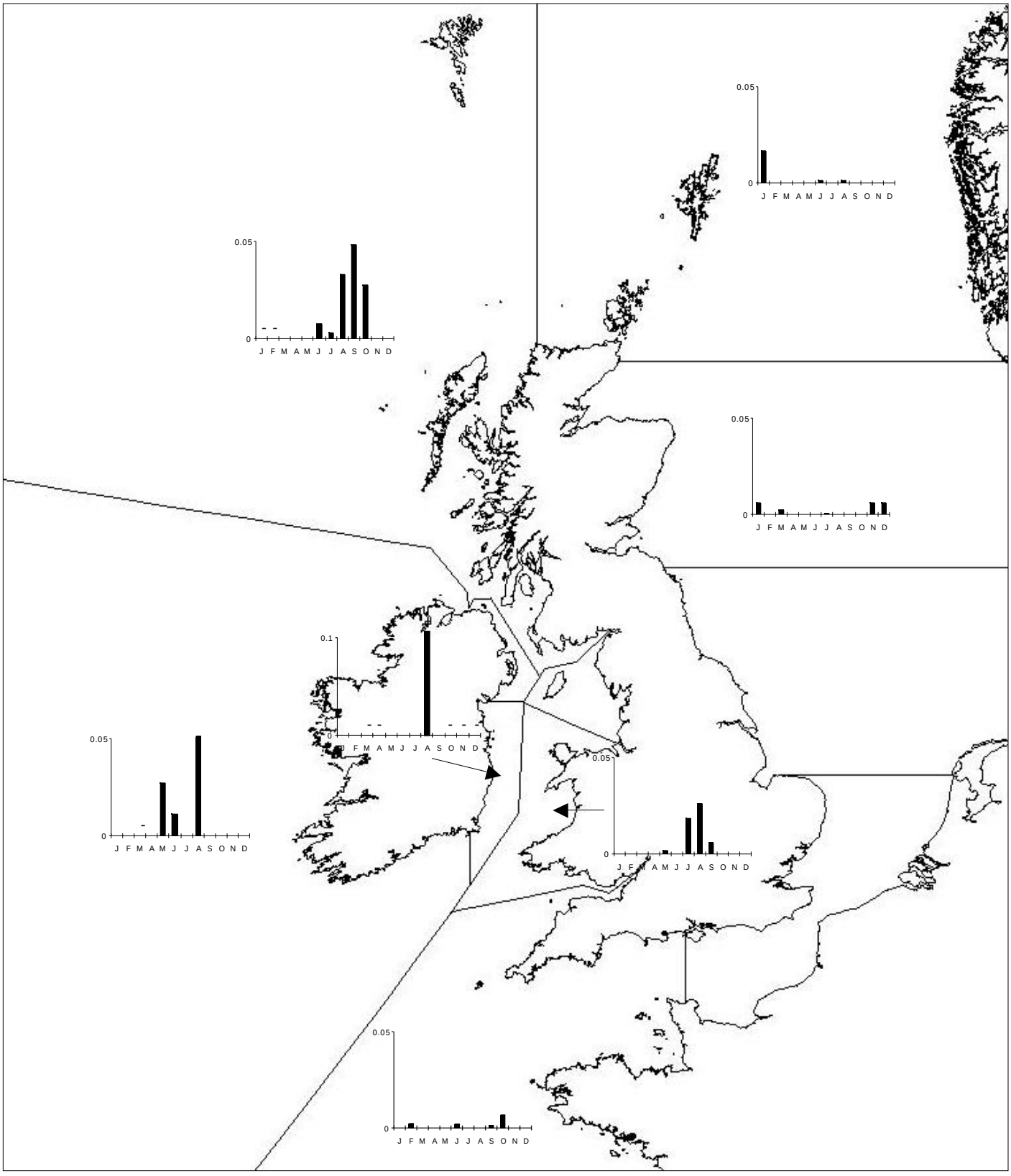


Fig. 25. Seasonal Distribution of Risso's Dolphin Sightings / hour (effort-related sightings only)

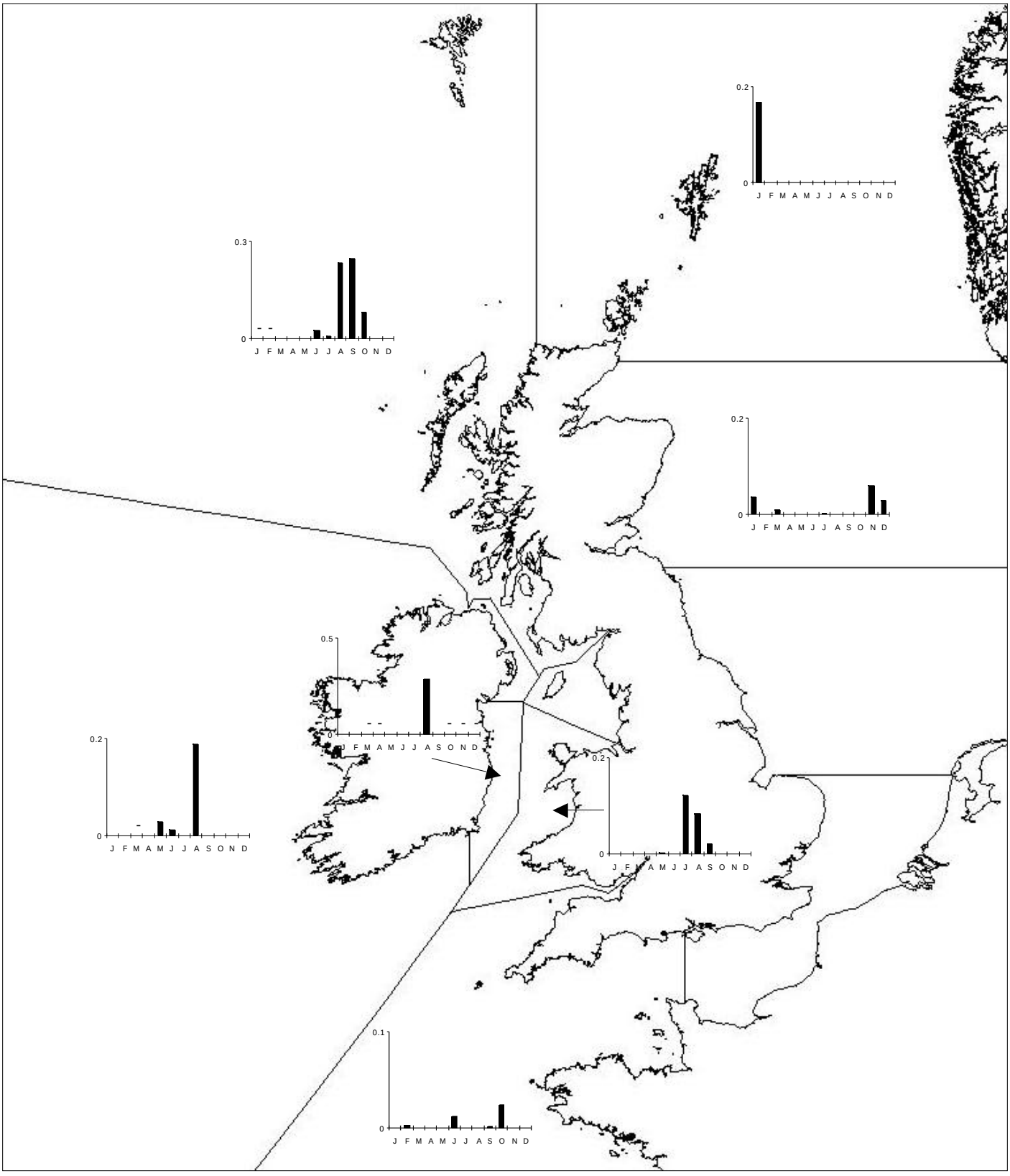


Fig. 26. Seasonal Distribution of Risso's Dolphin Individuals / hour (effort-related sightings only)

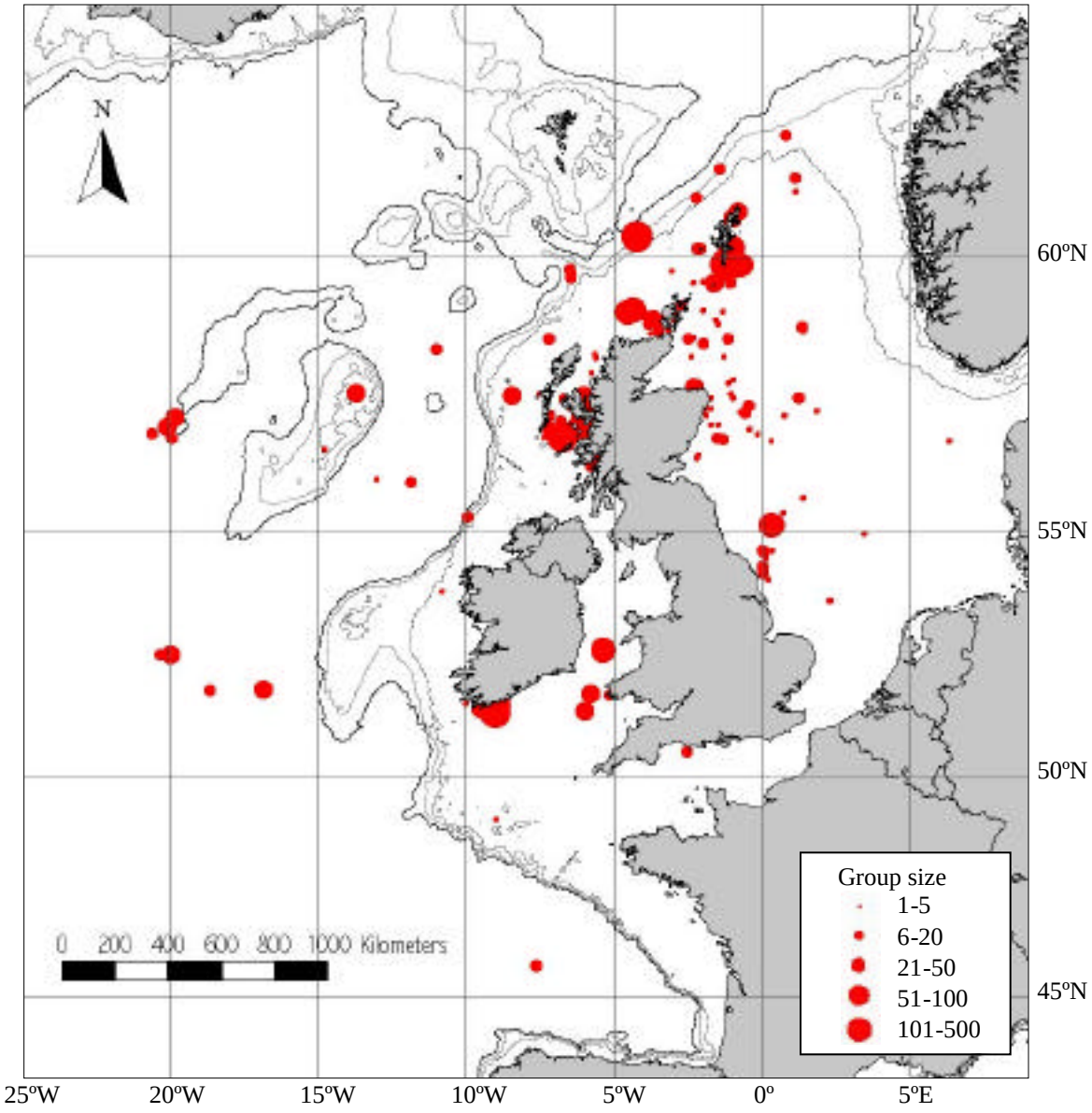


Fig. 27. Map of Atlantic White-sided Dolphins

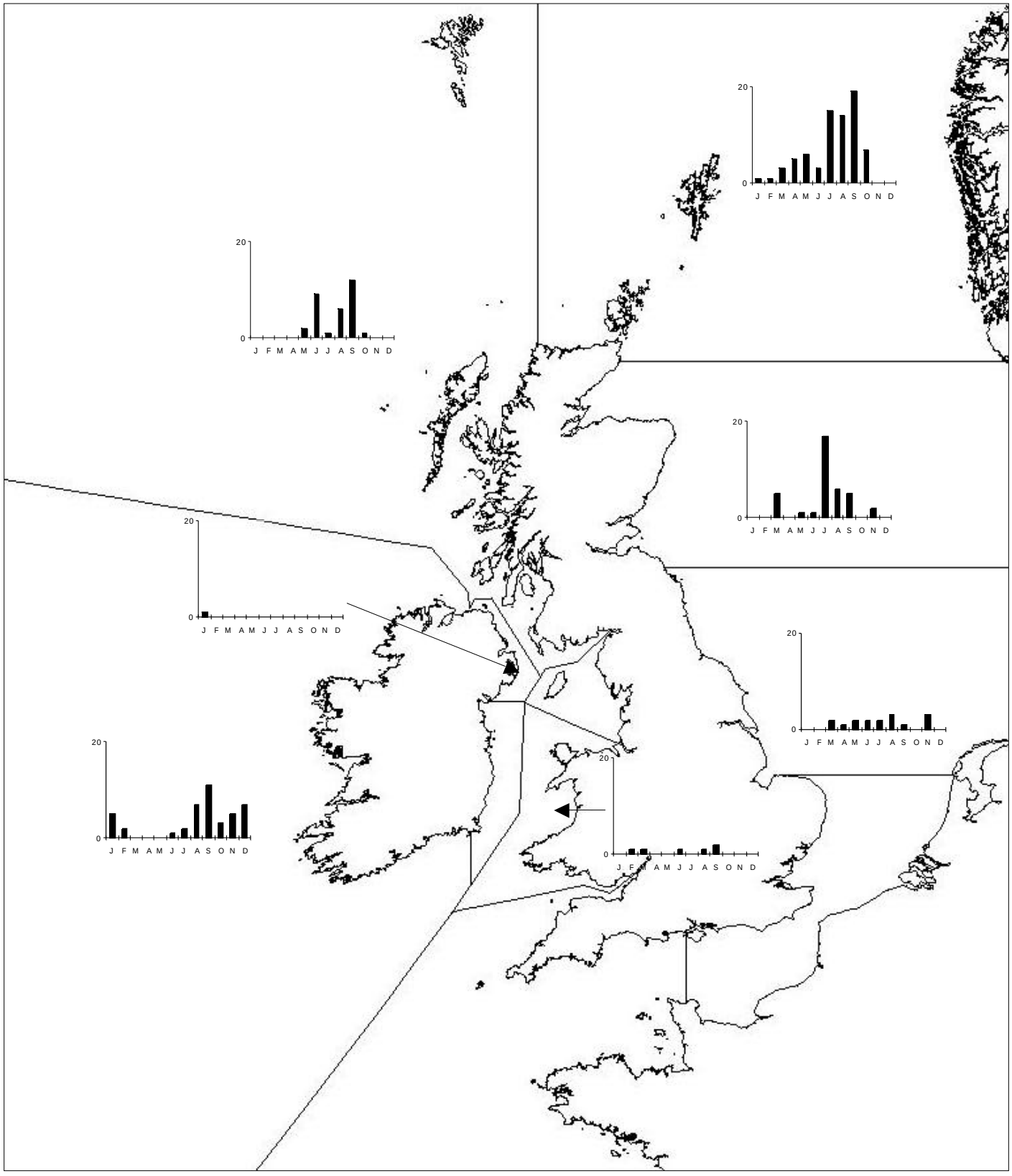


Fig. 28. Seasonal Distribution of AtlanticWhite-sided Dolphin Sightings (all sightings)

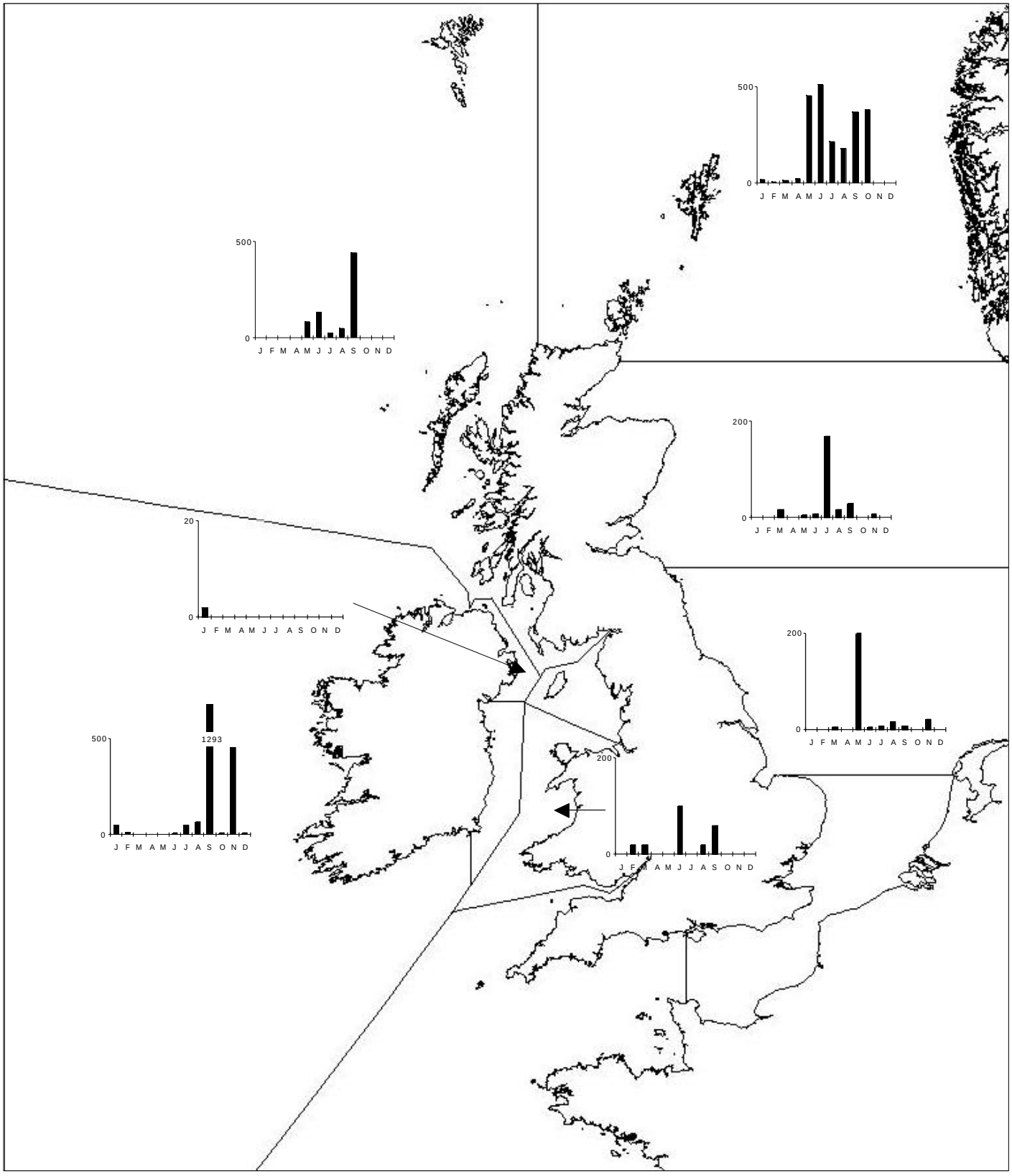


Fig. 29. Seasonal Distribution of Atlantic White-sided Dolphin Individuals (all sightings)

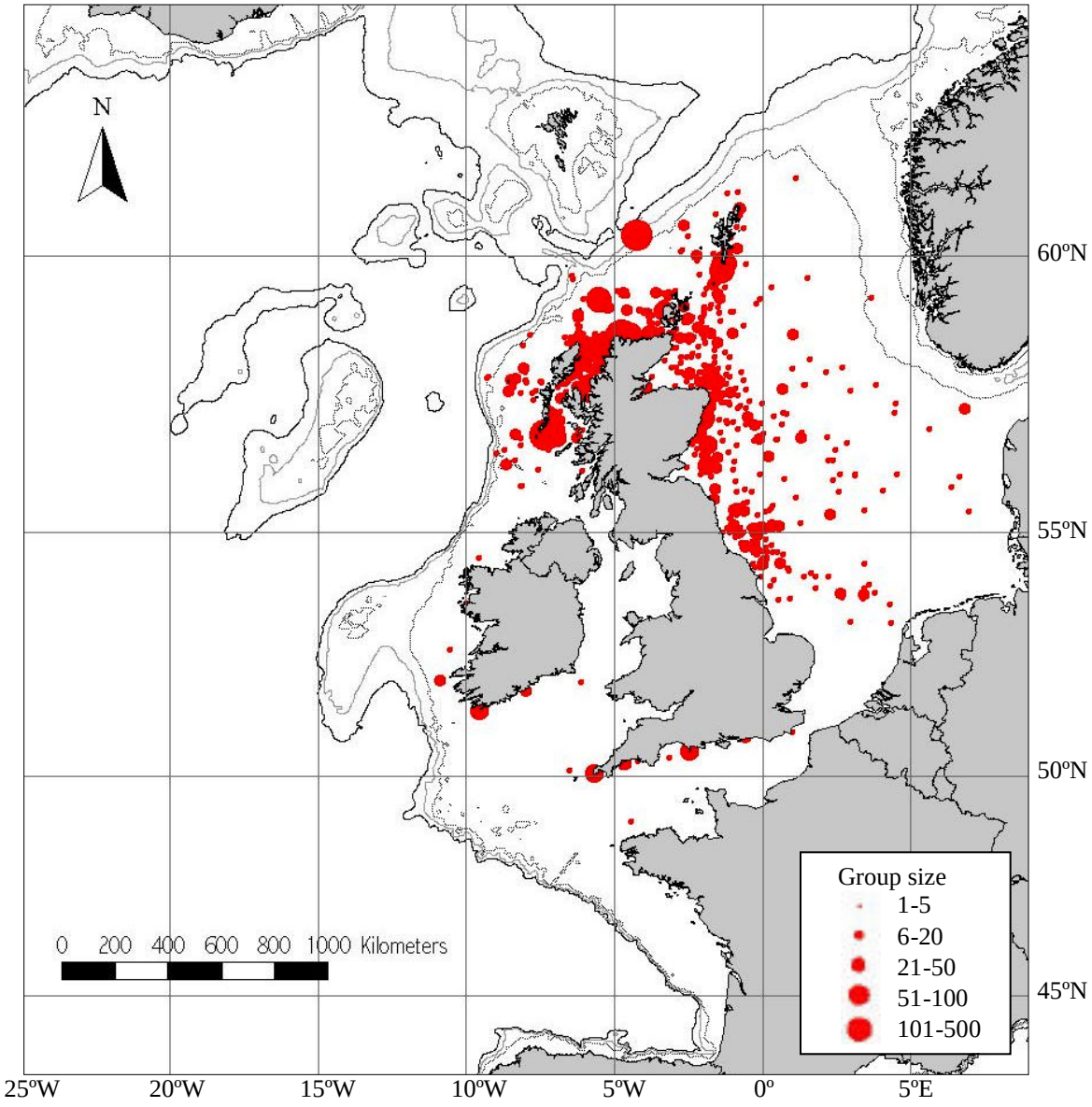


Fig. 30. Map of White-beaked Dolphin Sightings

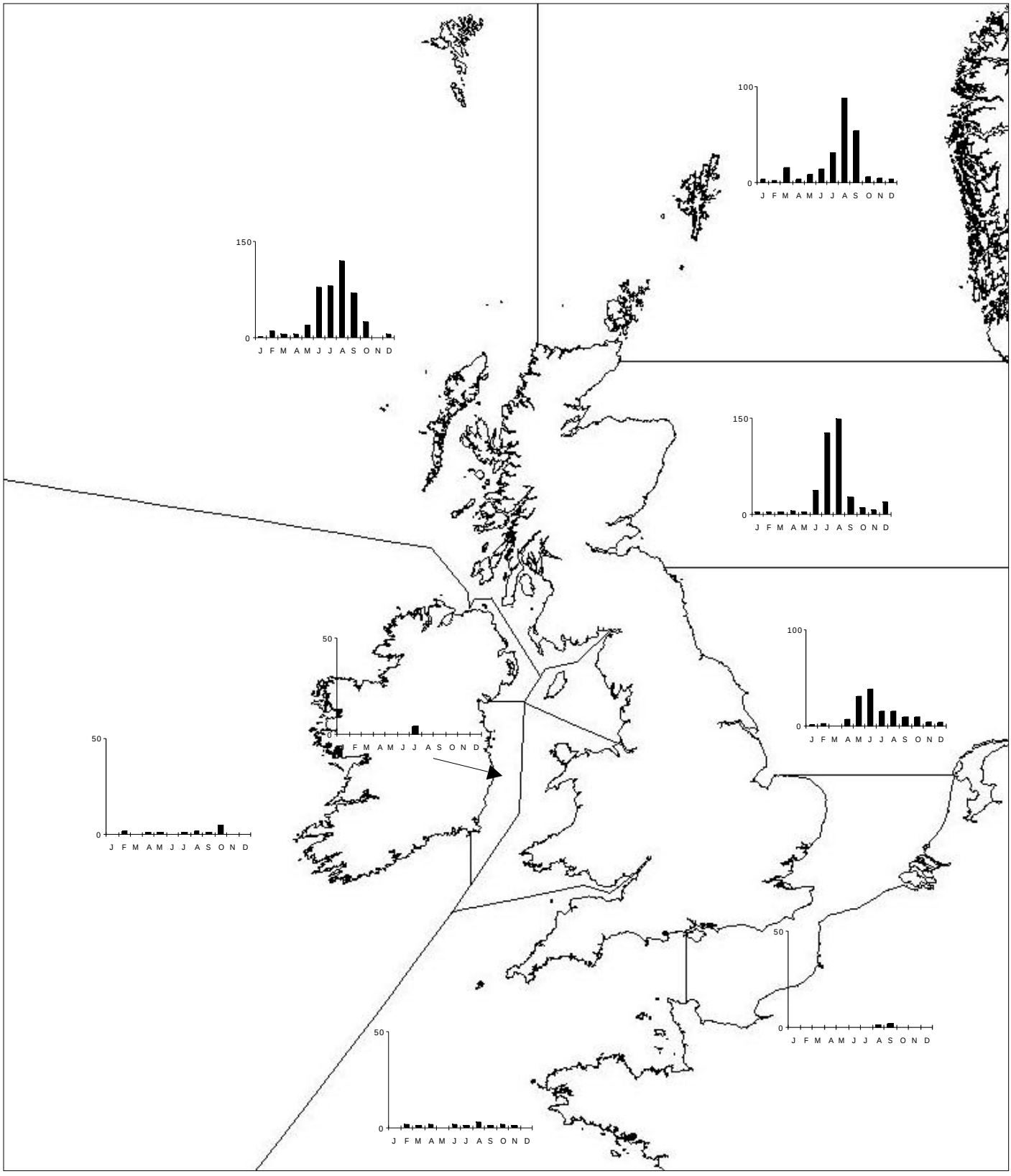


Fig. 31. Seasonal Distribution of White-beaked Dolphin Sightings (all sightings)

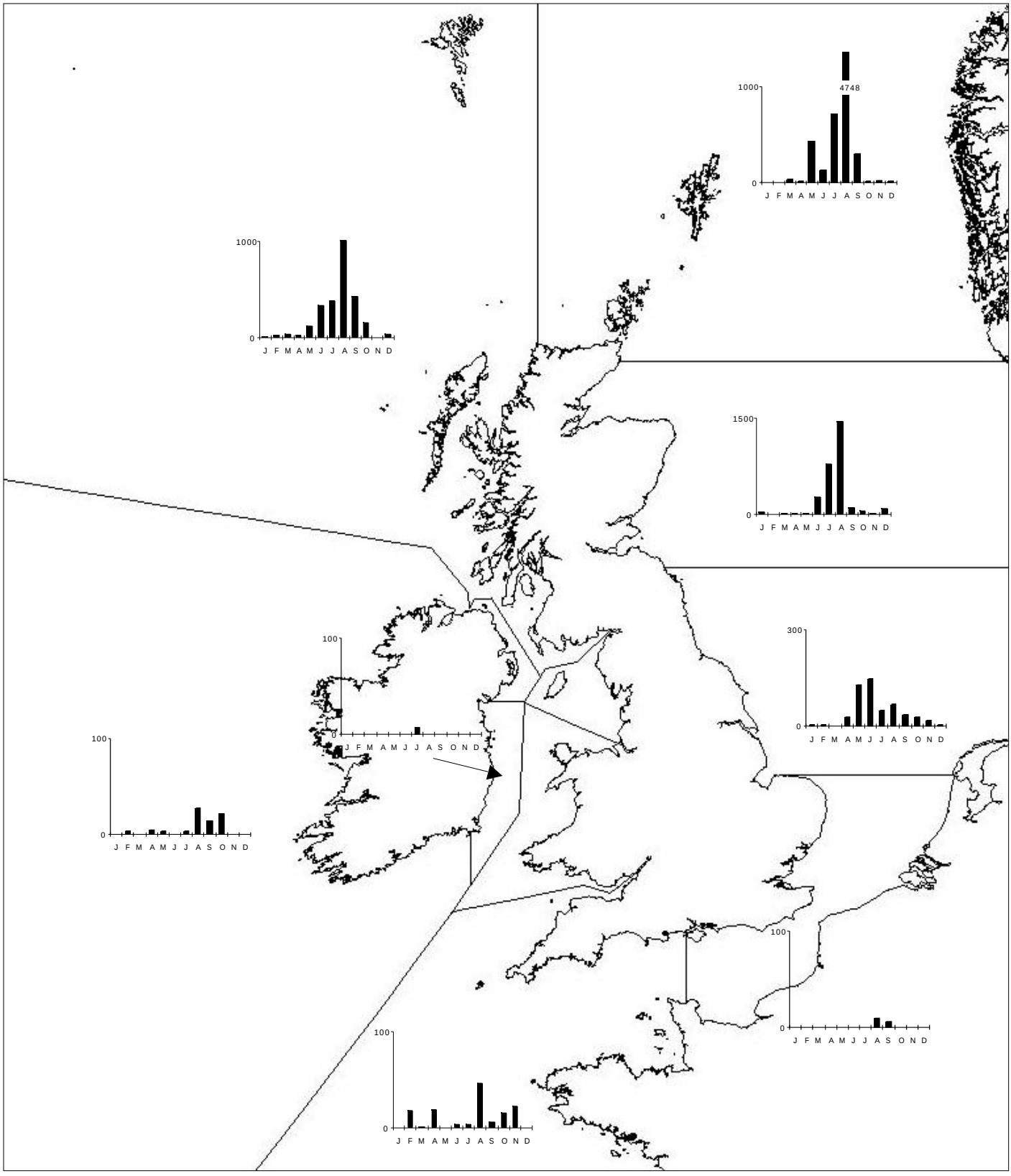


Fig. 32. Seasonal Distribution of White-beaked Dolphin Individuals (all sightings)

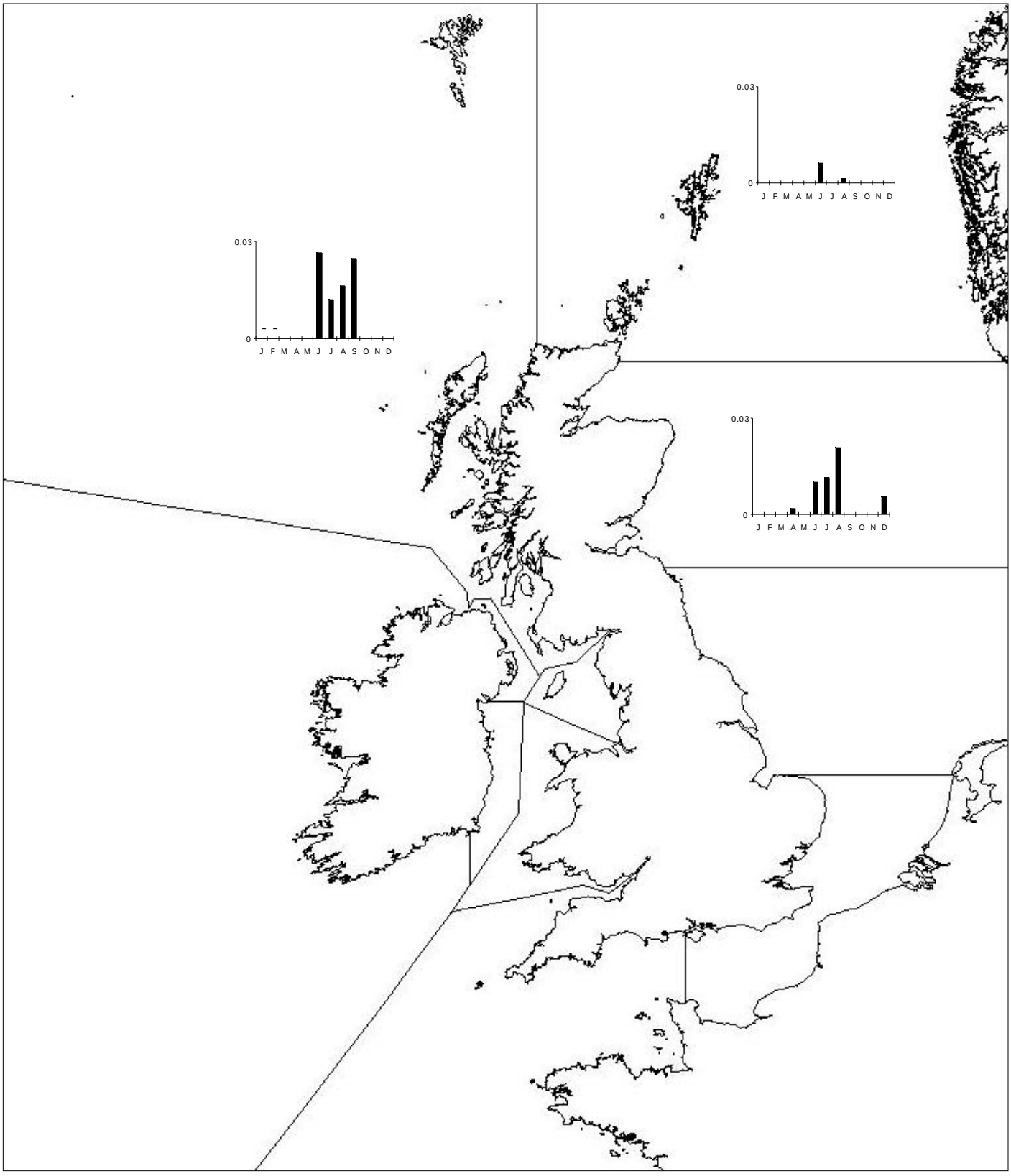


Fig. 33. Seasonal Distribution of White-beaked Dolphin Sightings / hour (effort-related sightings only)

Fig. 34. Seasonal Distribution of White-beaked Dolphin Individuals / hour (effort-related sightings only)

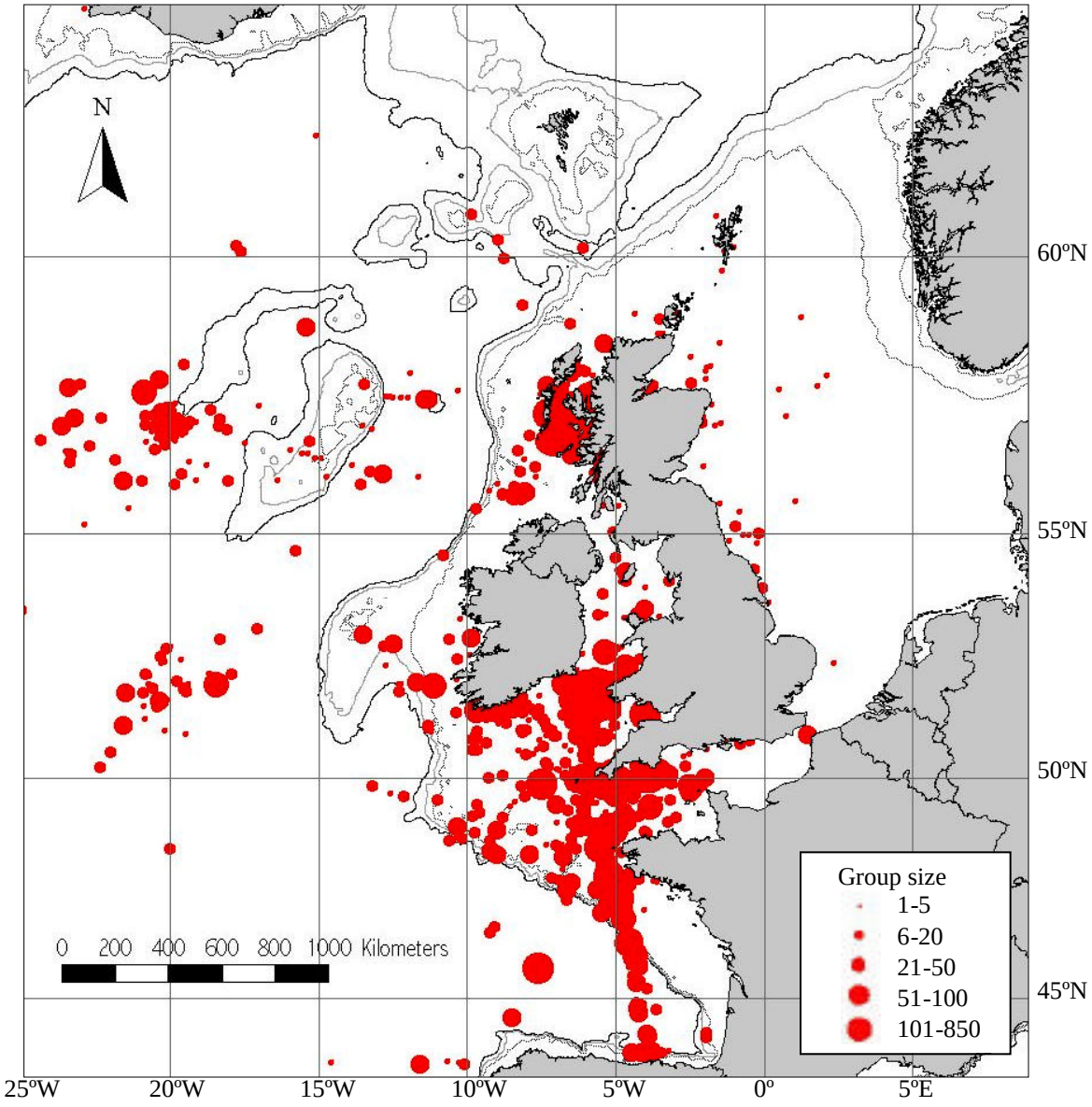


Fig. 35. Map of Short-beaked Common Dolphin Sightings

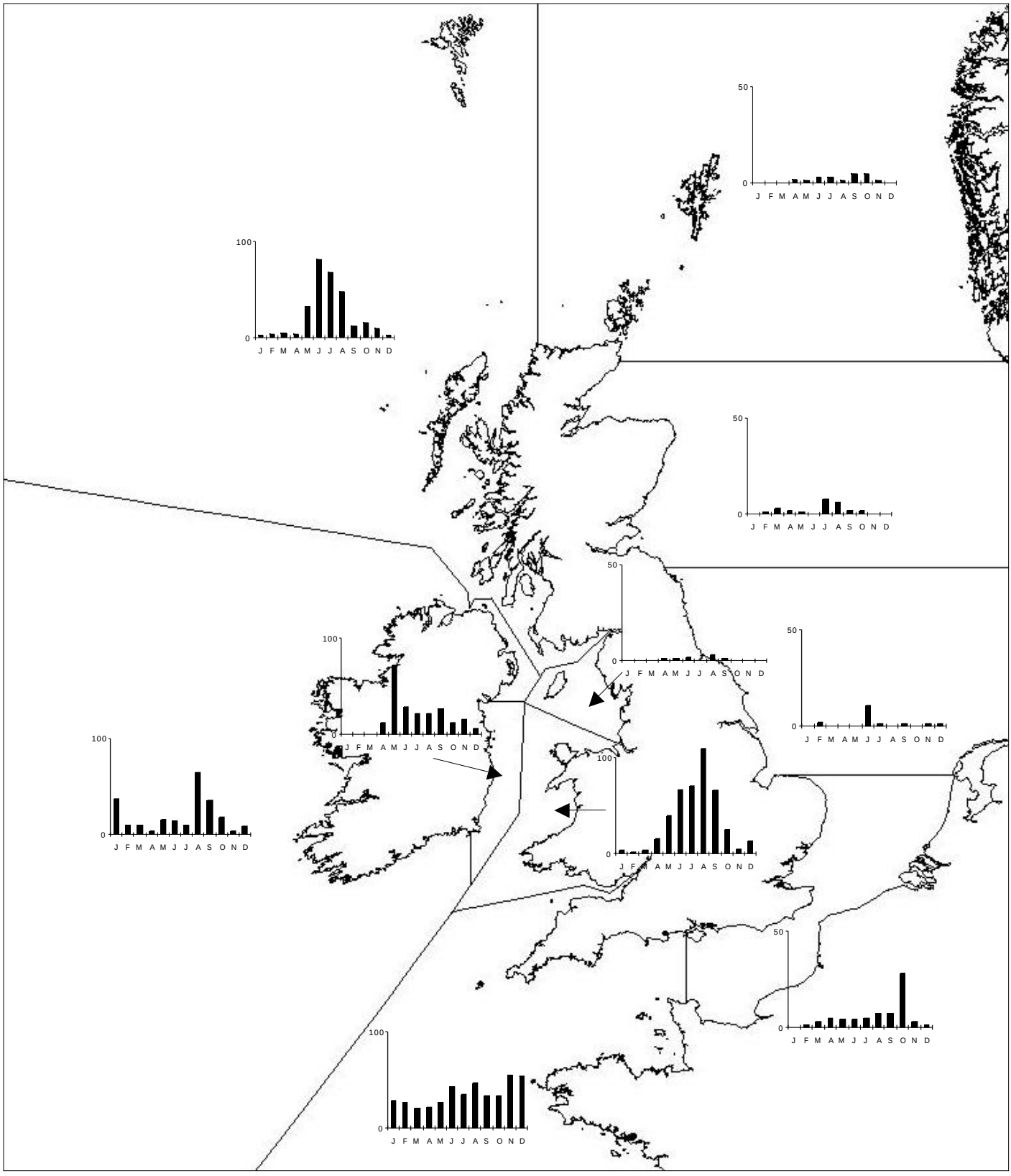


Fig. 36. Seasonal Distribution of Short-beaked Common Dolphin Sightings (all sightings)

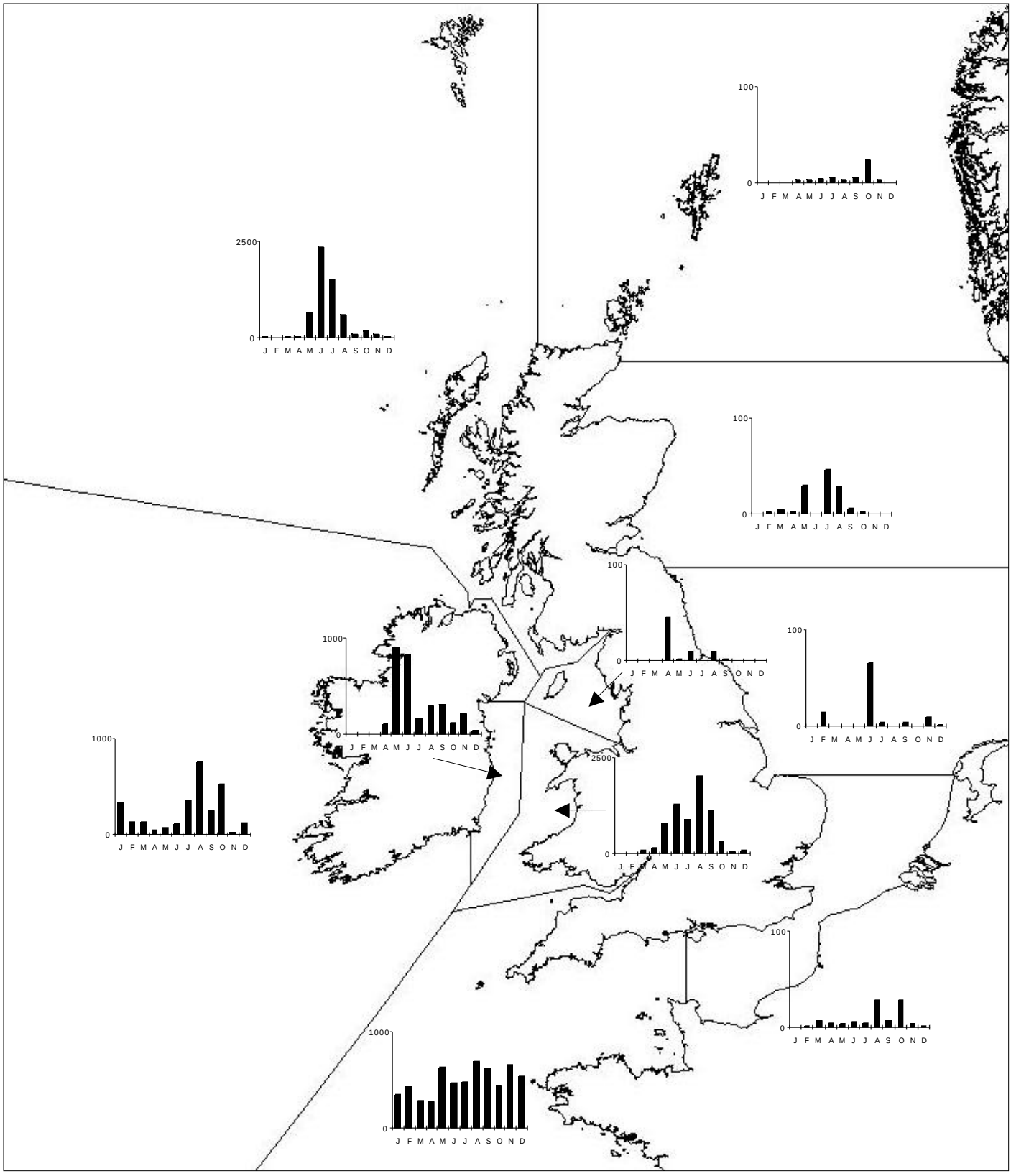


Fig. 37. Seasonal Distribution of Short-beaked Common Dolphin Individuals (all sightings)

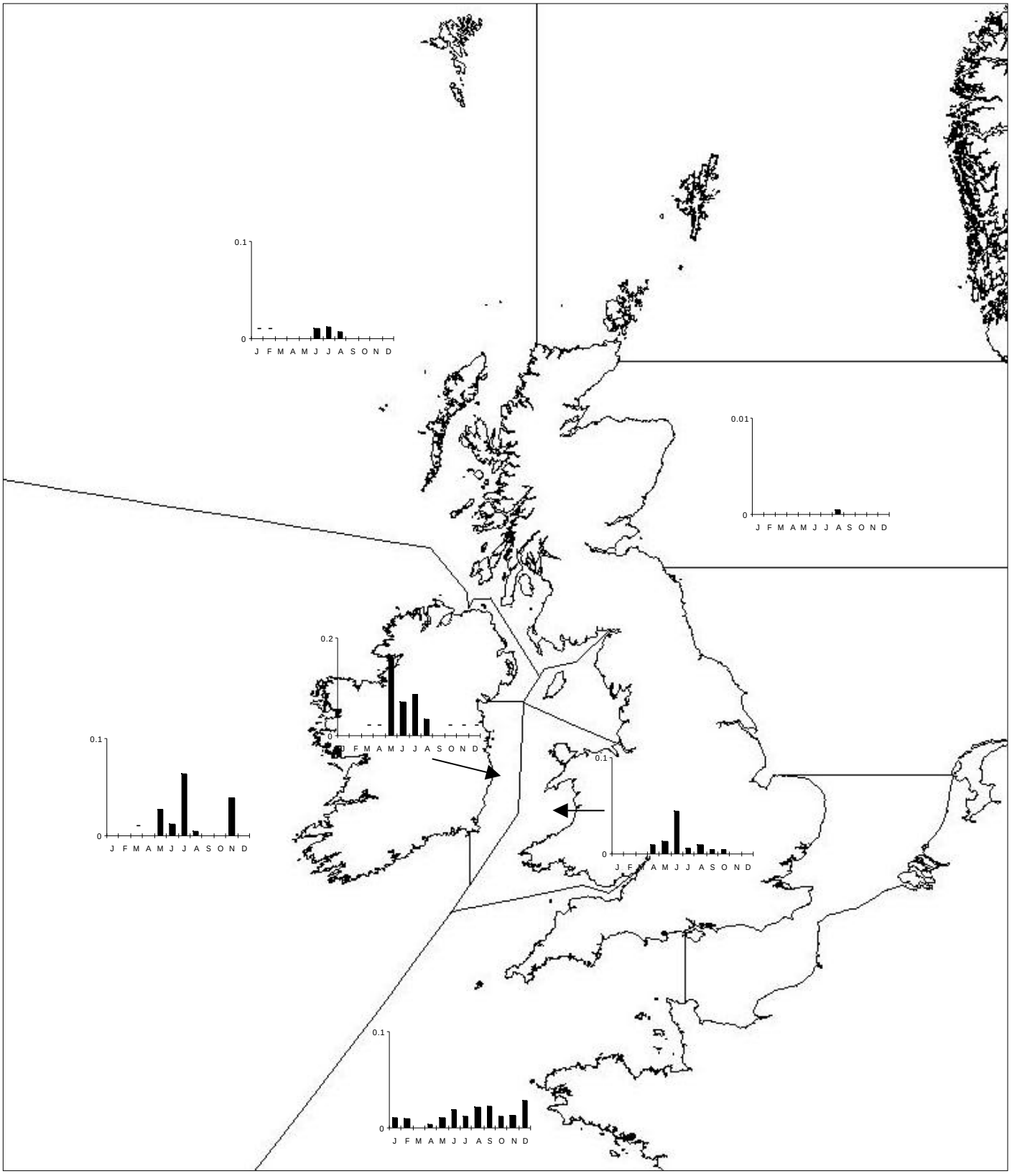


Fig. 38. Seasonal Distribution of Short-beaked Common Dolphin Sightings / hour (effort-related sightings only)

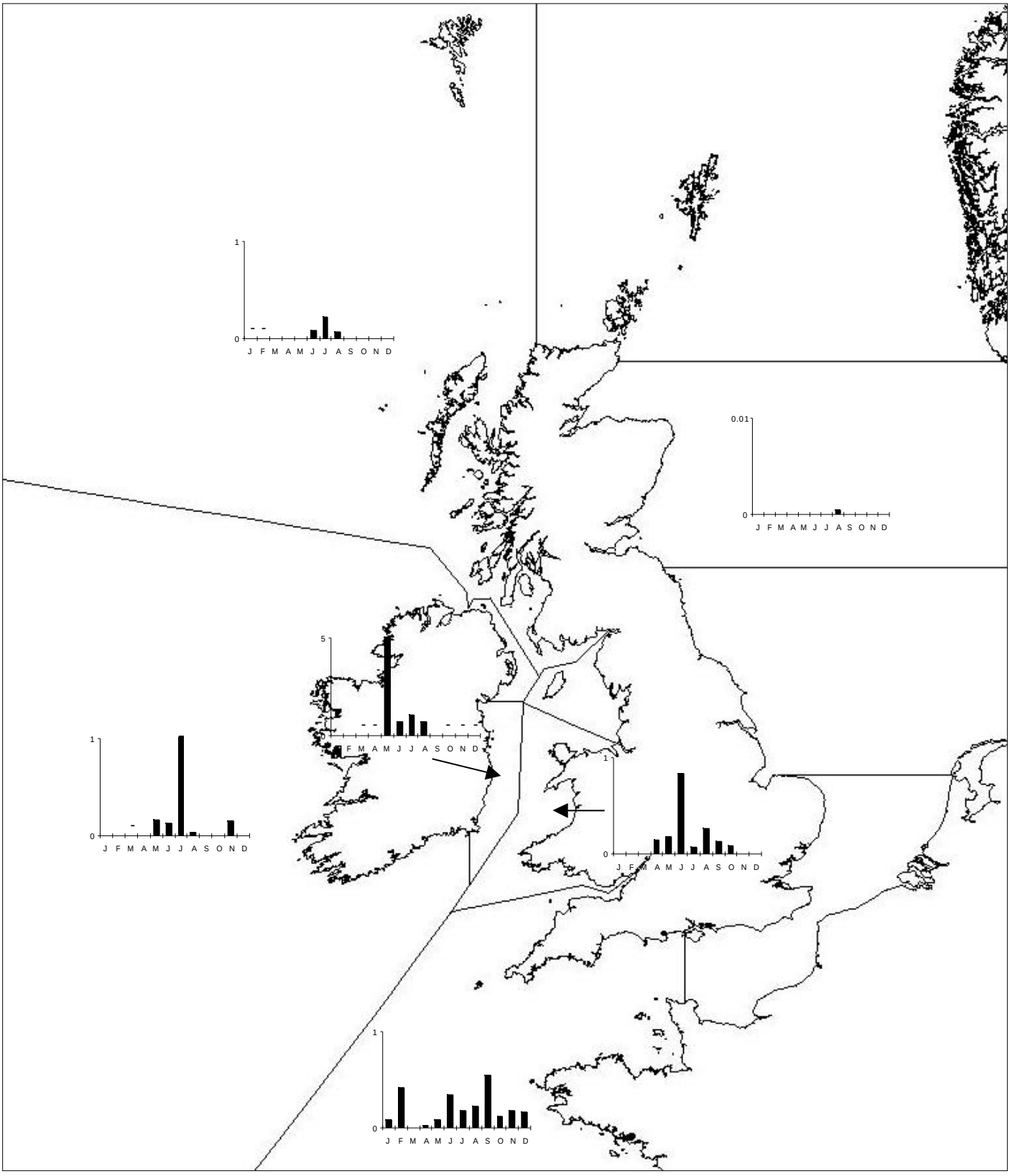


Fig. 39. Seasonal Distribution of Short-beaked Common Dolphin Individuals / hour (effort-related sightings only)

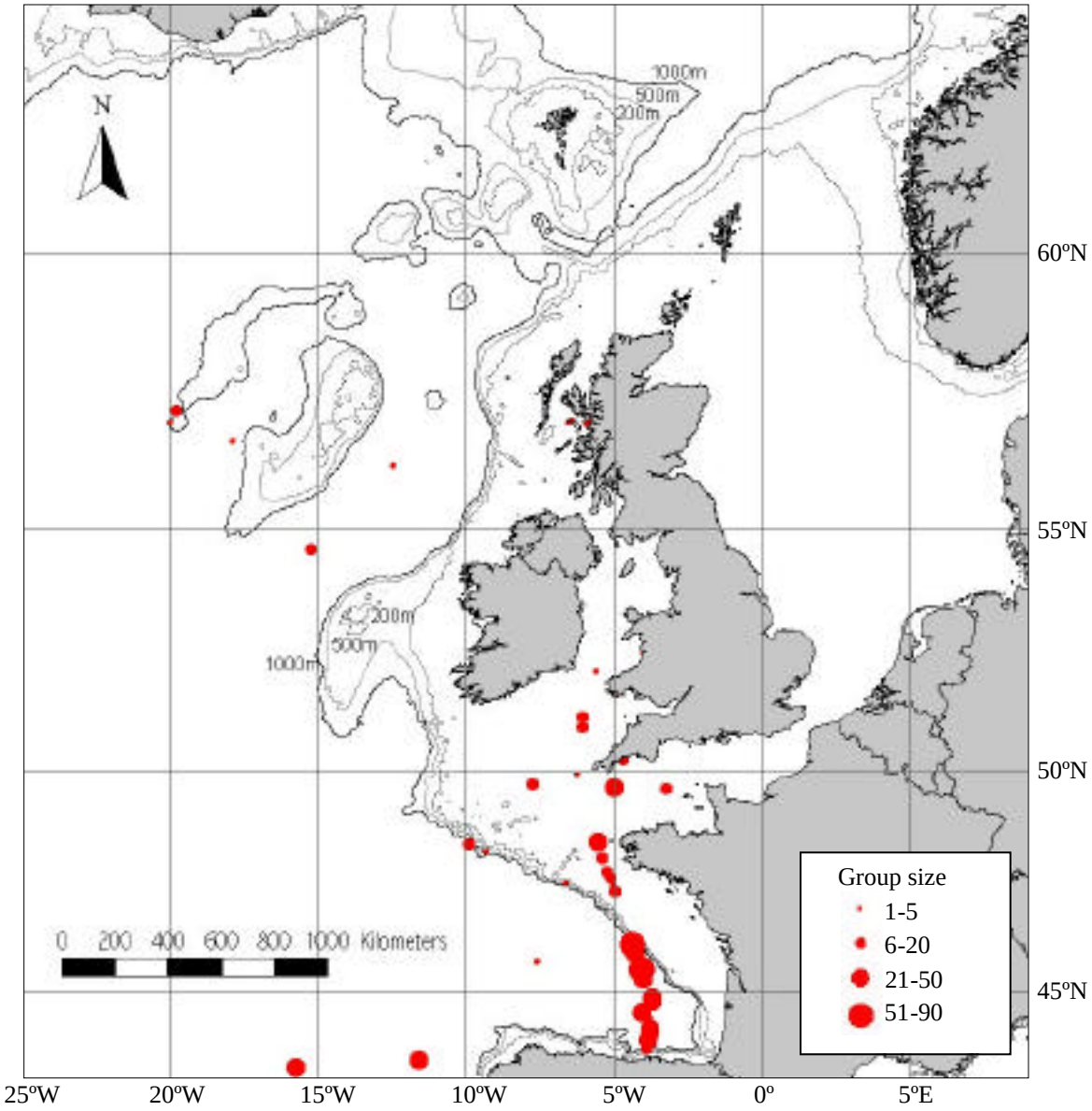


Fig. 40 Map of Striped Dolphin Sightings

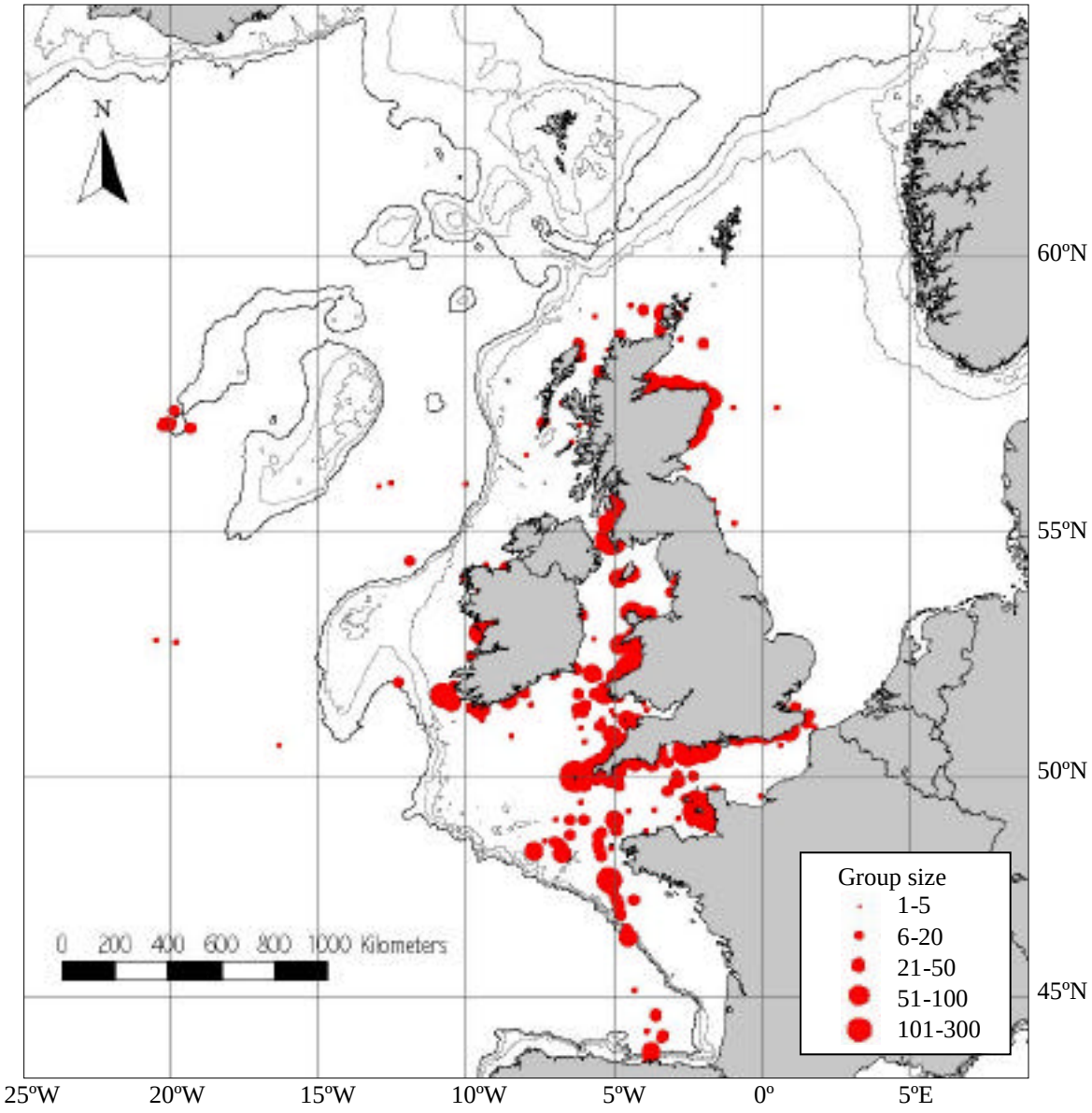


Fig. 41. Map of Bottlenose Dolphin Sightings

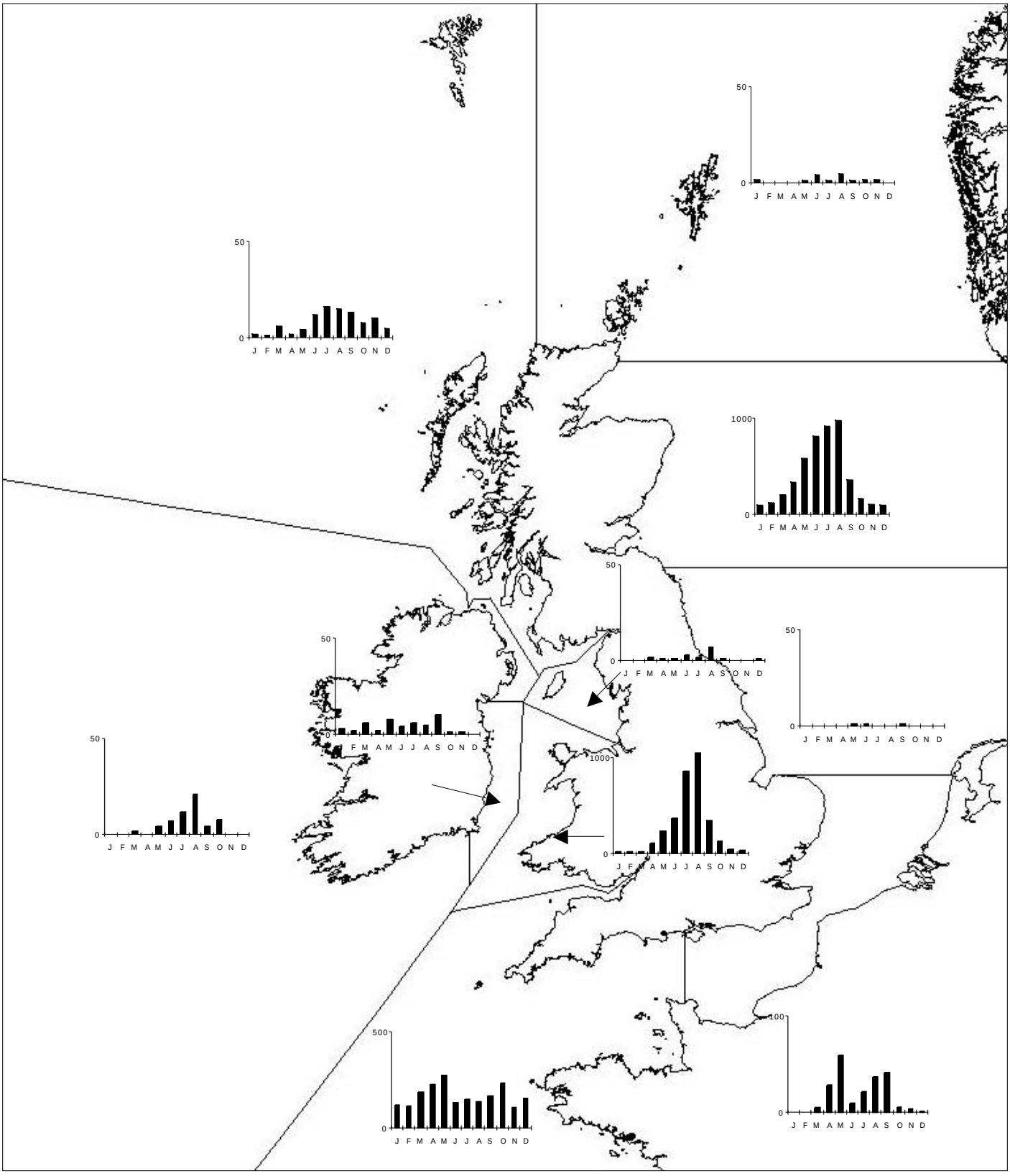


Fig. 42. Seasonal Distribution of Bottlenose Dolphin Sightings (all sightings)

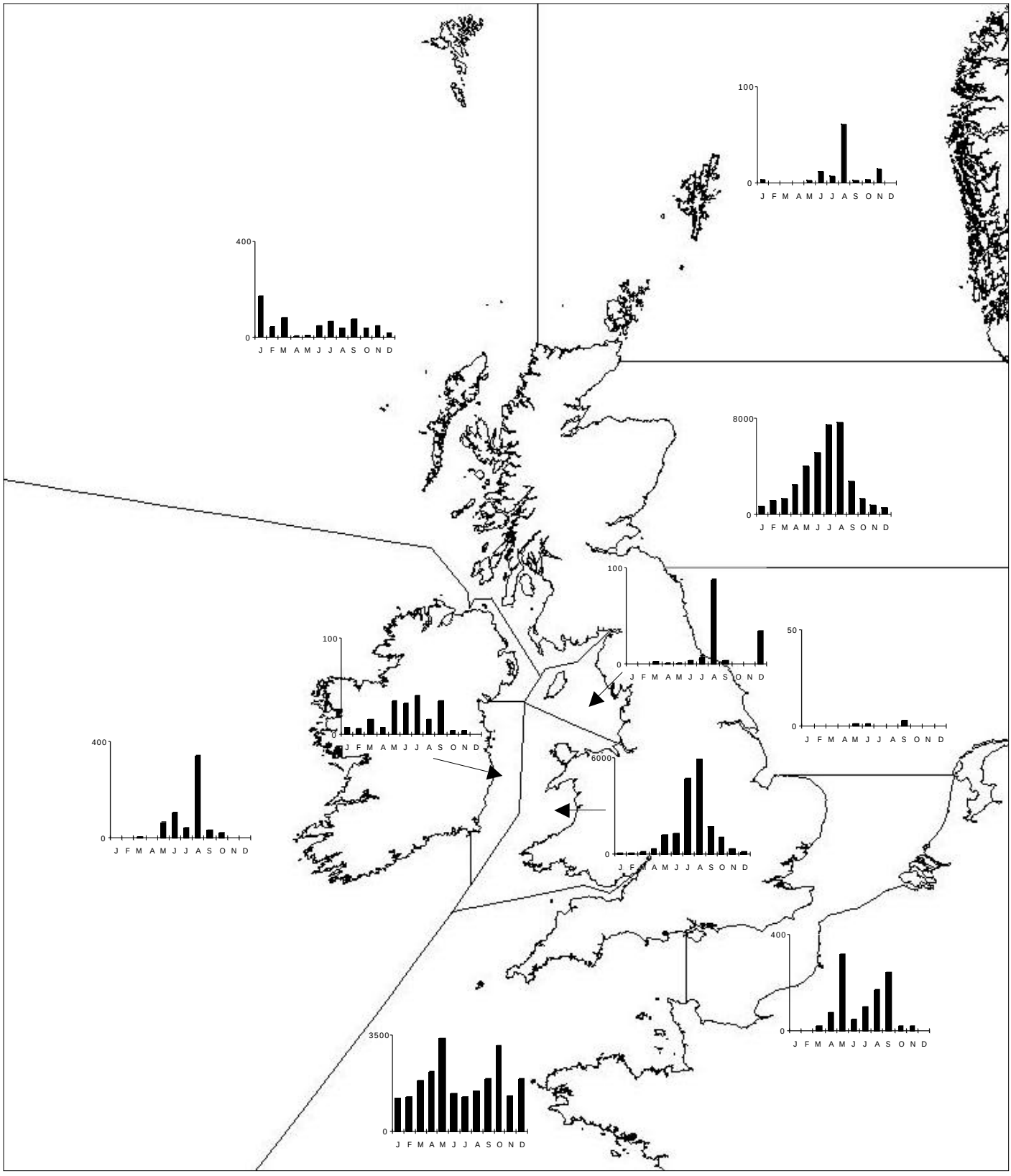


Fig. 43. Seasonal Distribution of Bottlenose Dolphin Individuals (all sightings)

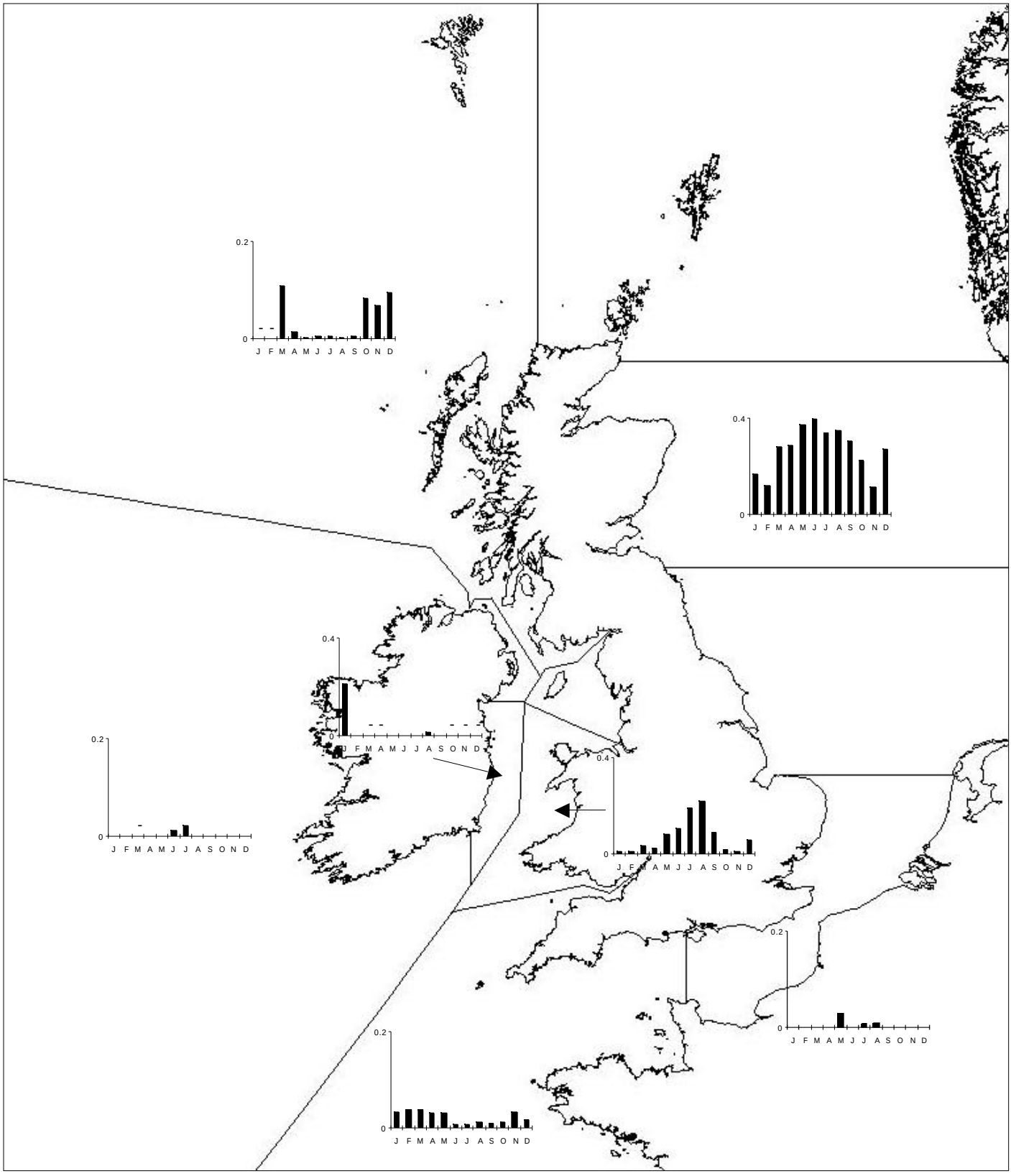


Fig. 44. Seasonal Distribution of Bottlenose Dolphin Sightings / hour (effort-related sightings only)

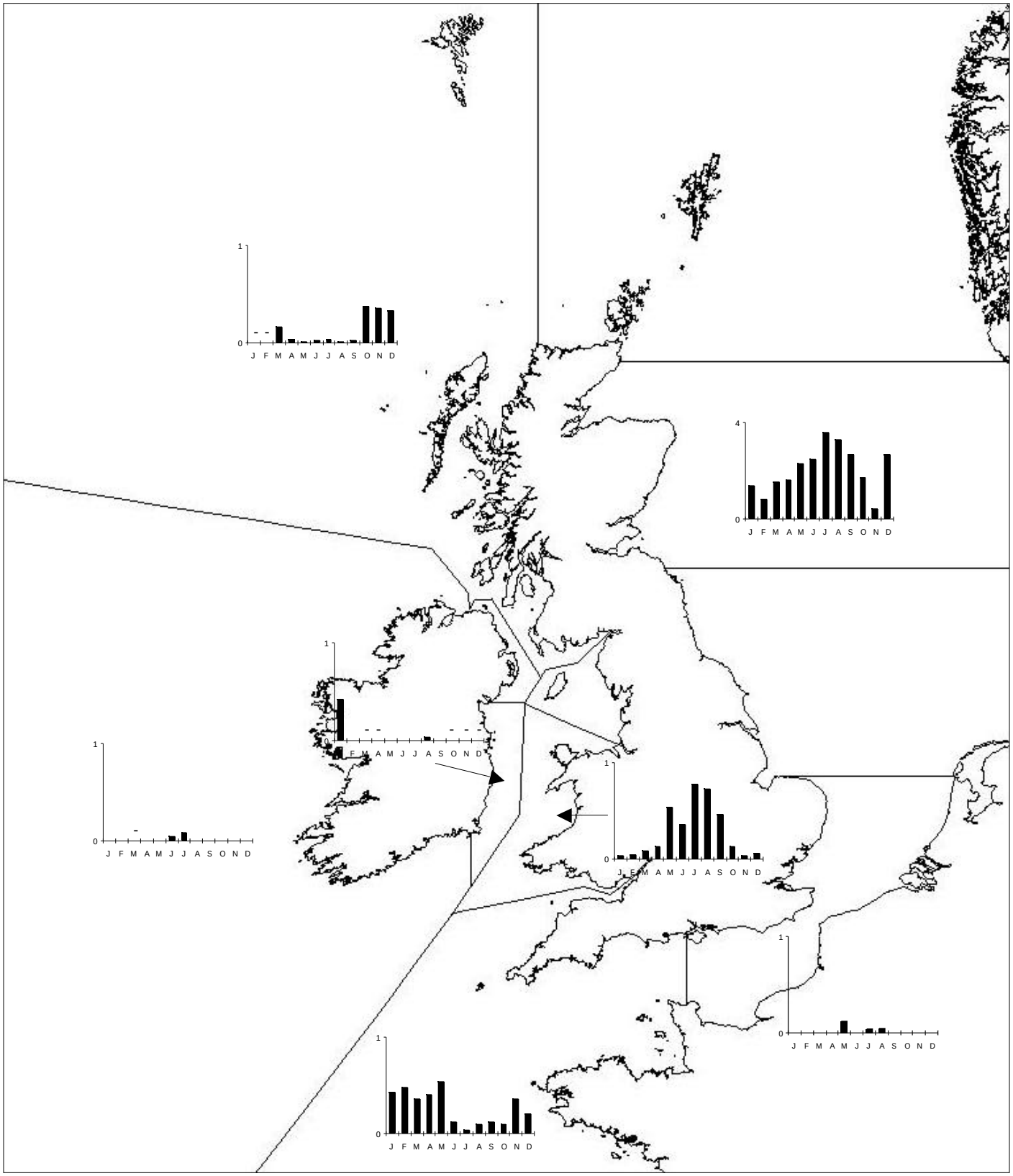


Fig. 45. Seasonal Distribution of Bottlenose Dolphin Individuals / hour (effort-related sightings only)

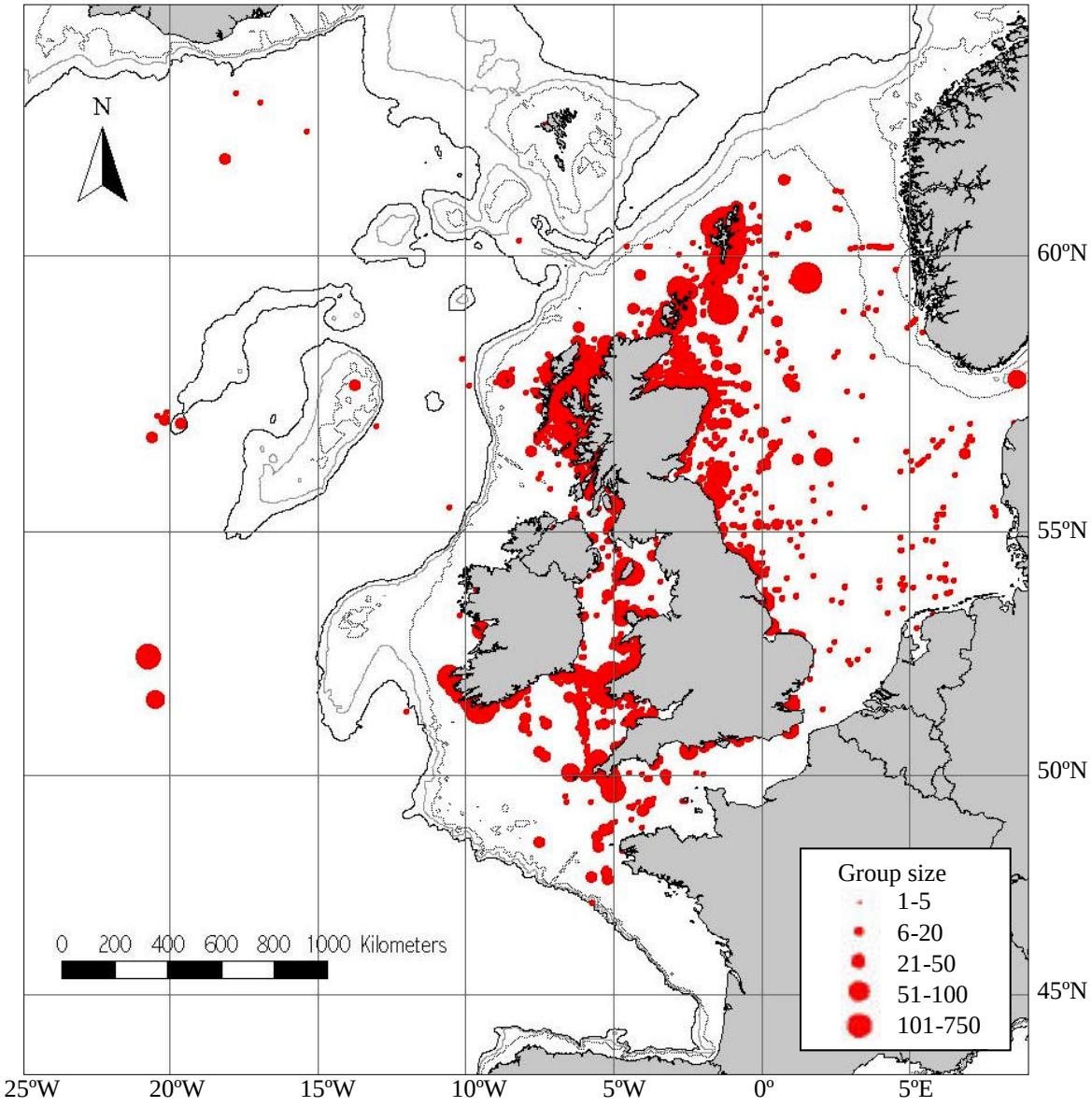


Fig. 46. Map of Harbour Porpoise Sightings

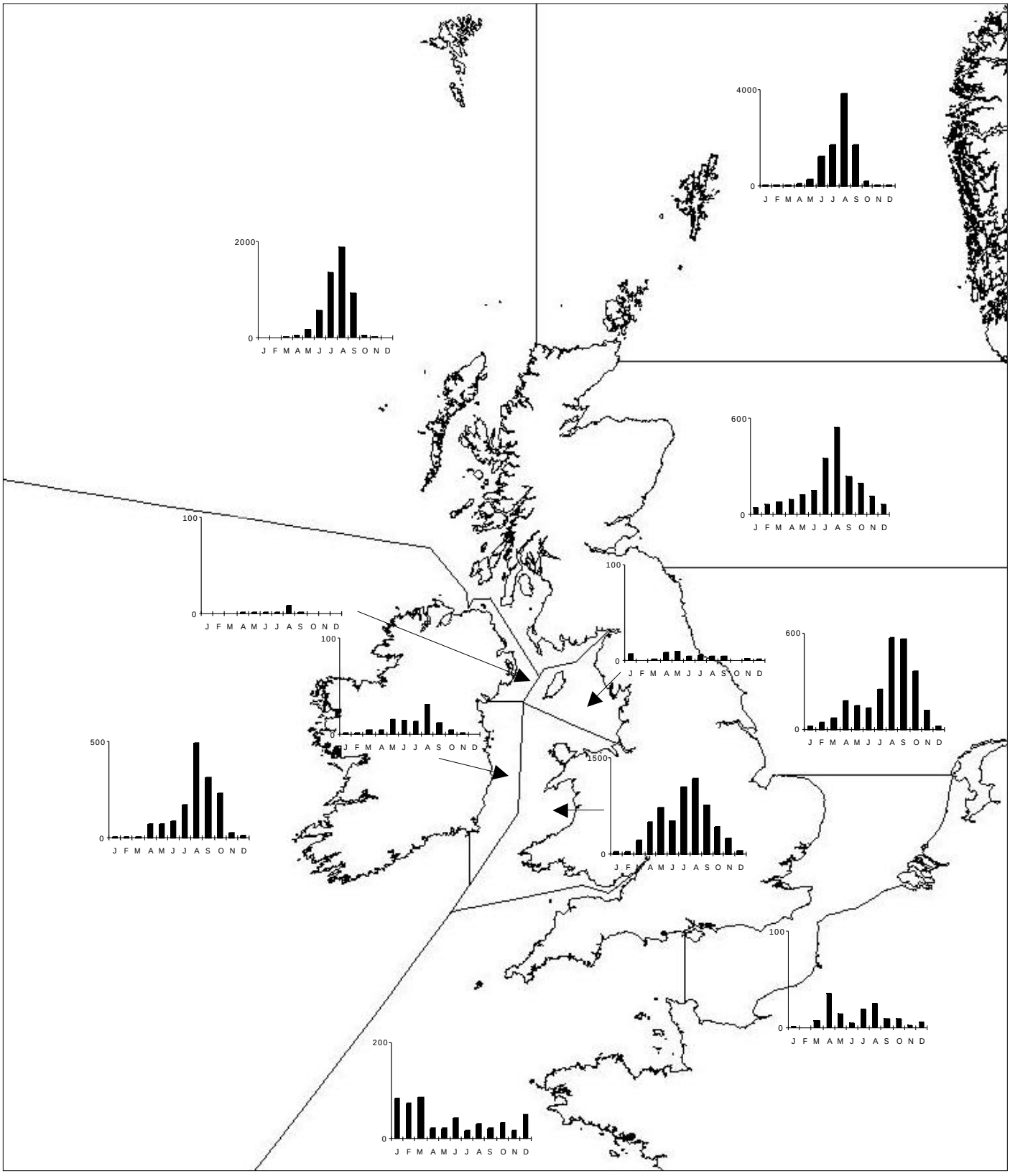


Fig. 47. Seasonal Distribution of Harbour Porpoise Sightings (all sightings)

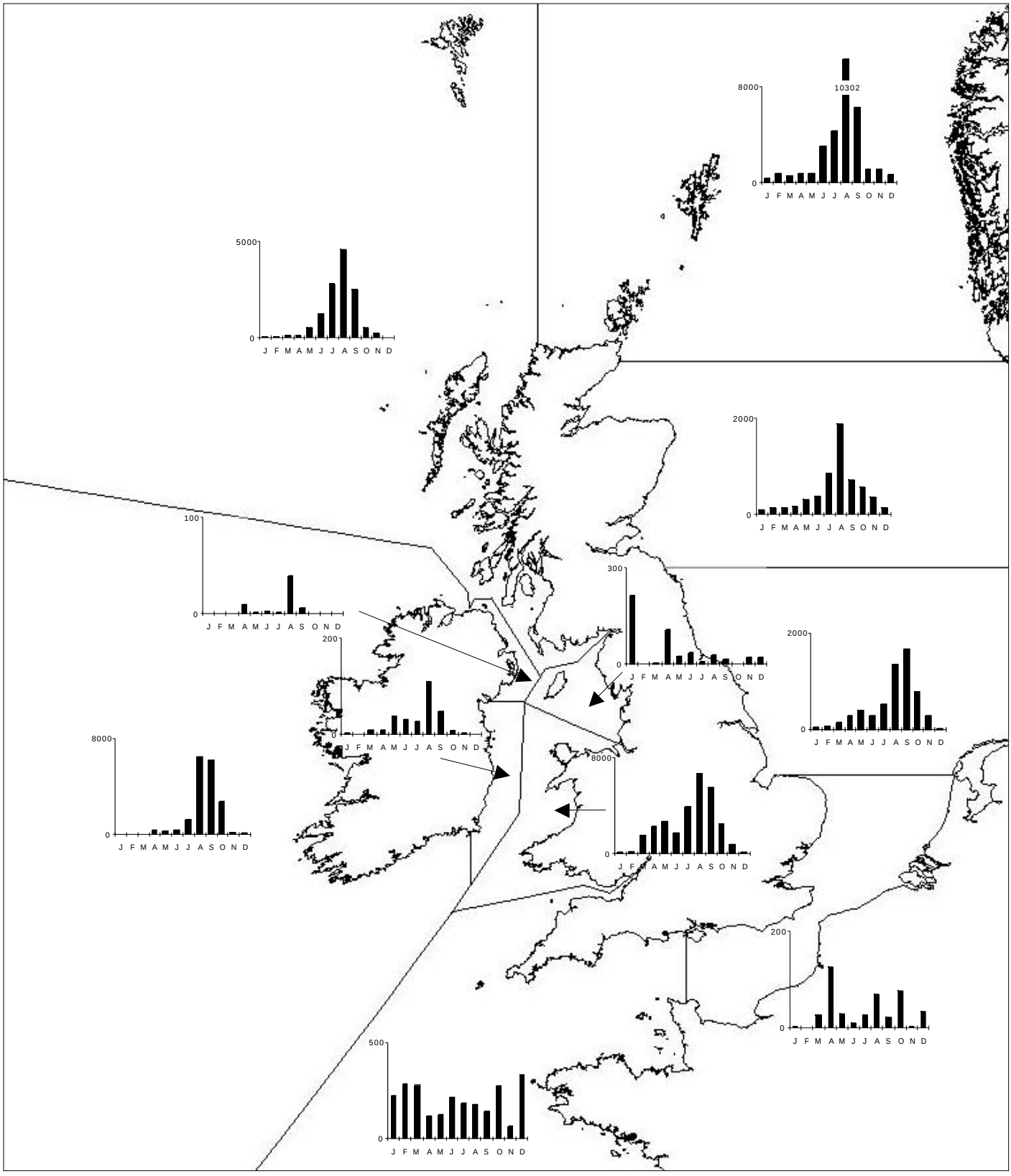


Fig. 48. Seasonal Distribution of Harbour Porpoise Individuals (all sightings)

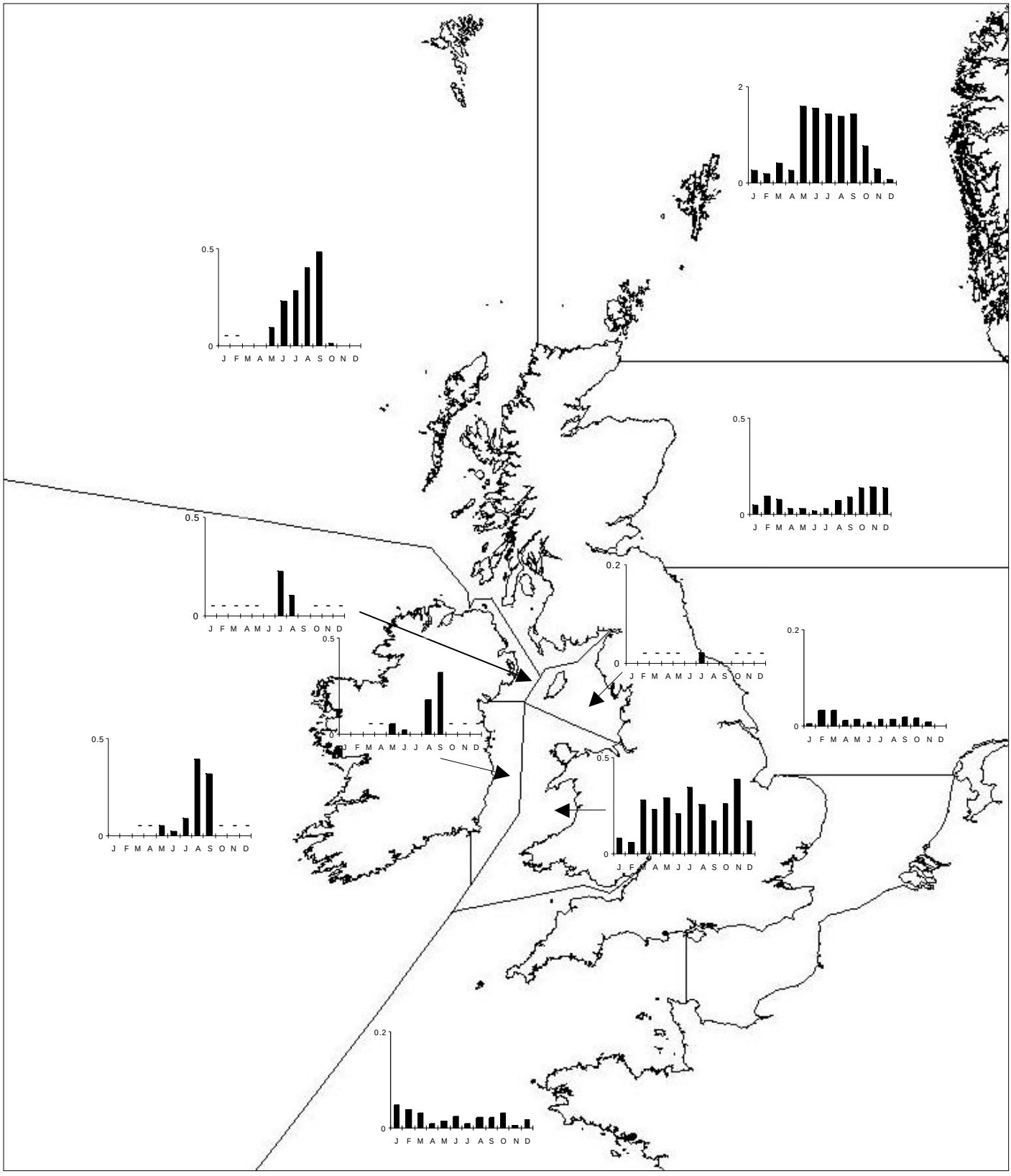


Fig. 49. Seasonal Distribution of Harbour Porpoise Sightings / hour (effort-related sightings only)

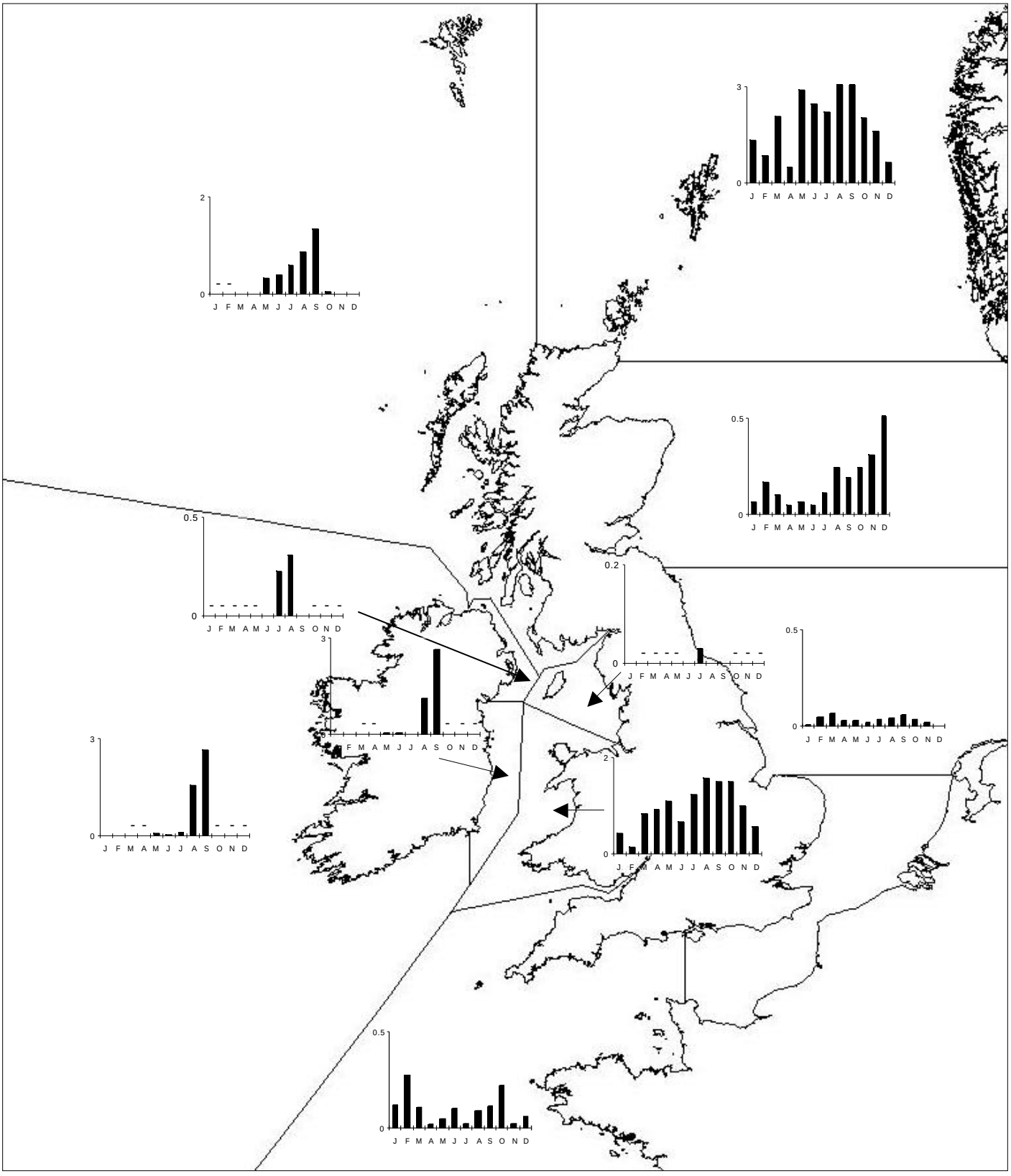
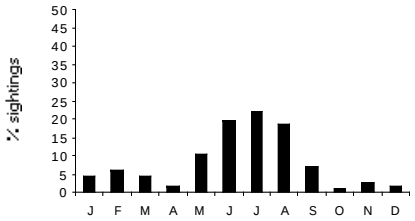


Fig. 50. Seasonal Distribution of Harbour Porpoise Individuals / hour (effort-related sightings only)

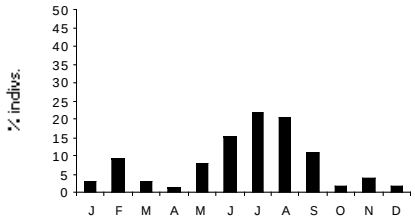
Fig. 51. Seasonal distribution (%) of regular cetaceans around the UK

a) Humpback Whale

Sightings (n=113)

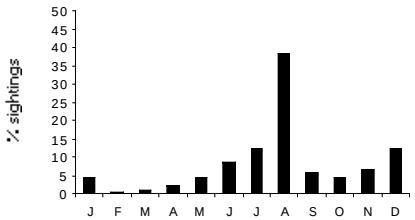


Individuals (n=157)

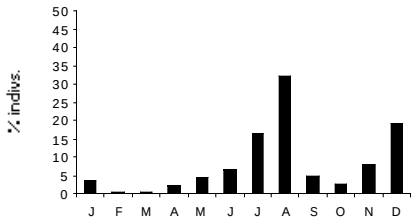


b) Fin Whale

Sightings (n=188)

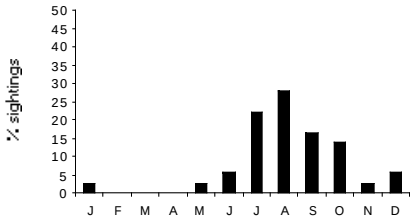


Individuals (n=403)

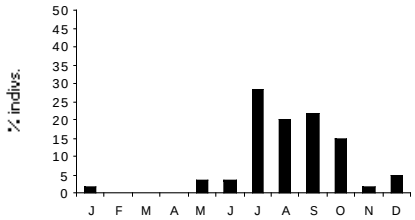


c) Sei Whale

Sightings (n=36)

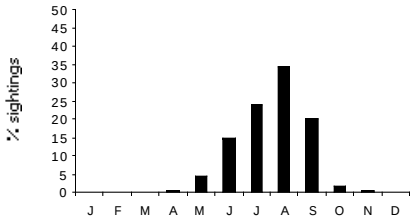


Individuals (n=60)

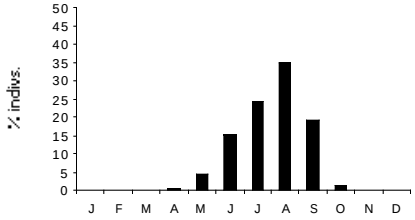


d) Minke Whale

Sightings (n=2549)

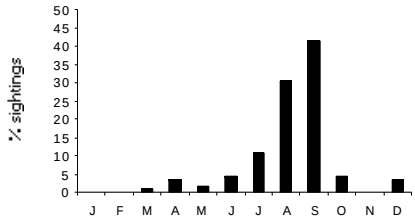


Individuals (n=3550)

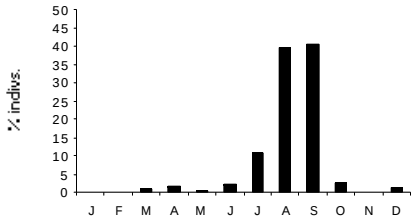


e) Northern Bottlenose Whale

Sightings (n=119)

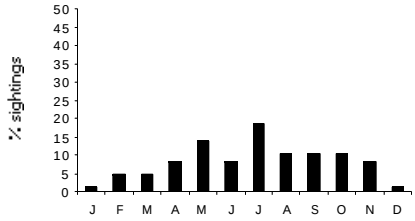


Individuals (n=325)

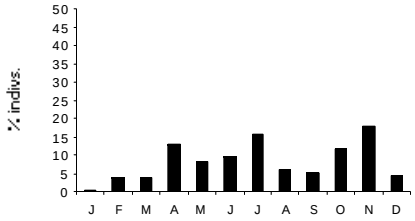


f) Sperm Whale

Sightings (n=86)

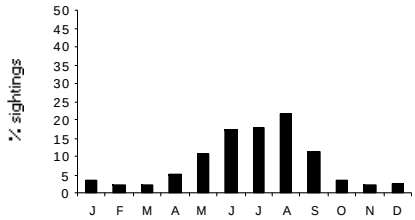


Individuals (n=241)

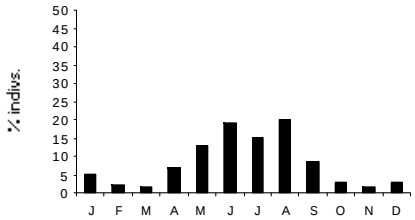


g) Killer Whale

Sightings (n=573)

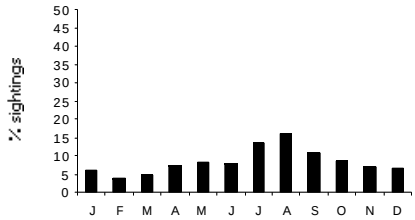


Individuals (n=2510)

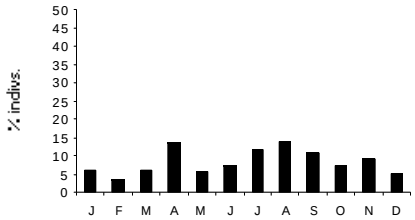


h) Long-finned Pilot Whale

Sightings (n=1472)

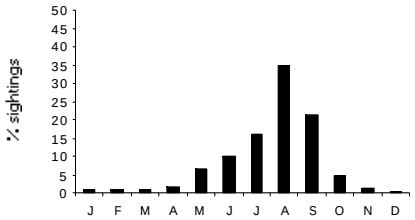


Individuals (n=38103)

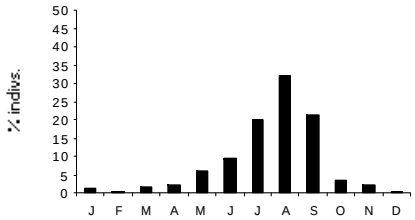


i) Risso's Dolphin

Sightings (n=952)

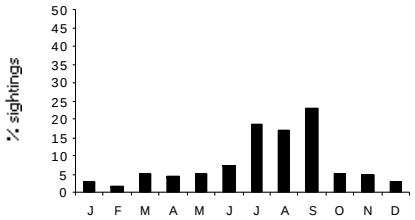


Individuals (n=5838)

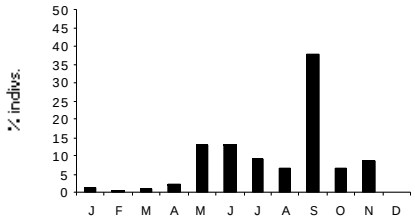


j) Atlantic White-sided Dolphin

Sightings (n=224)

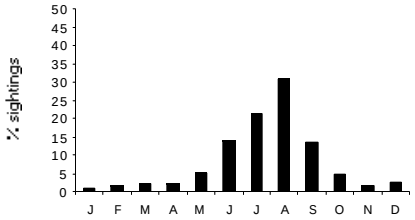


Individuals (n=5811)

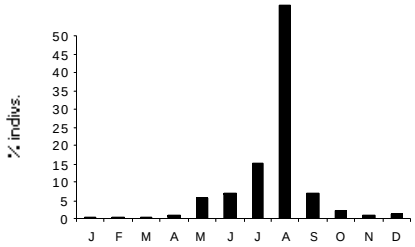


k) White-beaked dolphin

Sightings (n=1232)

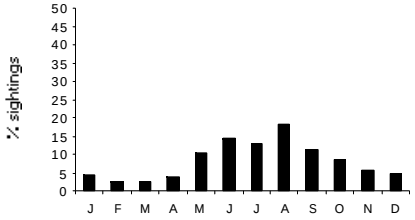


Individuals (n=12596)

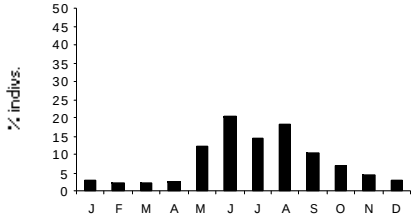


l) Short-beaked Common Dolphin

Sightings (n=1856)

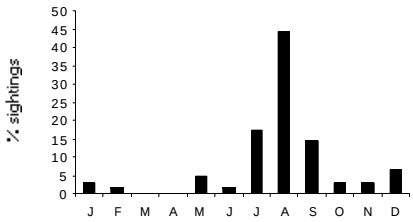


Individuals (n=25815)

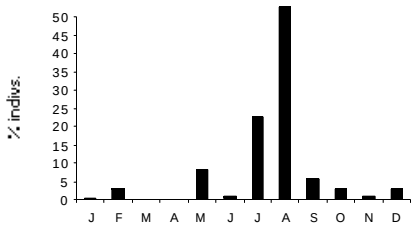


m) Striped Dolphin

Sightings (n=63)

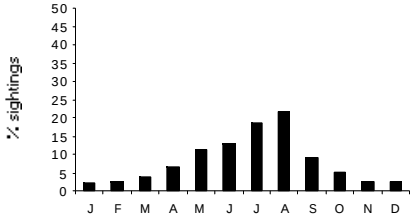


Individuals (n=1047)

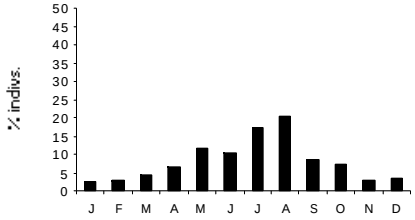


n) Bottlenose Dolphin

Sightings (n=10473)

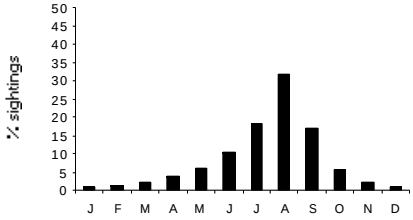


Individuals (n=77668)



o) Harbour Porpoise

Sightings (n=27117)



Individuals (n=105004)

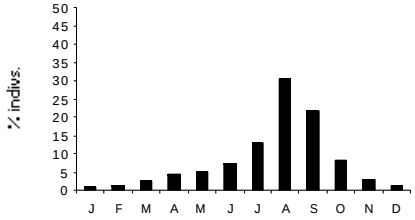
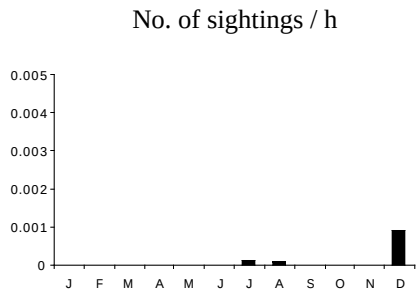
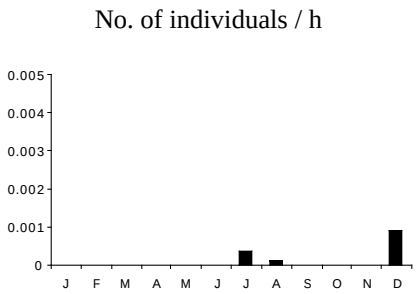


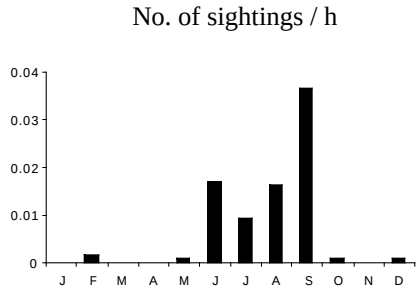
Fig. 52. Seasonal Distribution of regular cetaceans around the UK (effort-related data)

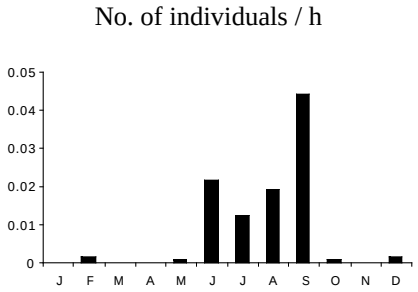
a) Fin Whale



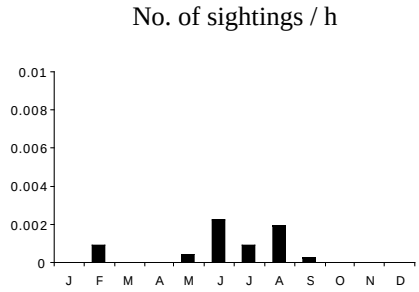


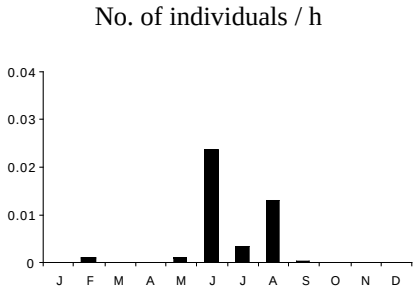
b) Minke Whale



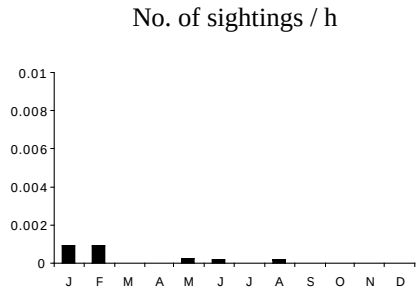


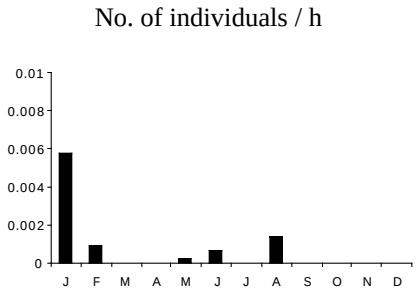
c) Killer Whale





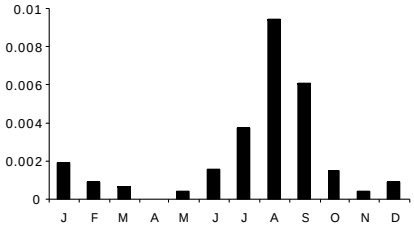
d) Long-finned Pilot Whale



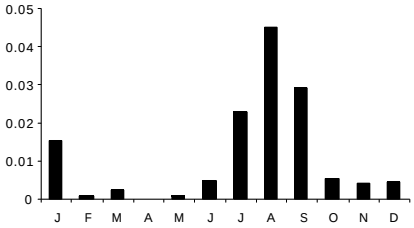


e) Risso's Dolphin

No. of sightings / h

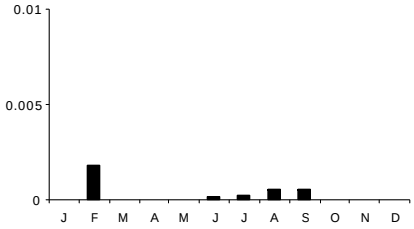


No. of individuals / h

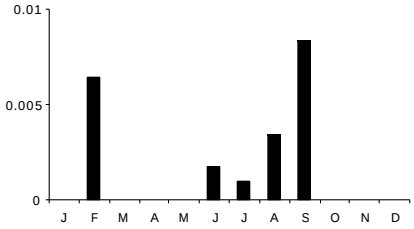


f) Atlantic White-sided Dolphin

No. of sightings / h

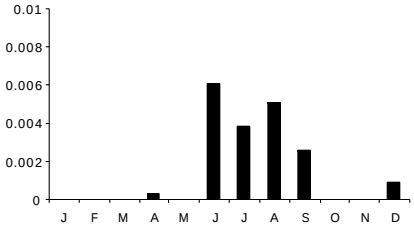


No. of individuals / h

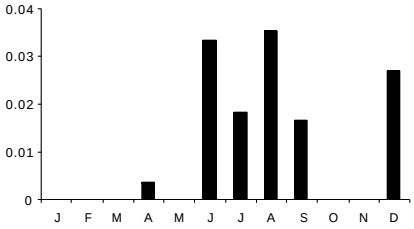


g) White-beaked Dolphin

No. of sightings / h

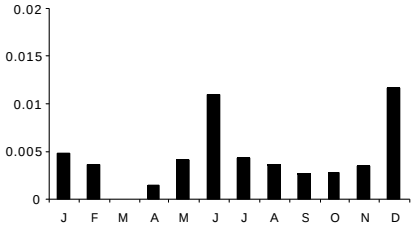


No. of individuals / h

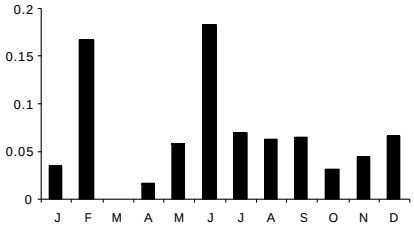


h) Short-beaked Common Dolphin

No. of sightings / h

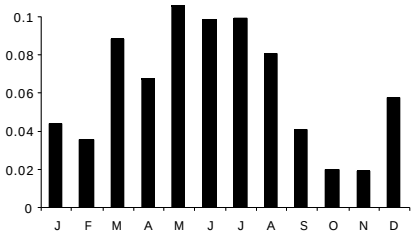


No. of individuals / h

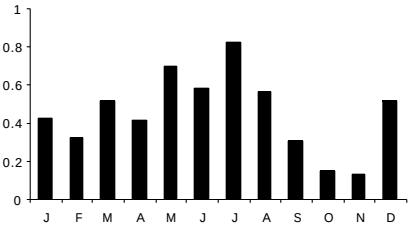


i) Bottlenose Dolphin

No. of sightings / h

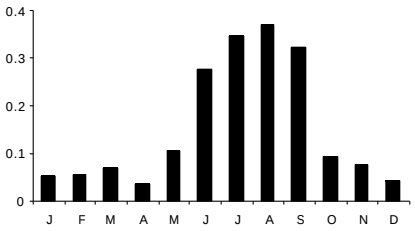


No. of individuals / h



j) Harbour Porpoise

No. of sightings / h



No. of individuals / h

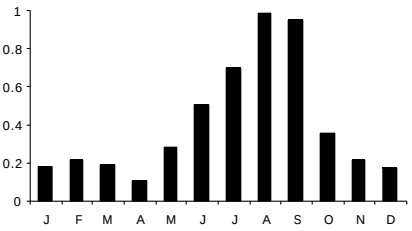
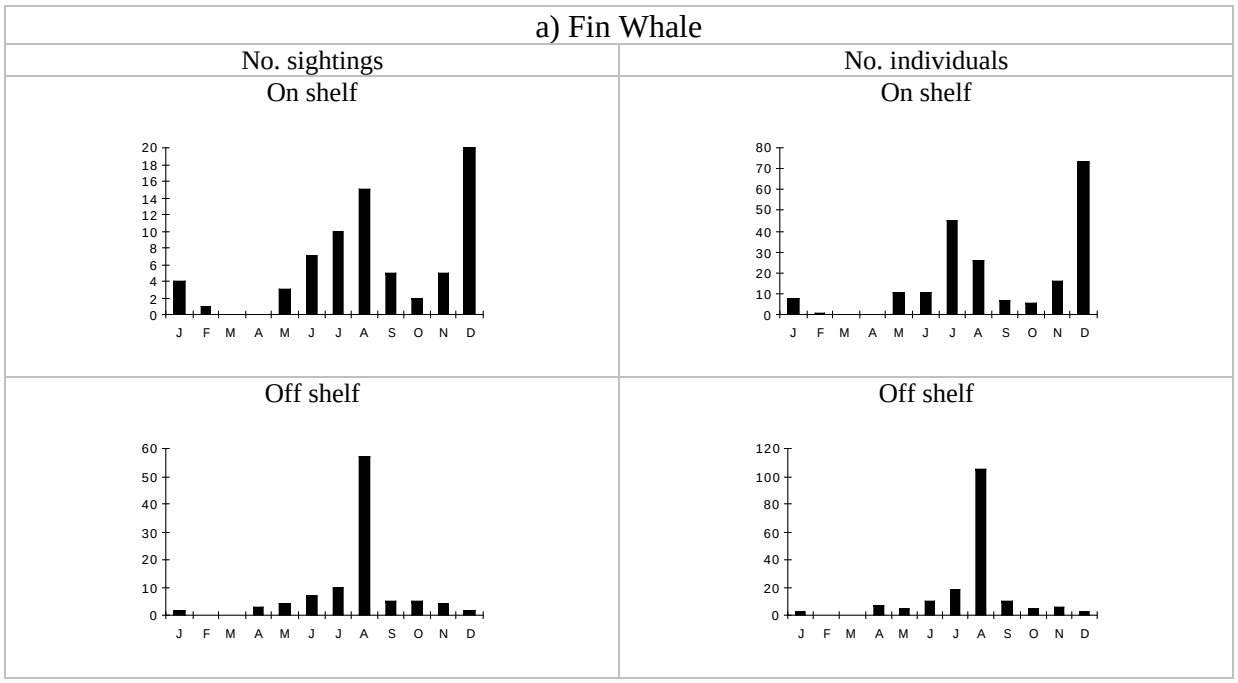
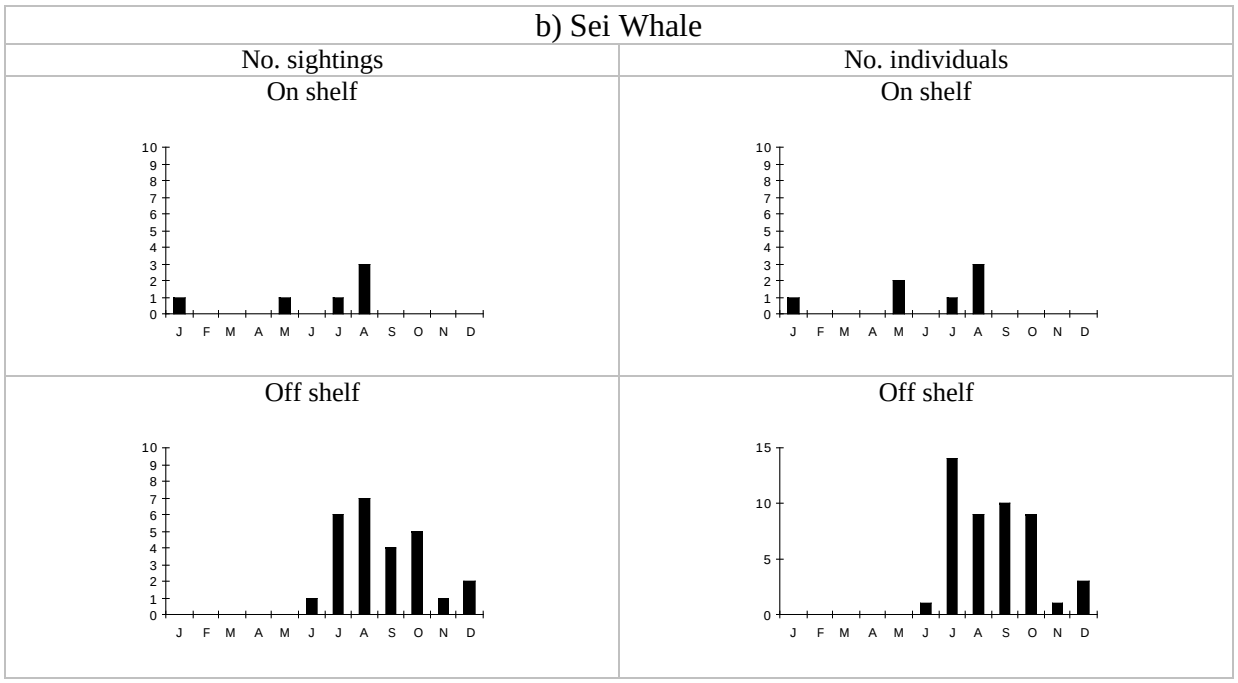
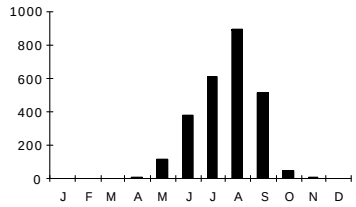
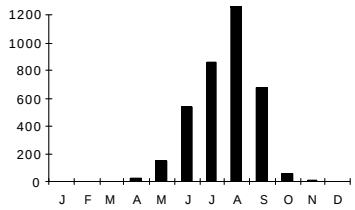
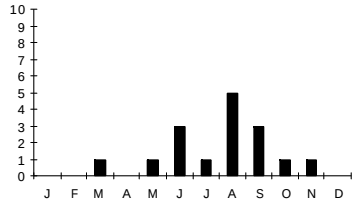
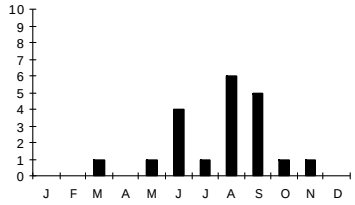


Fig. 53. On / off continental shelf: monthly trends, all sightings

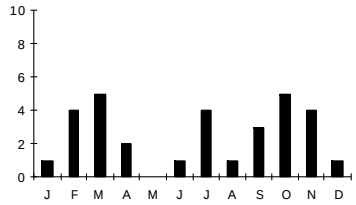
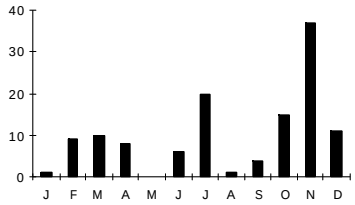
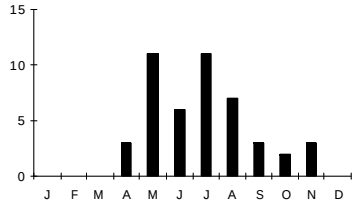
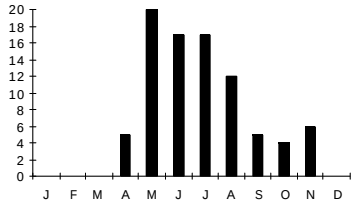


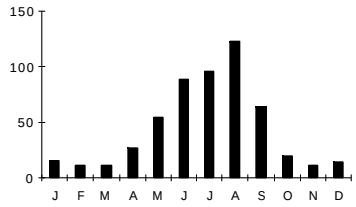
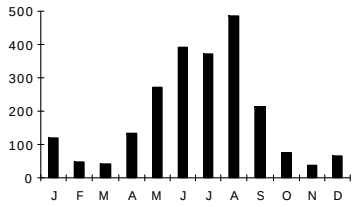
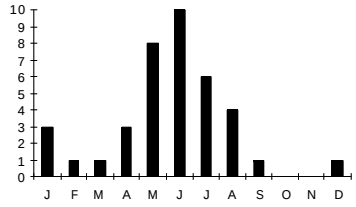
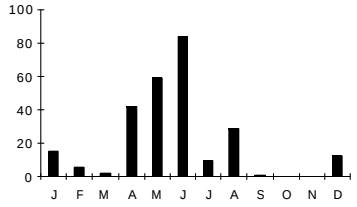


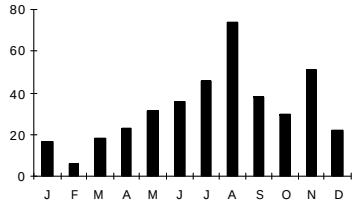
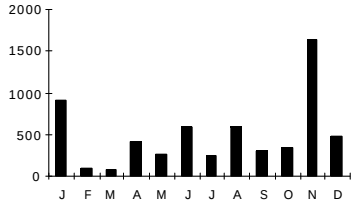
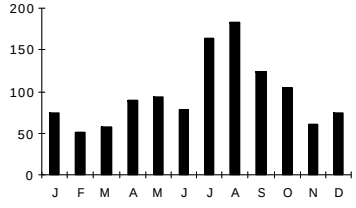
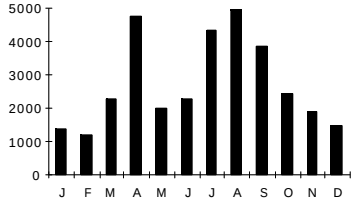
c) Minke Whale

No. sightings	No. individuals
On shelf	On shelf
	
Off shelf	Off shelf
	

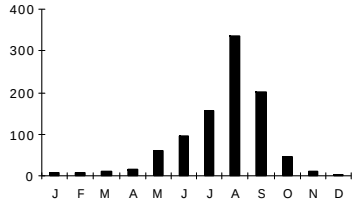
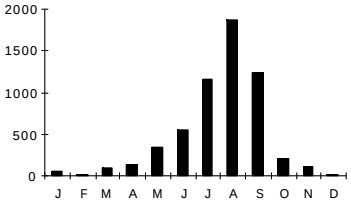
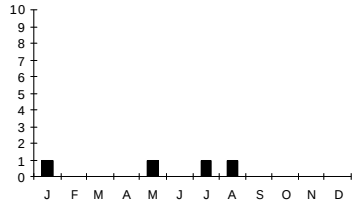
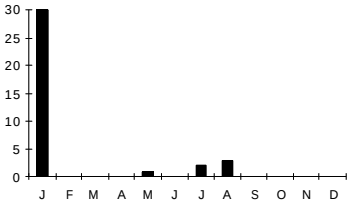
d) Sperm Whale

No. sightings	No. individuals
On shelf	On shelf
	
Off shelf	Off shelf
	

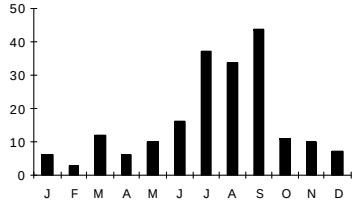
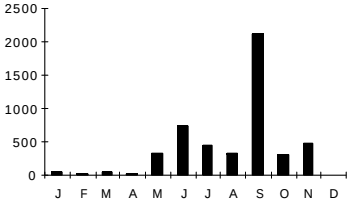
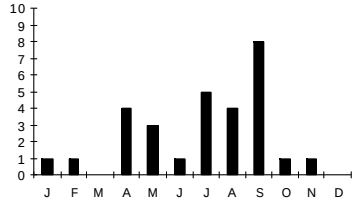
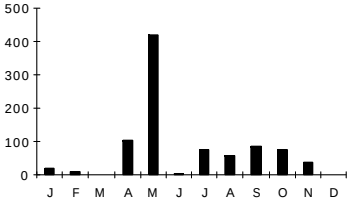
e) Killer Whale	
No. sightings	No. individuals
On shelf 	On shelf 
Off shelf 	Off shelf 

f) Long-finned Pilot Whale	
No. sightings	No. individuals
On shelf 	On shelf 
Off shelf 	Off shelf 

g) Risso's Dolphin

No. sightings	No. individuals
On shelf	On shelf
	
Off shelf	Off shelf
	

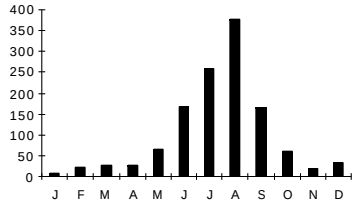
h) Atlantic White-sided Dolphin

No. sightings	No. individuals
On shelf	On shelf
	
Off shelf	Off shelf
	

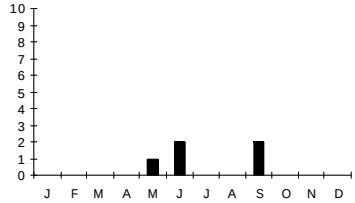
i) White-beaked Dolphin

No. sightings

On shelf

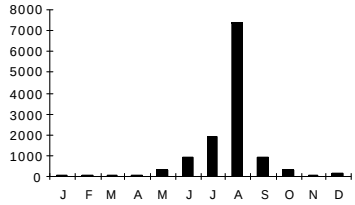


Off shelf

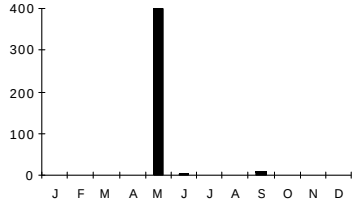


No. individuals

On shelf



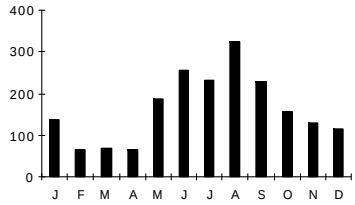
Off shelf



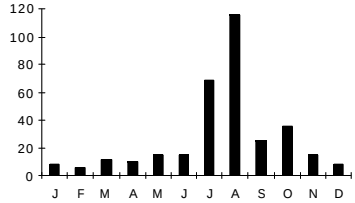
j) Common Dolphin

No. sightings

On shelf

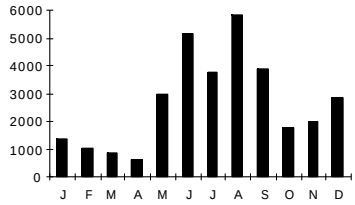


Off shelf

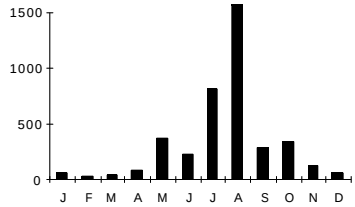


No. individuals

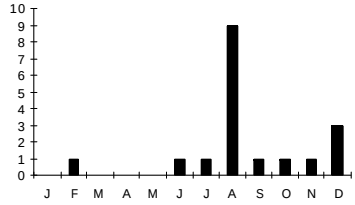
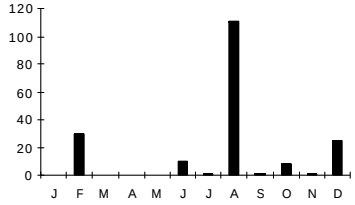
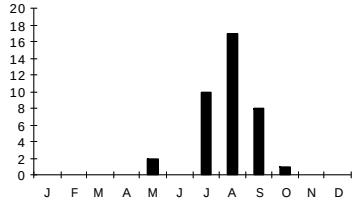
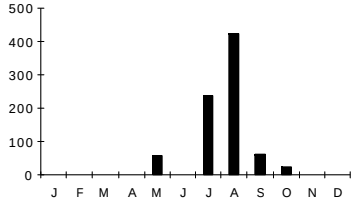
On shelf



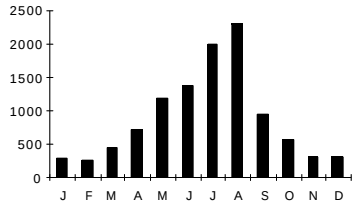
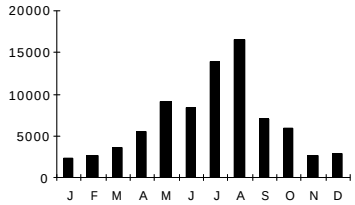
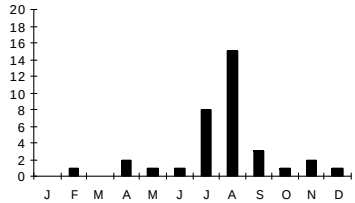
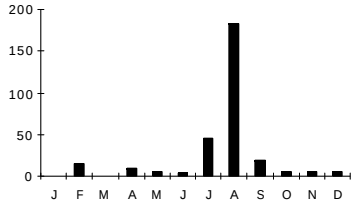
Off shelf



k) Striped Dolphin

No. sightings	No. individuals
On shelf	On shelf
	
Off shelf	Off shelf
	

l) Bottlenose Dolphin

No. sightings	No. individuals
On shelf	On shelf
	
Off shelf	Off shelf
	

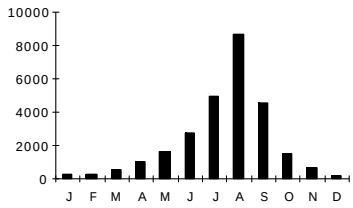
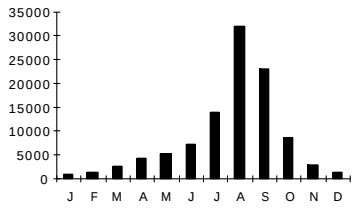
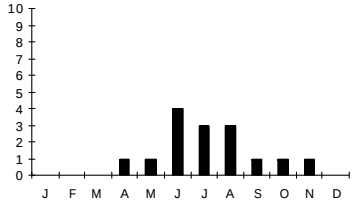
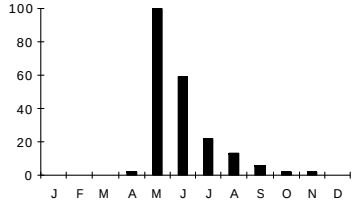
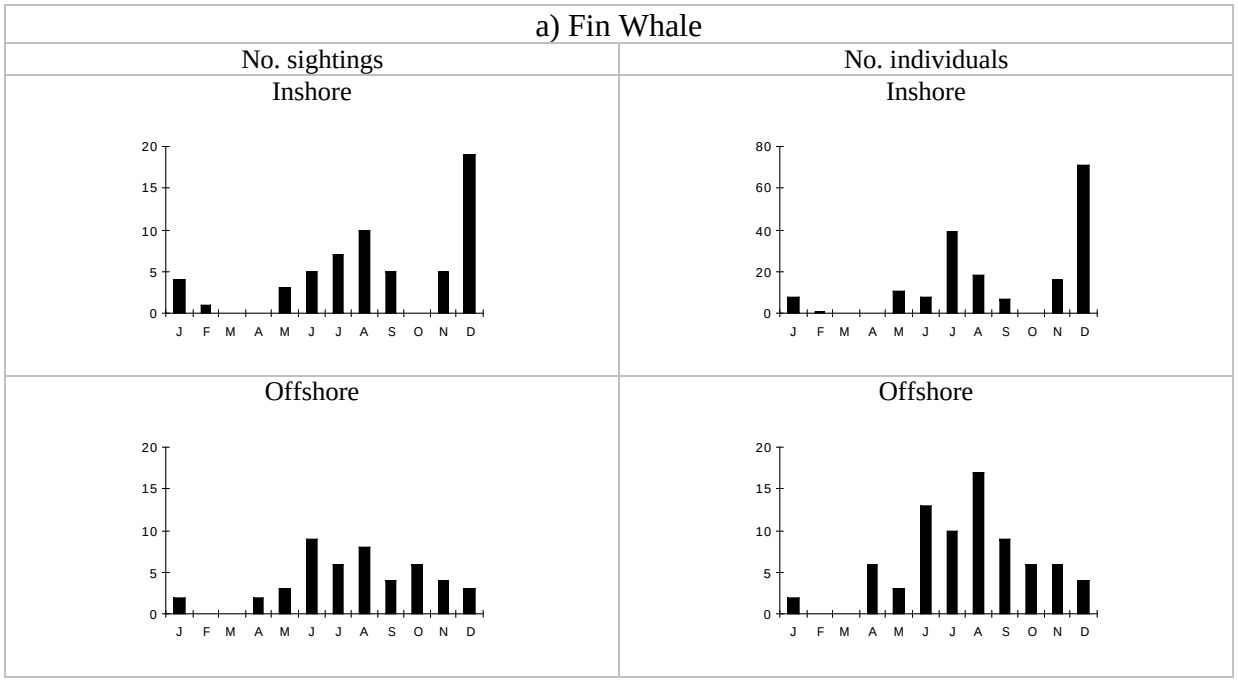
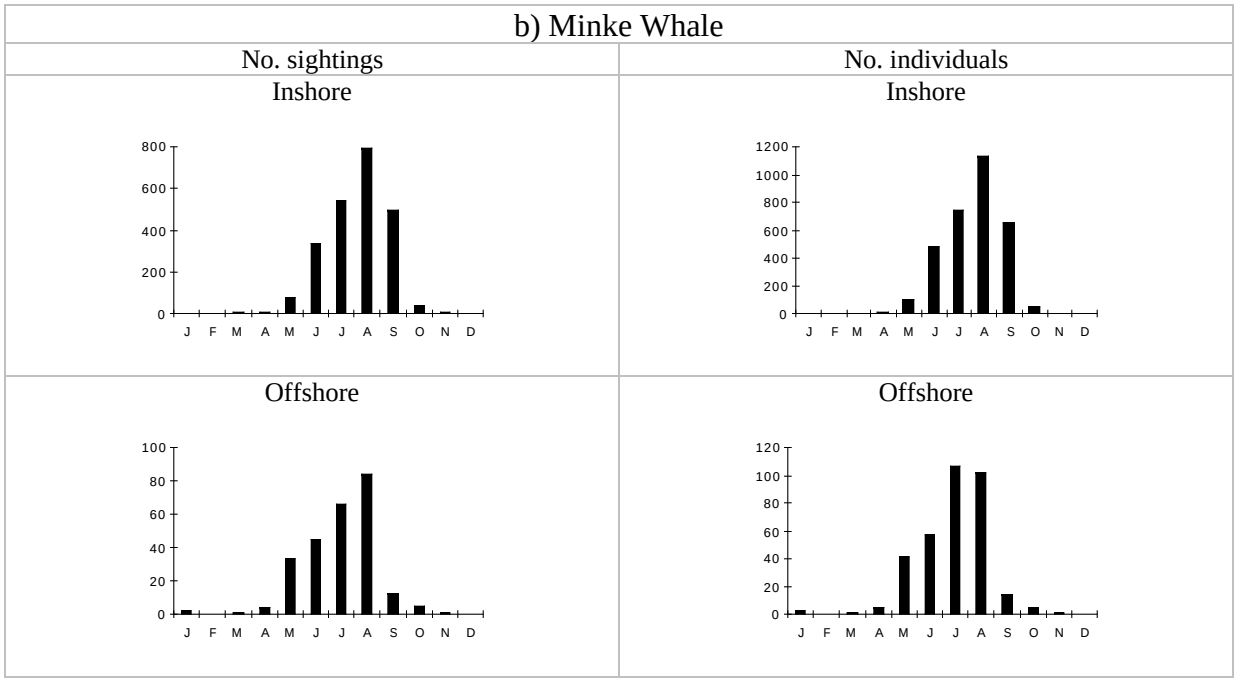
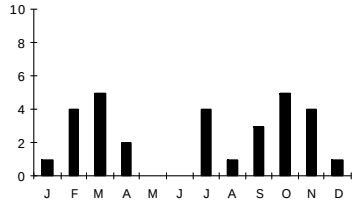
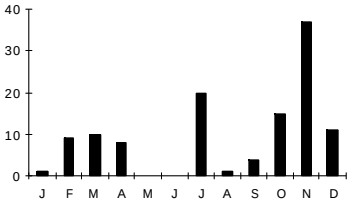
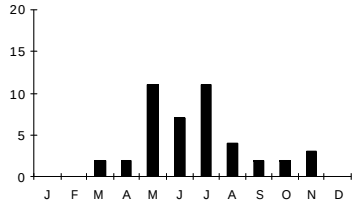
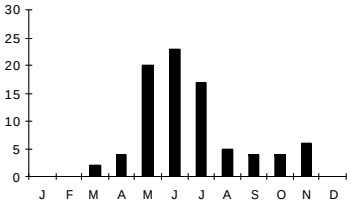
m) Harbour Porpoise	
No. sightings	No. individuals
On shelf 	On shelf 
Off shelf 	Off shelf 

Fig. 54 Inshore (<12nm) vs Offshore (>12nm) comparisons of Seasonal Occurrence

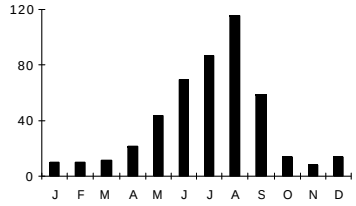
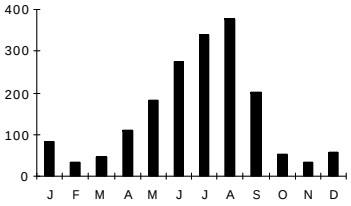
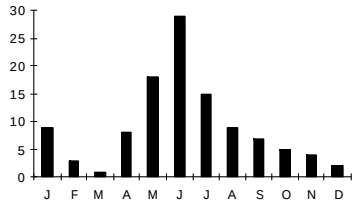
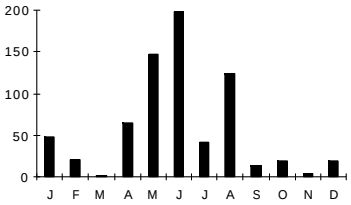


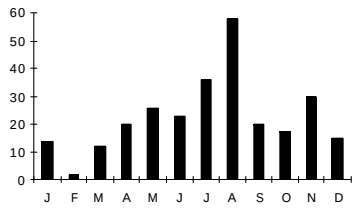
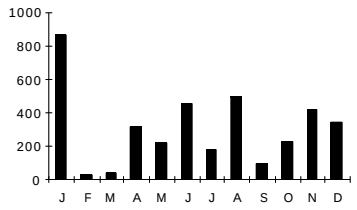
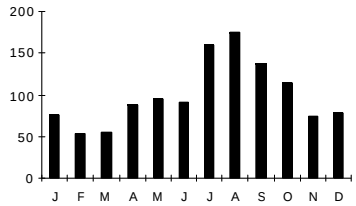
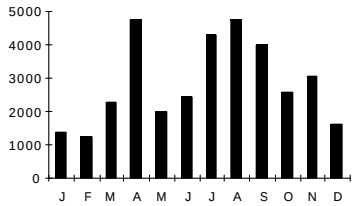


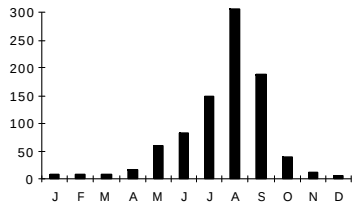
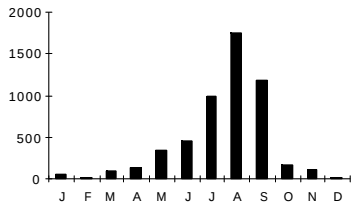
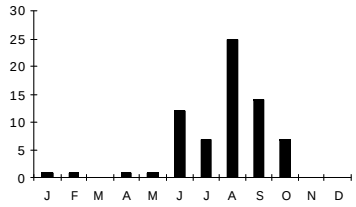
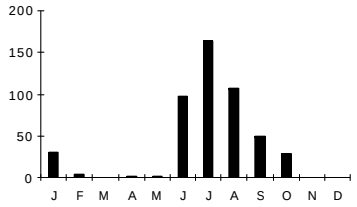
c) Sperm Whale

No. sightings	No. individuals
Inshore	Inshore
	
Offshore	Offshore
	

d) Killer Whale

No. sightings	No. individuals
Inshore	Inshore
	
Offshore	Offshore
	

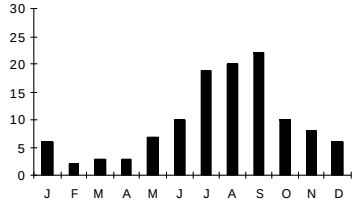
e) Long-finned Pilot Whale	
No. sightings	No. individuals
Inshore 	Inshore 
Offshore 	Offshore 

f) Risso's Dolphin	
No. sightings	No. individuals
Inshore 	Inshore 
Offshore 	Offshore 

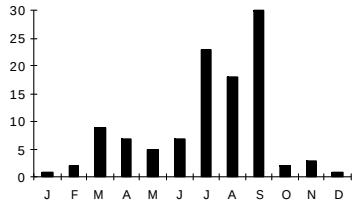
g) Atlantic White-sided Dolphin

No. sightings

Inshore

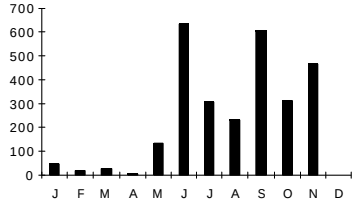


Offshore



No. individuals

Inshore



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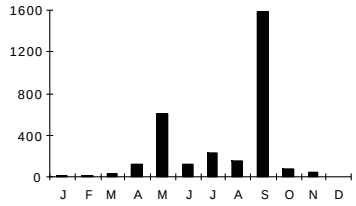
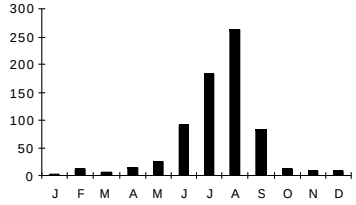


h) White-beaked Dolphin

No. sightings

Inshore



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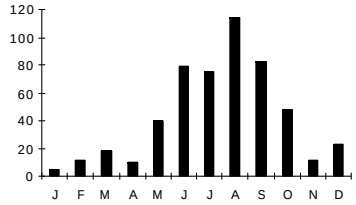
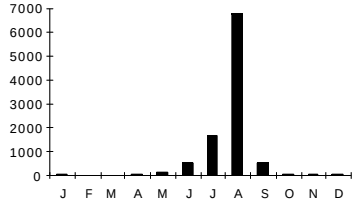
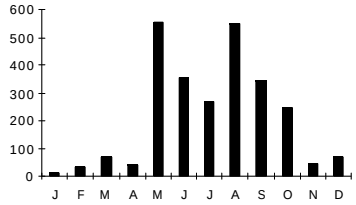


No. individuals

Inshore



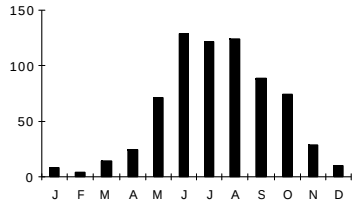
Offshore



i) Common Dolphin

No. sightings

Inshore



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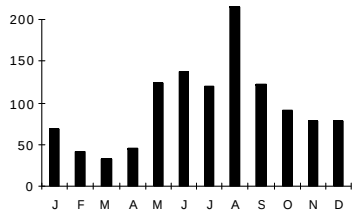
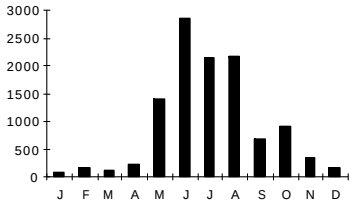


No. individuals

Inshore



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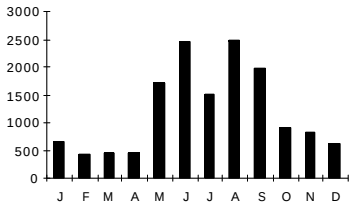
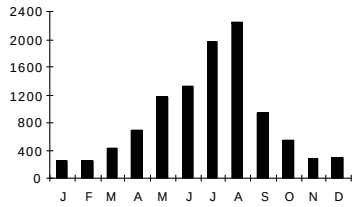


j) Bottlenose Dolphin

No. sightings

Inshore



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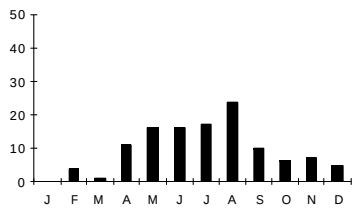
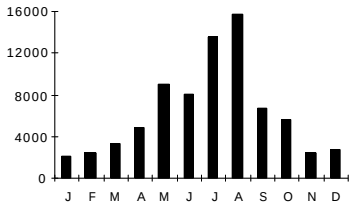


No. individuals

Inshore



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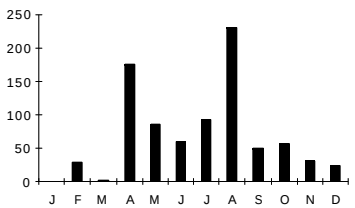


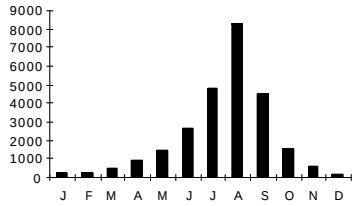
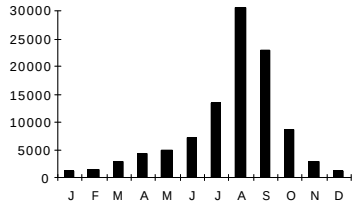
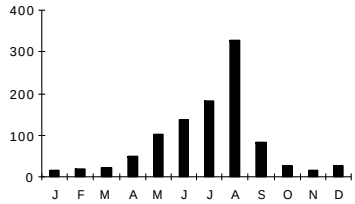
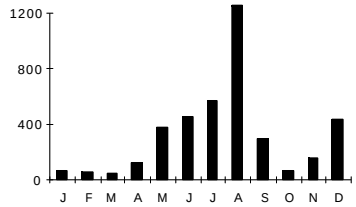
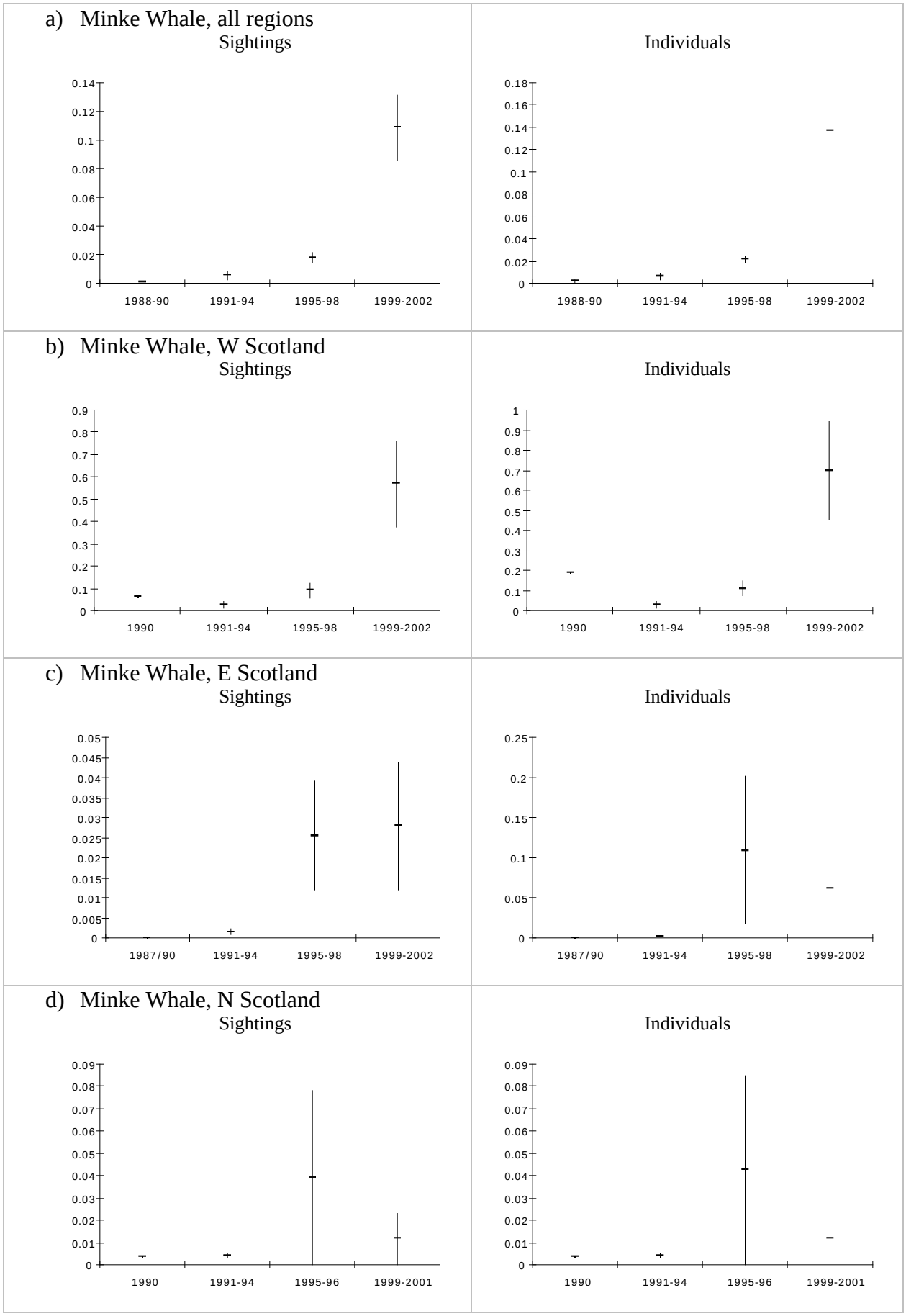
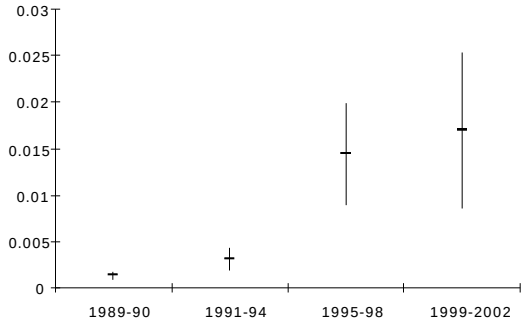
k) Harbour Porpoise	
No. sightings	No. individuals
Inshore 	Inshore 
Offshore 	Offshore 

Fig. 55. Long-term Trends in Various Cetacean Species (from Effort-related Observations)

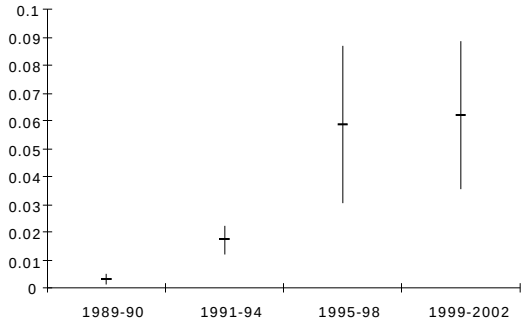


e) Risso's Dolphin, all regions

Sightings

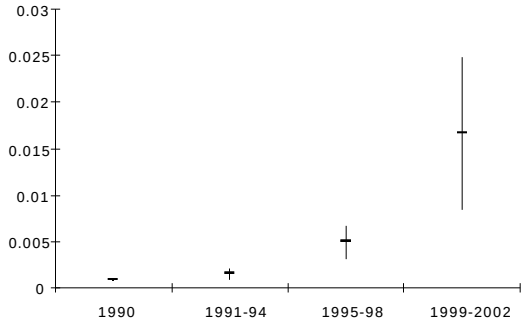


Individuals

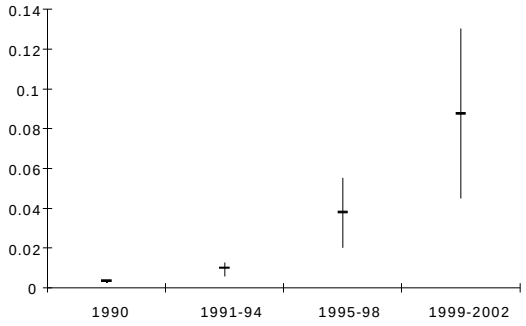


f) White-beaked Dolphin, all regions

Sightings

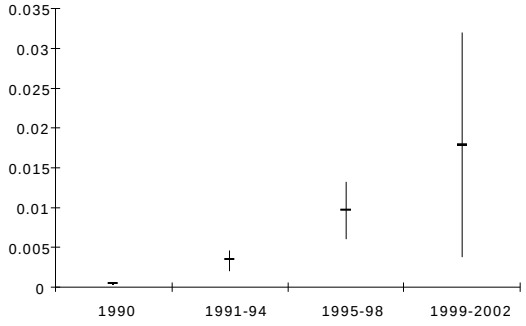


Individuals

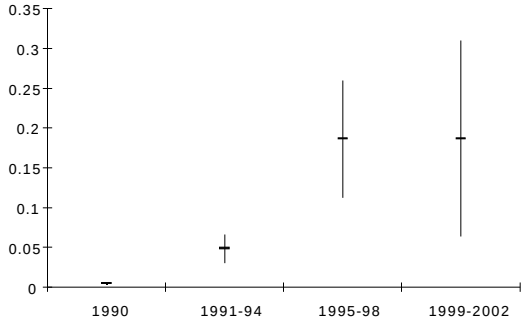


g) Short-beaked Common Dolphin, all regions

Sightings

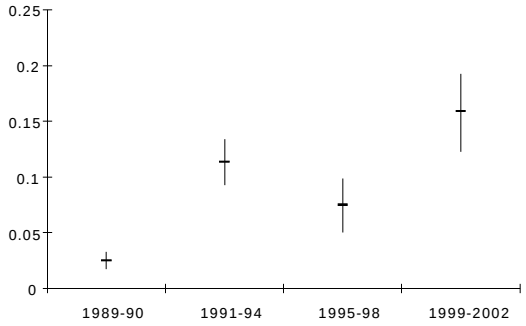


Individuals

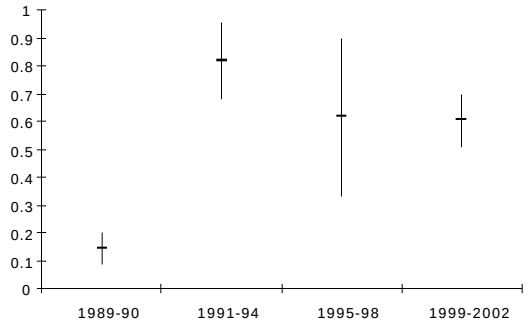


h) Bottlenose Dolphin, all regions

Sightings

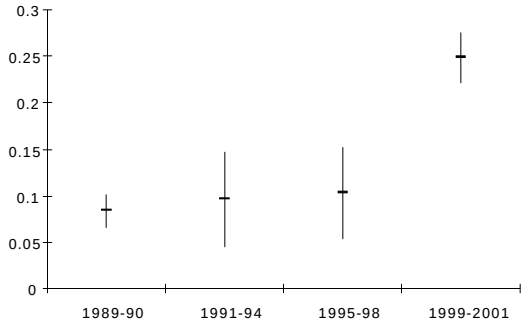


Individuals

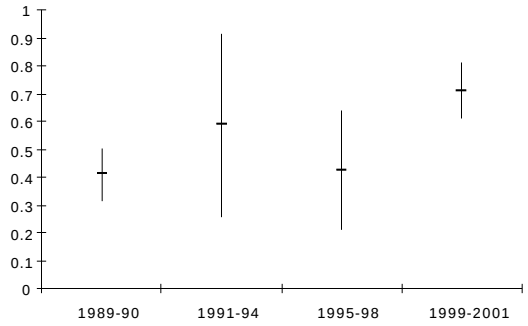


i) Bottlenose Dolphin, Wales

Sightings

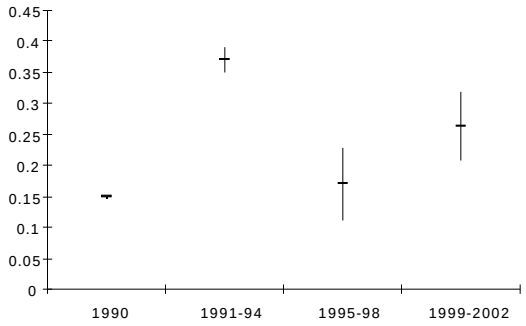


Individuals

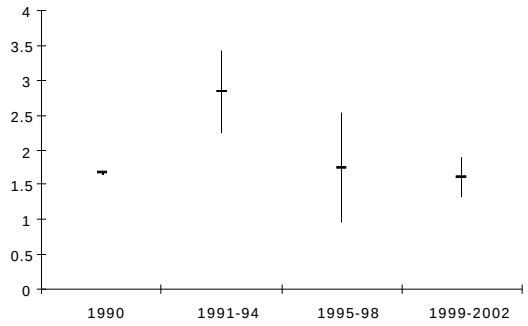


j) Bottlenose Dolphin, E Scotland

Sightings

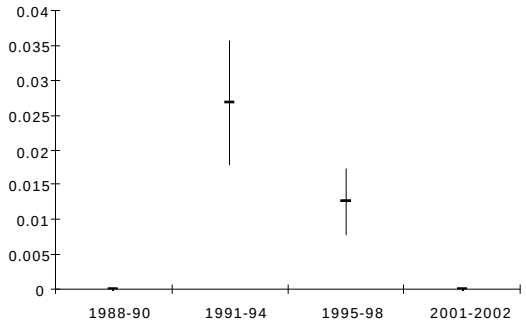


Individuals

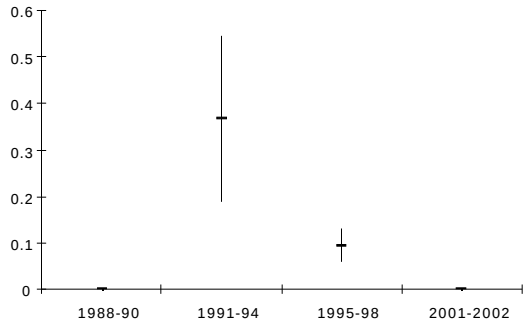


k) Bottlenose Dolphin, SW England

Sightings

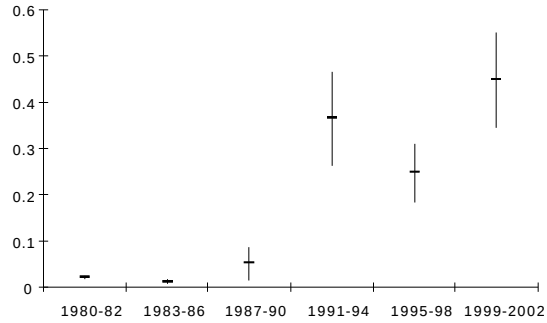


Individuals

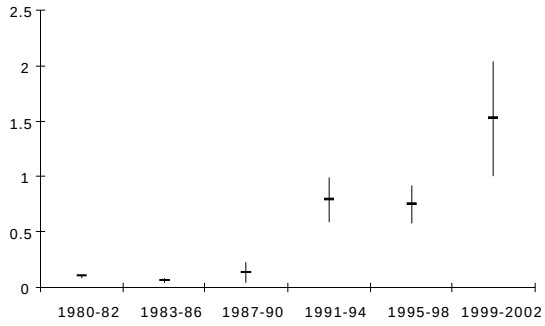


l) Harbour Porpoise, all regions

Sightings



Individuals



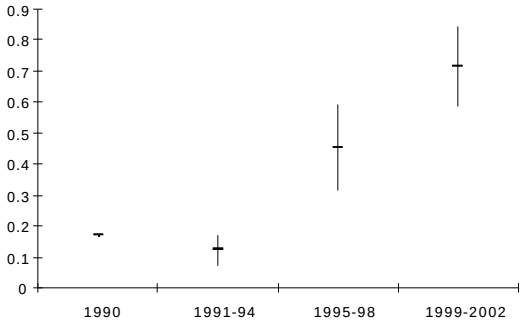
m) Harbour Porpoise, N Scotland

Sightings

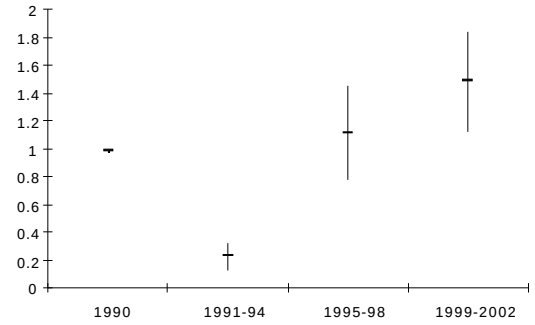
Individuals

n) Harbour Porpoise, W Scotland

Sightings



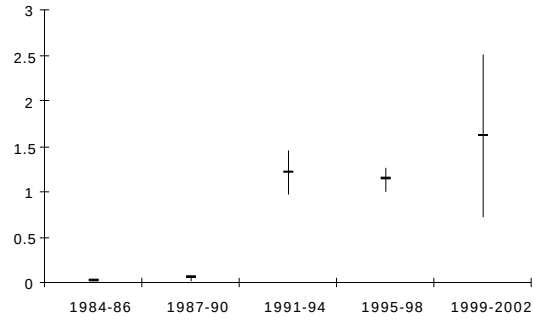
Individuals



o) Harbour Porpoise, Wales

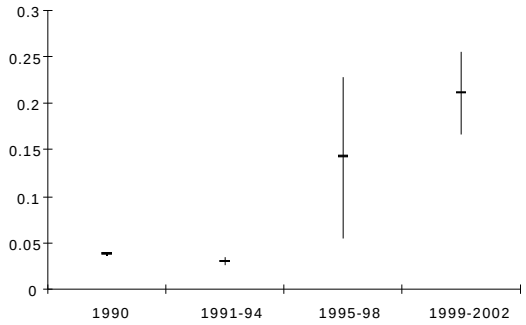
Sightings

Individuals

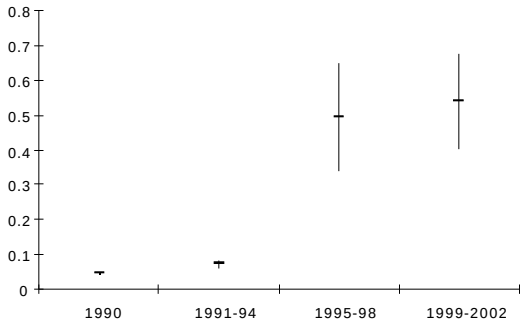


p) Harbour Porpoise, E Scotland

Sightings

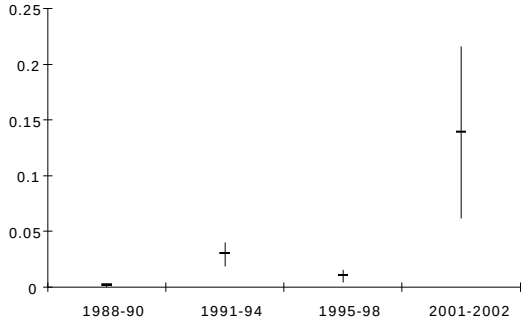


Individuals

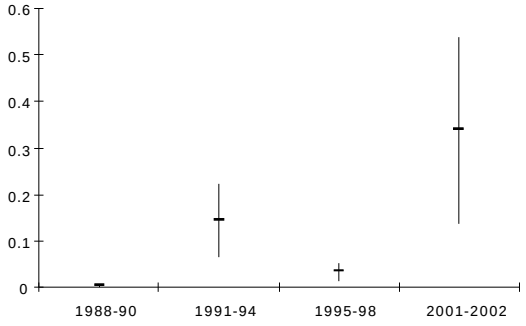


q) Harbour Porpoise, SW England

Sightings



Individuals

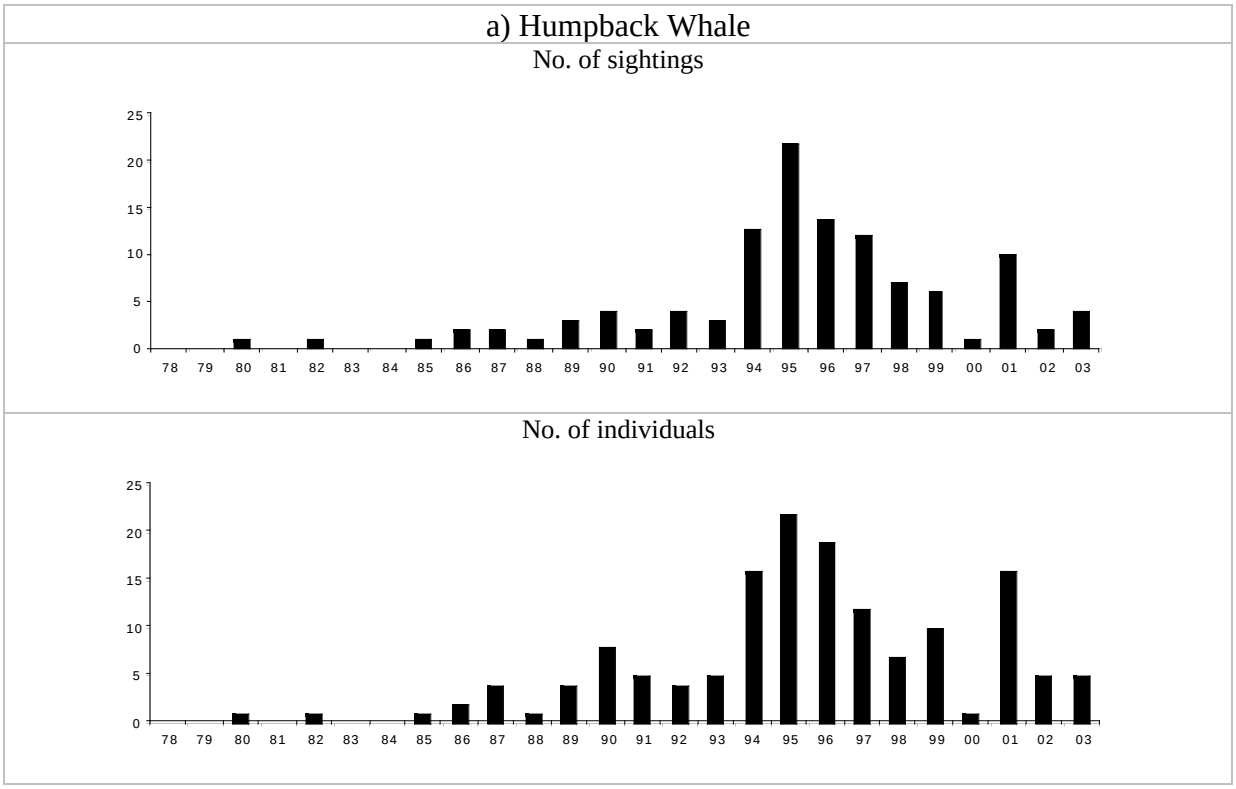


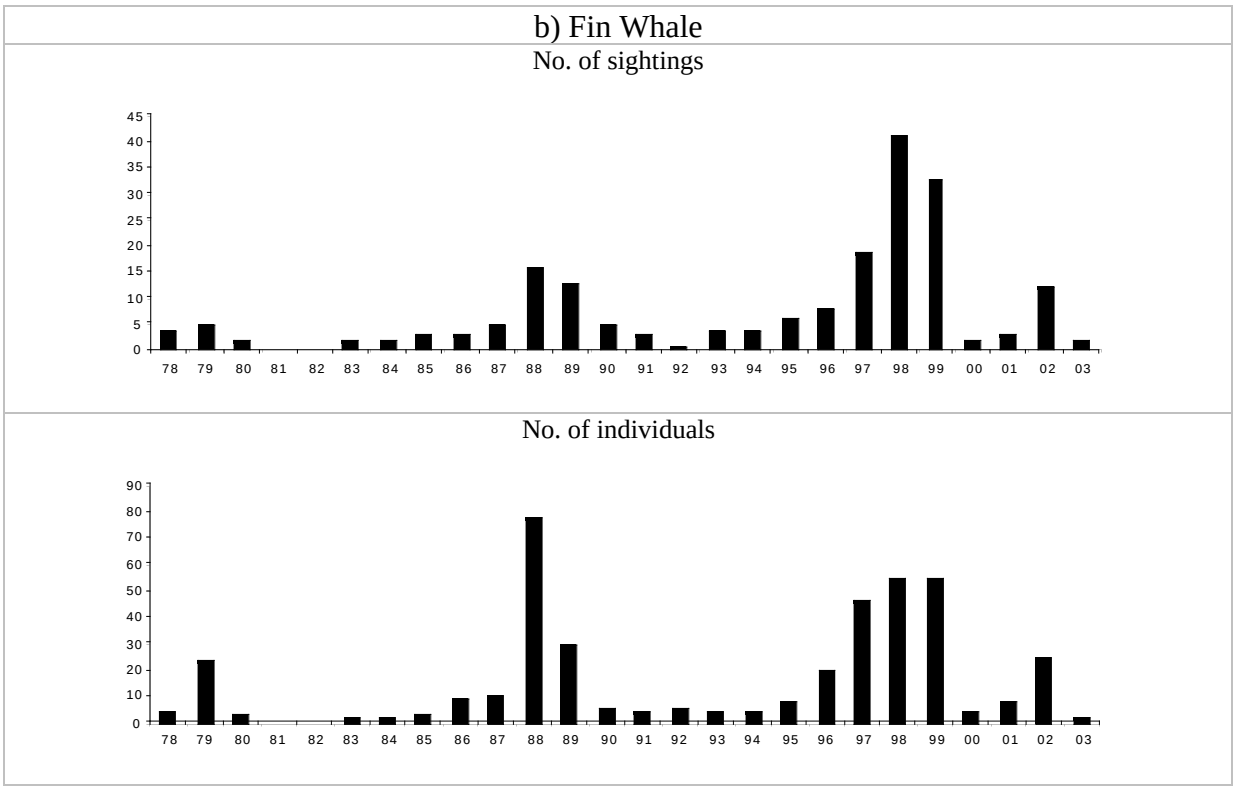
NOTES

Values are mean numbers of sightings & individuals per unit effort, with 95% confidence limits.

Statistical tests to detect significant trends use Cuzick's trend tests (Cuzick, 1985), the significance level of P=0.05 being corrected for multiple testing using a Bonferroni adjustment. Results are given for each in the relevant species accounts.

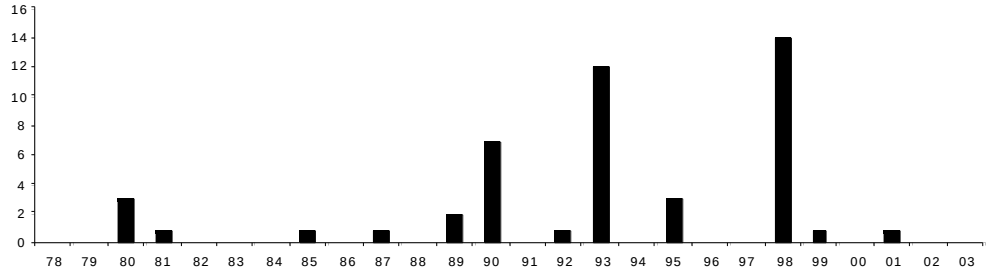
Fig. 56. Yearly number.of sightings / individuals per year for regular but uncommon cetacean species over the last 25 years (1978-2003)



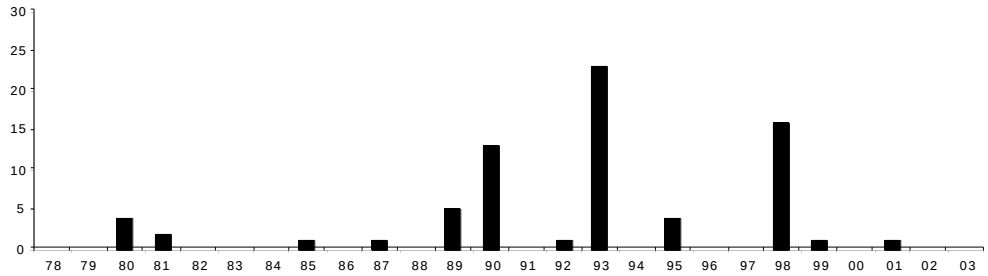


c) Sei Whale

No. of sightings

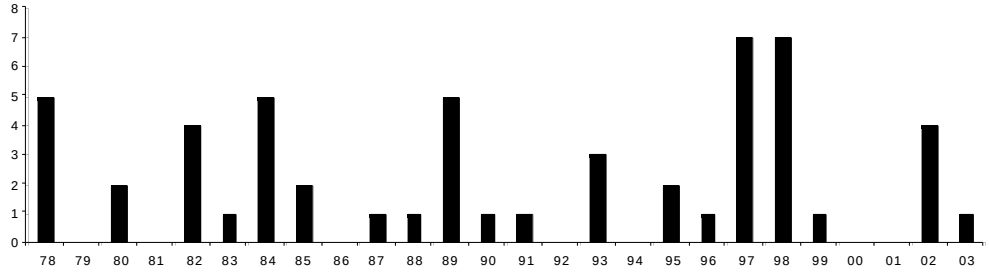


No. of individuals

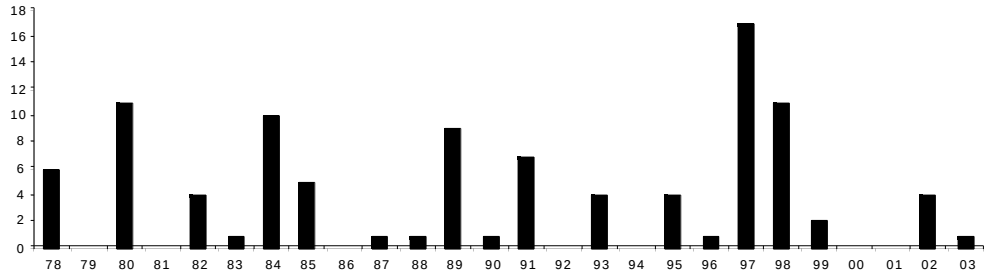


d) Northern Bottlenose Whale

No. of sightings

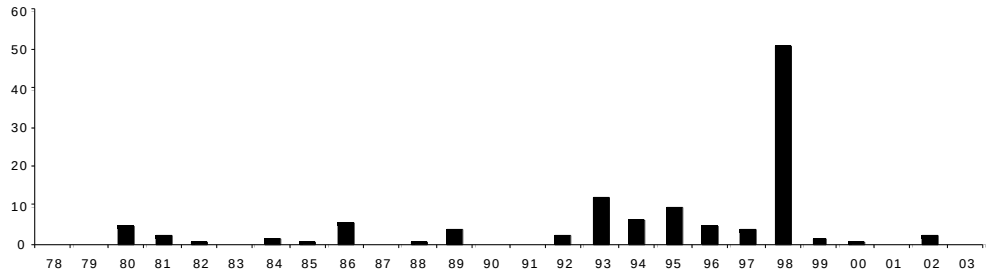


No. of individuals

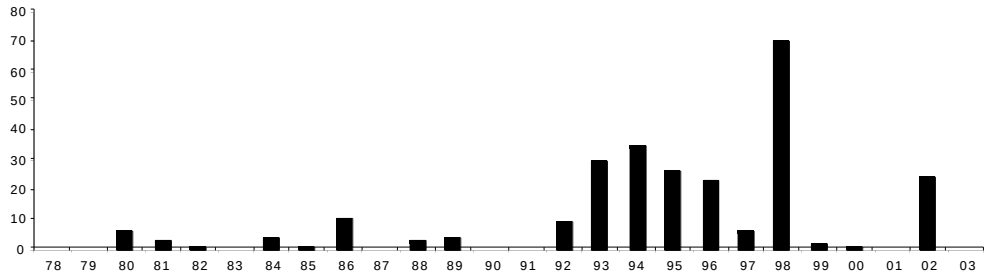


e) Sperm Whale

No. of sightings

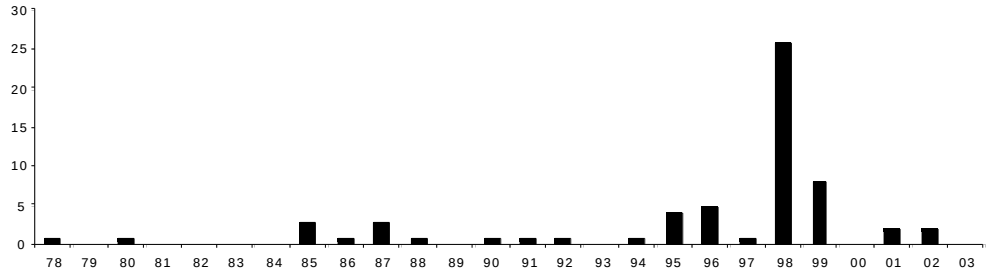


No. of individuals



f) Striped Dolphin

No. of sightings



No. of individuals

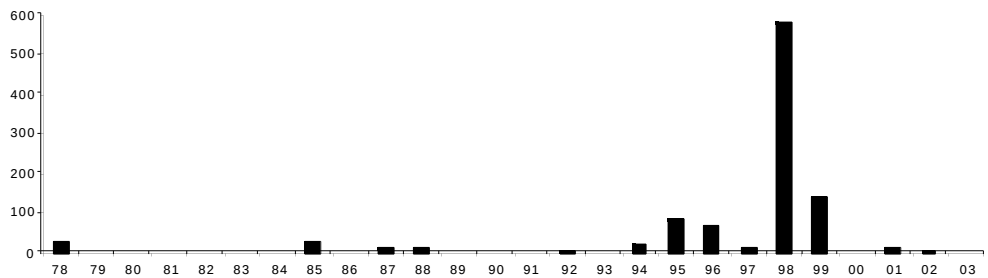
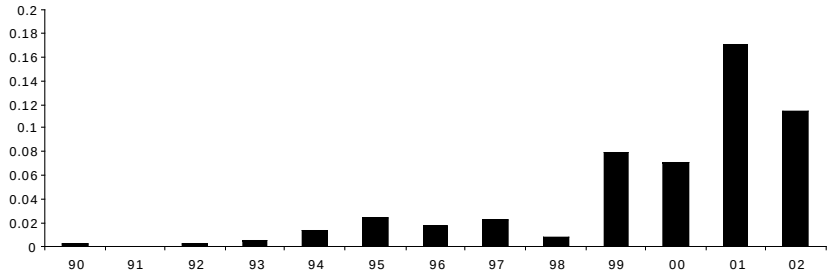


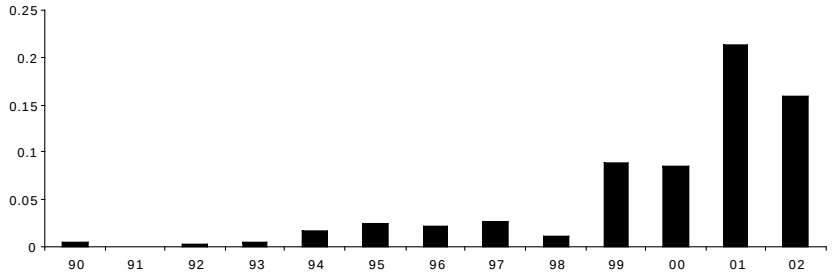
Fig. 57. Yearly sightings rates and individual rates for commoner cetacean species since 1990 (all regions)

a) Minke Whale

No. of sightings per hour

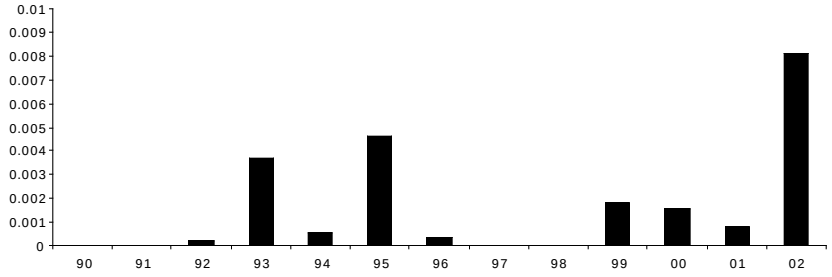


No. of individuals per hour

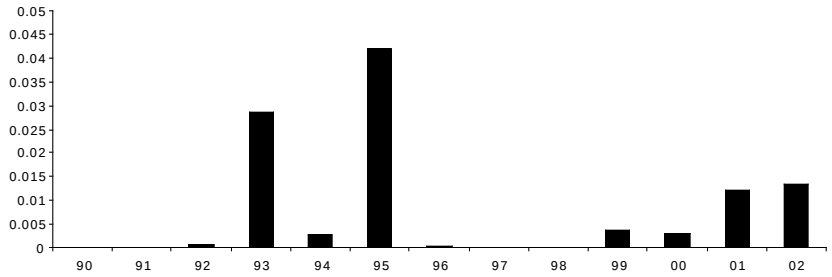


b) Killer Whale

No. of sightings per hour

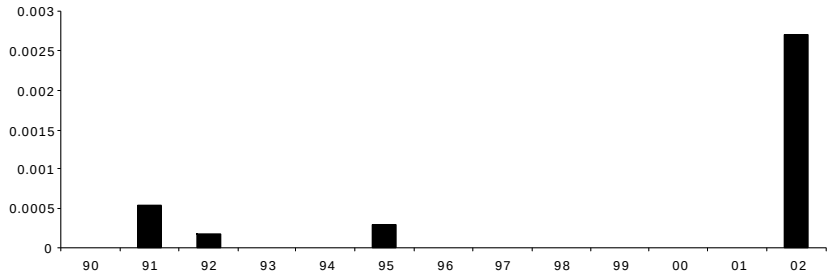


No. of individuals per hour

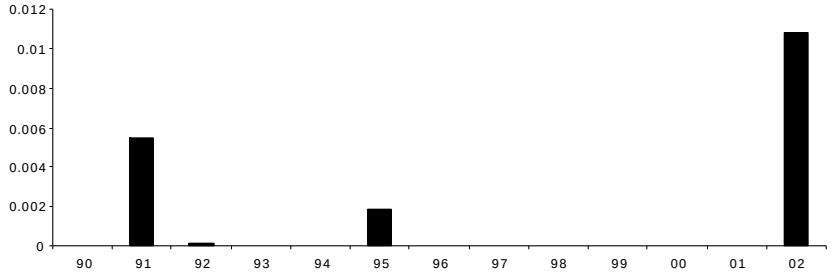


c) Long-finned Pilot Whale

No. of sightings per hour

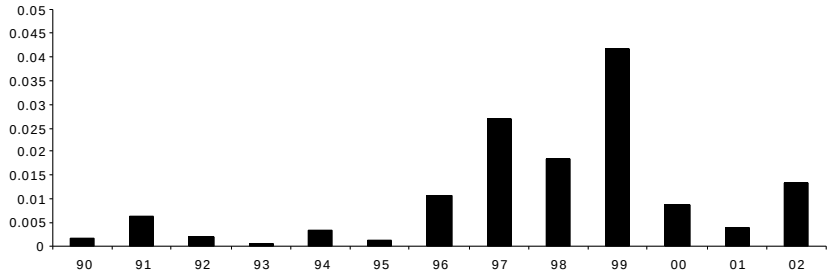


No. of individuals per hour

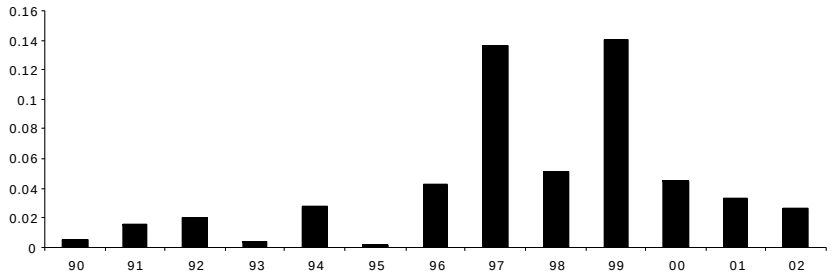


d) Risso's Dolphin

No. of sightings per hour

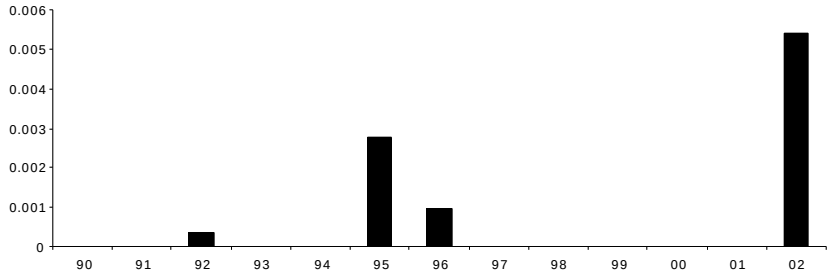


No. of individuals per hour

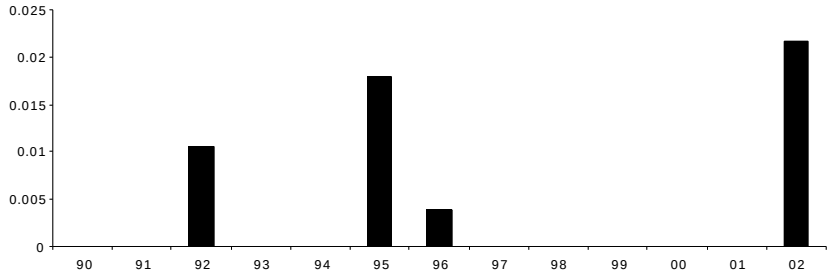


e) Atlantic White-sided Dolphin

No. of sightings per hour

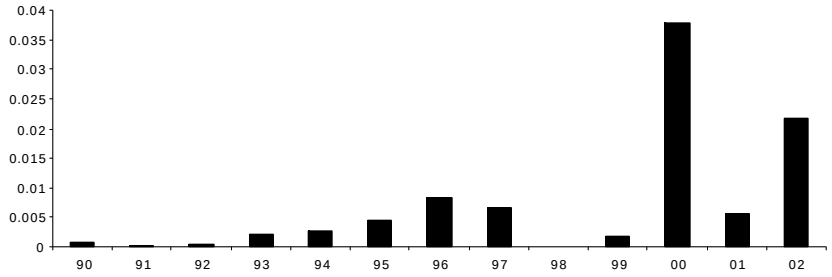


No. of individuals per hour

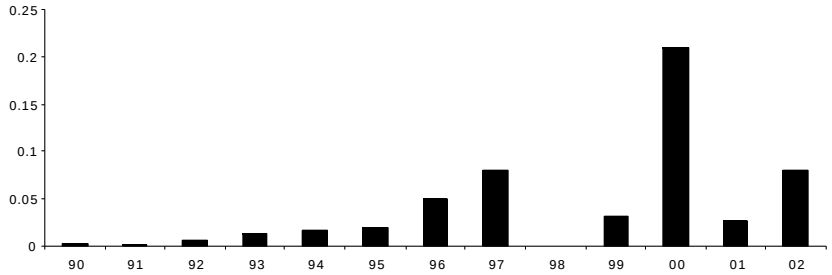


f) White-beaked Dolphin

No. of sightings per hour

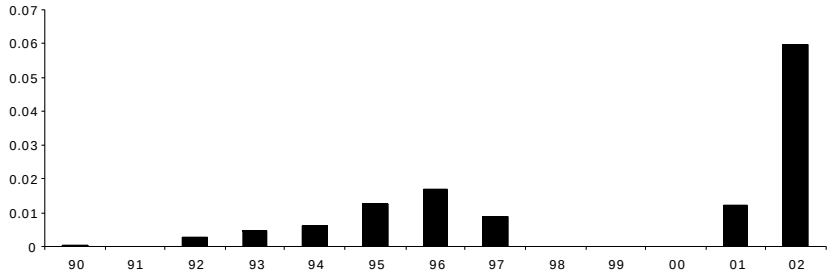


No. of individuals per hour

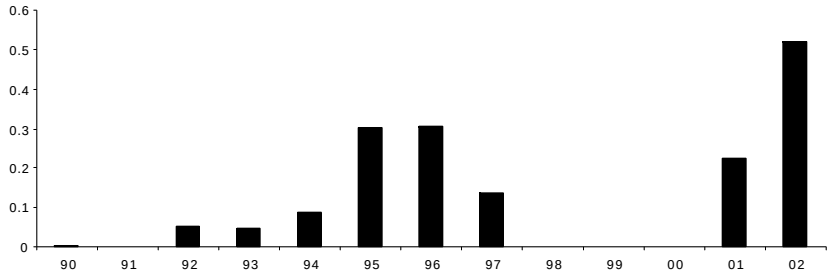


g) Short-beaked Common Dolphin

No. of sightings per hour

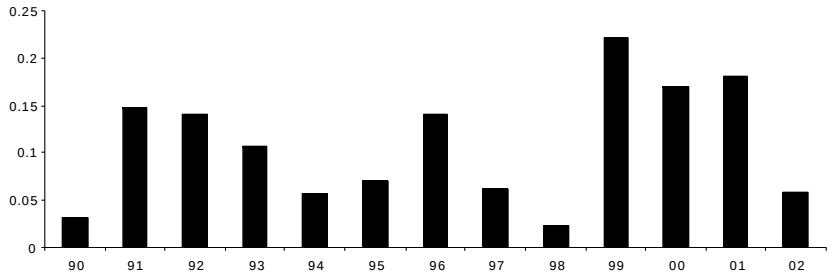


No. of individuals per hour

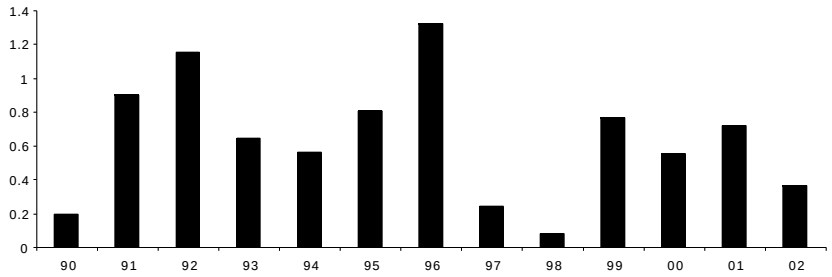


h) Bottlenose Dolphin

No. of sightings per hour

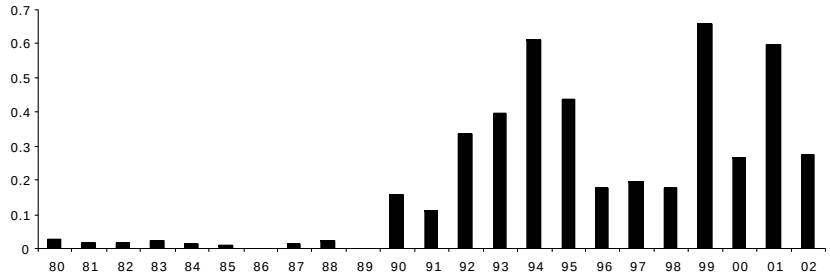


No. of individuals per hour



i) Harbour Porpoise

No. of sightings per hour



No. of individuals per hour