Mammal Review

Mammal Review ISSN 0305-1838

REVIEW

Global distribution of fin whales *Balaenoptera physalus* in the post-whaling era (1980–2012)

Elizabeth F. EDWARDS* *Marine Mammal and Turtle Division, Southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 8901 La Jolla Shores Dr., La Jolla, CA 92037, USA. E-mail: Elizabeth.Edwards@noaa.gov*
Candice HALL *Roffers Ocean Fishing Forecasting Service, Inc., 60 Westover Drive, West Melbourne, FL 32904, USA. E-mail: canned_ice5@hotmail.com*
Thomas J. MOORE *Marine Mammal and Turtle Division, Southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 8901 La Jolla Shores Dr., La Jolla, CA 92037, USA. E-mail: Thomas.J.Moore@noaa.gov*
Corey SHEREDY *Amec Earth and Environmental, 9210 Sky Park Ct, San Diego, CA 92123, USA. E-mail: csheredy@gmail.com*
Jessica V. REDFERN *Marine Mammal and Turtle Division, Southwest Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 8901 La Jolla Shores Dr., La Jolla, CA 92037, USA. E-mail: Jessica.Redfern@noaa.gov*

Keywords
cetacean density, cetacean detections, equatorial hiatus, seasonal, migration

*Correspondence author.

Submitted: 12 September 2014
Returned for revision: 3 November 2014
Revision accepted: 30 April 2015
Editor: KH

doi:10.1111/mam.12048

ABSTRACT

1. The global distribution of fin whales *Balaenoptera physalus* is not fully understood. Existing maps can be divided into two conflicting categories: one showing a continuous global distribution and another showing an equatorial hiatus (gap in the global distribution) between approximately 20°N and 20°S. Questions also remain about the seasonal distribution of fin whales.
2. To explore the suggested equatorial hiatus and seasonal distribution patterns, we synthesised information on fin whale distribution in the post-whaling era (1980–2012) from published literature, publicly available reports and studies conducted by various organisations. We created four seasonally stratified maps showing line-transect density estimates, line-transect survey effort, acoustic detections, and sightings.
3. An equatorial hiatus in the global distribution of fin whales during the post-whaling era is supported by numerous line-transect surveys and by the rarity of equatorial acoustic detections and sightings, and corroborated by whaling era reports, morphological analyses, and genetic analyses.
4. Our synthesis of post-whaling era data is consistent with results from other studies indicating that fin whales are more abundant at higher latitudes during warmer months and more abundant at lower latitudes (although these latitudes are still greater than 20°) during colder months. However, our synthesis and results from other studies also indicate that some fin whales in both hemispheres remain in higher latitudes (50°–60° north or south) during colder months and in lower latitudes (to approximately 20°–30° north or south) during warmer months, indicating that seasonal fin whale movements differ from the seasonal migrations of blue whales *Balaenoptera musculus* and humpback whales *Megaptera novaeangliae*.

5. Our maps of global fin whale distribution provide a comprehensive picture of current knowledge and highlight important geographical and temporal data gaps. Surveys should be conducted within the identified data gaps in order to increase fine-scale spatial and temporal knowledge of distribution patterns, improve fin whale taxonomy, and identify areas of elevated fin whale densities that may require management of threats, such as ship strikes.

INTRODUCTION

During the commercial whaling era (approximately 1890–1980), over 900000 fin whales *Balaenoptera physalus* were removed from the global population, reducing abundance by over 70% (Brownell & Yablokov 2009, Reilly et al. 2013). Commercial whaling ceased globally in 1982 (with a few, relatively small exceptions), when the International Whaling Commission's moratorium on whaling set catch limits to zero (Stoett 2011). Fin whales are now protected by global directives, such as the International Union for Conservation of Nature (Endangered on the IUCN Red List of Threatened Species) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (Appendix I). They are also protected by law in the USA (Endangered under the Endangered Species Act and Depleted under the Marine Mammal Protection Act), Canada (Threatened under the Canadian Committee on the Status of Endangered Wildlife), Europe (Protected under Conservation of Habitats and Species Regulations), the Mediterranean region (Protected under the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area), the Pacific Islands region (Appendix I and II of the Convention on the Conservation of Migratory Species of Wild Animals) and Australia (Vulnerable under the Environment Protection and Biodiversity Conservation Act).

Fin whale abundance in the post-whaling era appears to have increased off the west coast of the USA (Moore & Barlow 2011), along the coast of western Greenland (Heide-Jorgensen et al. 2010), in the Northeast and Central Atlantic (Vikingsson et al. 2009) and in the northern Gulf of Alaska (Zerbini et al. 2006). However, the recovery status of fin whales in other areas is unclear. In a number of regions, including the North Pacific Ocean, the North Atlantic Ocean, the Mediterranean Sea and along the coast of South Africa, ship strikes have been documented (Laist et al. 2001, Panigada et al. 2006, Redfern et al. 2013). A study of ship strikes that included 11 whale species found that fin whale strikes were the most frequent (Laist et al. 2001). Additional direct threats to fin whales include entanglement in fishing gear and limited hunting (near Greenland, near Iceland, and in the Antarctic; Reilly et al. 2013). Indirect threats include pollution and contaminants, recreational and commercial use of preferred habitat, increasing ocean noise, and reductions in prey and habitat availability because of climate change. Appropriate management units are required for the successful recovery of fin whale populations around the world. To define these units, more information is needed about fin whale taxonomy and population structure in the post-whaling era. The Society of Marine Mammalogy recognises the Northern Hemisphere, Southern Hemisphere and pygmy subspecies of fin whales. Recent genetic analyses show that finer-scale distinctions exist (i.e. North Pacific and North Atlantic fin whales should not be considered one subspecies), suggesting a need to revise global fin whale taxonomy (Archer et al. 2013).

Understanding the global distribution of a species can help with taxonomic analyses. For example, distribution gaps may suggest populations that are reproductively isolated. Global maps of fin whale distributions in the Encyclopedia of Marine Mammals (Aguilar 2009) and on OBIS-SEAMAP (Ocean Biogeographic Information System Spatial Ecological Analysis of Mega-vertebrate Populations; Anonymous 2013a) show a continuous global distribution, suggesting no spatial or temporal structure. However, other global maps show an equatorial hiatus (gap in the global distribution) between approximately 20°N and 20°S (Mizroch et al. 1984, Meredith & Campbell 1988, Perry et al. 1999, Reilly et al. 2013). Questions also exist about the seasonal distribution of fin whales. Two of the hiatus maps suggest seasonal migrations in both hemispheres, and that fin whales occupy higher latitudes in warm months and lower latitudes in cold months (Mizroch et al. 1984, Meredith & Campbell 1988). Meredith and Campbell (1988) suggest population substructure within each hemisphere. Environmental envelope modelling also suggests relatively continuous distributions in the North Pacific Ocean, North Atlantic Ocean and Southern Hemisphere, but reduced probability of occurrence between approximately 20°N and 20°S (mapping methods are described by Kaschner et al. 2006; Kesner-Reyes et al. 2012; the map can be viewed on the AquaMaps website; Anonymous 2013b). Additionally, Mizroch et al. (2009) suggest that fin whales remain in the temperate and/or polar North Pacific and are not found south of approximately 20°N, even in winter.

To explore the global distribution of fin whales in the post-whaling era (1980–2012), we synthesised information

from published literature, publicly available reports, and studies conducted by various organisations. Where possible, we mapped published estimates of fin whale density from dedicated line-transect surveys. We also mapped published line-transect surveys in which very few or no fin whales were seen, which allowed us to document areas where fin whales were rare or absent. Line-transect effort was mapped as the number and spatial extent of surveys. We also mapped fin whale presence using acoustic detections and sightings data, because recent analyses show that only 25% of the world's oceans has been surveyed for cetaceans using line-transect techniques, and that survey effort is geographically uneven and biased towards summer months (Kaschner et al. 2012). Maps for each data type (density, line-transect effort, acoustic detections, and sightings) were stratified by season, because migratory movements could create large seasonal differences in the relative abundance of fin whales.

METHODS

Data sources

A wide variety of techniques are used to estimate cetacean distribution, abundance, trends and population parameters (e.g. birth and death rates), including line-transect surveys, non-standardised surveys, photo-identification catalogues, mark-recapture methods and incidental observations (Forney & Wade 2006). We included location data collected between 1980 and 2012 by studies using any of these techniques, to summarise post-whaling era fin whale distributions. Data were taken from published literature and publicly available reports, and were contributed by various organisations (see the Acknowledgements and Appendix S1). Stranding data were not included because the origin of the stranded animal is usually unknown and may not be well represented by the location of the stranding.

Seasonal fin whale density was mapped using published estimates of density derived from line-transect surveys. We included line-transect surveys in which no fin whales were seen and large-scale line-transect surveys (573000 km^2 to 19.148×10^6 km^2) in which one to eight fin whales were observed, in order to document areas where fin whales are absent and rare (Kinzey et al. 1999, 2000, Hammond et al. 2002, Mullin & Fulling 2003, Jackson et al. 2004, 2008, Barlow & Taylor 2005, Hammond 2006); these surveys were assigned a density of zero in the seasonally stratified maps. The published boundaries for each survey, including survey strata where available, were scanned, digitised, and imported into mapping software (ArcGIS for Desktop 10; Anonymous 2010) using the original projection, if known, or the projection that provided as close a match as possible to the published map. For a few small-scale line-transect surveys in which no fin whales were sighted (e.g. Ballance et al. 2001, Dolar et al. 2006, Dualu-Drouout et al. 2008), survey boundaries were approximated by a polygon encompassing all survey tracks. Vertices were added to each survey boundary to ensure they were correctly re-projected when mapping the global distribution.

Seasonal fin whale presence was mapped using acoustic detections and sightings from all available sources. The locations of acoustic detections have been published using either the exact location of individual hydrophones (e.g. Stafford et al. 2007, Nieukirk et al. 2012) or the area containing SOSUS (US Navy Sound Surveillance System) hydrophones (for these hydrophones, the exact location is not made available, so they cannot be allocated to an individual grid cell; see Moore et al. 1998, Charif & Clark 2009). We used the geographical coordinates of hydrophone locations to map fin whale presence when available; otherwise, the locations were digitised from published maps. The area in the North Pacific (approximately 2.998×10^6 km^2; Moore et al. 1998) and the area in the Northeast Atlantic Ocean (approximately 1.991×10^6 km^2; Charif & Clark 2009) containing SOSUS hydrophones were mapped using the same procedures followed for the line-transect surveys. The detection range of a hydrophone varies according to equipment and physical environment; the detection ranges of the hydrophones associated with the studies that we used to map fin whale distributions were between 10 and 100 km (Payne & Webb 1971, Watkins et al. 1981, Sirovic et al. 2007, Simon et al. 2010, Nieukirk et al. 2012, Delarue et al. 2013).

Sightings data included opportunistic sightings (e.g. Reid et al. 2003), sightings from non-systematic surveys (e.g. Matsuoka et al. 2009), sightings from line-transect surveys (e.g. Barlow 2010), tagging locations (e.g. Sanpera et al. 1985, Mikkelsen et al. 2001) and photo-identification studies (e.g. Aguilar et al. 1983). The geographical coordinates of sighting locations were contributed from individual studies, downloaded from OBIS-SEAMAP on January 2014 (Anonymous 2014), or taken from published literature. When necessary, sighting locations were digitised from published maps.

Mapping

Seasonal fin whale data were mapped in 100×100 km grid cells using ArcGIS for Desktop 10 (Anonymous 2010). The World Cylindrical Equal Area projection (WKID 54034) was selected to maintain equal areas when working with published estimates of fin whale density. The spatial resolution of the grid was derived from reported acoustic detection ranges (see Data Sources) and fin whale swimming speeds. Fin whales are capable of swimming at a wide range of speeds, but on average they swim at 2–6 km/hour (Ray et al. 1978, Watkins et al. 1981, 1996, Mikkelsen et al. 2001, Heide-Jorgensen et al. 2003, Lafortuna et al. 2003, Gannier

2005, Schorr et al. 2010). Consequently, each side of our 100×100 km grid cells represents approximately the distance travelled each day by fin whales at an average swimming speed of 4 km/hour.

Published density estimates from line-transect surveys were assigned to all grid cells within and on survey boundaries. Strata-specific density estimates were used when available. If a grid cell was within the boundary of multiple strata from a single survey (e.g. a grid cell crossed the boundary of two strata), the area of the cell within each stratum was calculated and the cell density was calculated as the area-weighted average of the strata densities. When a grid cell contained density estimates from multiple surveys (e.g. surveys conducted in multiple years), the cell density was calculated as the average of the survey densities within each season. It can be challenging to compare density estimates from different surveys because line-transect methods and assumptions may vary between surveys (Williams et al. 2011, Jewell et al. 2012). Consequently, we followed the approach of Forney and Wade (2006) and mapped three broad categories of densities. The category limits were selected based on the frequency distribution of density estimates in individual cells. Additionally, we assessed north–south patterns in summer fin whale densities in each hemisphere (June to August in the Northern Hemisphere, December to February in the Southern Hemisphere) by averaging the grid cell densities in 10° latitudinal bands.

Individual grid cells containing one or more sightings or acoustic detections from hydrophones in known locations were assigned a fin whale presence. Fin whale presence was also assigned to all grid cells within and on the boundary of larger areas containing SOSUS hydrophones. Seasonally stratified maps (December–February, March–May, June–August and September–November) were produced for each data type (density, line-transect survey effort, acoustic detections and sightings). Density estimates were assigned to season using the survey dates. When a survey was conducted in multiple seasons, the estimated density was assigned to all seasons containing 10 or more survey days. Acoustic detections and sightings were assigned to season using reported dates. Maps are presented using the Robinson projection (WKID 54030) centred on 60°W. Higher resolution versions of seasonal maps for density, line-transect effort, acoustic detections and sightings are presented in Appendices S2–S17.

RESULTS

Line-transect surveys, acoustic detections and sightings suggest that the global distribution of fin whales includes temperate and polar latitudes in both hemispheres. These areas are separated by an equatorial hiatus in the global distribution. Fin whale density was generally greater than zero at latitudes north of 20°N in the North Pacific Ocean (38 studies conducted primarily between June and November), north of 30°N in the North Atlantic Ocean (52 studies conducted primarily between June and August) and south of 50°S in the Southern Hemisphere (nine studies conducted primarily south of 60°S between December and February; Figs 1 and 2; Appendices S1–S9). Summer fin whale density appears to peak near 70°N and 50°S (Fig. 3). In the southern hemisphere, the peak in fin whale density is based on a single survey conducted in the Scotia Sea and around the Antarctic Peninsula between December and February (Figs 1 and 2; Appendices S2 and S6). Latitudinal peaks in fin whale density could not be assessed in other seasons because the number of surveys was too small.

At the three higher-latitude locations with line-transect survey effort during all four seasons (Figs 1 and 2; Appendices S2–S9), fin whales were absent (the Aleutian Islands, Brueggeman et al. 1987), rare (California, Forney et al. 1995), or less dense (northeast USA, Kenney et al. 1985) during the boreal winter (December–February) and more abundant during the boreal summer (June–August), consistent with well-known seasonal differences in detection frequency in these areas (e.g. Clapham & Irene 1991, Forney & Barlow 1998, Mizroch et al. 2009). Similarly, fin whales tend to be seen more frequently in the summer than in the winter in the most northerly areas of the western Mediterranean Sea (e.g. the Ligurian Sea; Notarbartolo di Sciara et al. 2003, Laran & Drouot-Dulau 2007, Aissi et al. 2008). Line-transect surveys failed to detect fin whales at higher latitudes (north of about 20°N) in only a few areas and seasons, including the southern and eastern Mediterranean Sea (May–October; Forcada et al. 1996, Boisseau et al. 2010), the North Sea (June–August; Hammond et al. 2002, Hammond 2006), the southeastern coast of the USA between Cape Hatteras and southern Florida (January–August; Appendix S1), the northeastern temperate Pacific (March–June; Barlow & Taylor 2005), and the Chukchi-Beaufort Sea area (June–November; Ljungblad et al. 1988, Anonymous 2007, Ireland et al. 2009, Clarke & Ferguson 2011, Clarke et al. 2011; Fig. 1; Appendices S2–S5).

Fin whale presence data (89 studies in the Northern Hemisphere and 25 studies in the Southern Hemisphere; Appendix S1) are consistent with the patterns from line-transect surveys that show fin whale densities greater than zero at higher latitudes in both hemispheres. Specifically, fin whale acoustic detections and sightings occurred at higher latitudes in the Northern Hemisphere (north of 20°N) during all seasons (Figs 4 and 5; Appendices S10–S17); sightings were most numerous during summer (June–August), but also occurred during winter (December–February), spring (March–May), and autumn (September–November). In the Southern Hemisphere, fin whale sightings were also most numerous at higher latitudes (south of 20°S) during summer

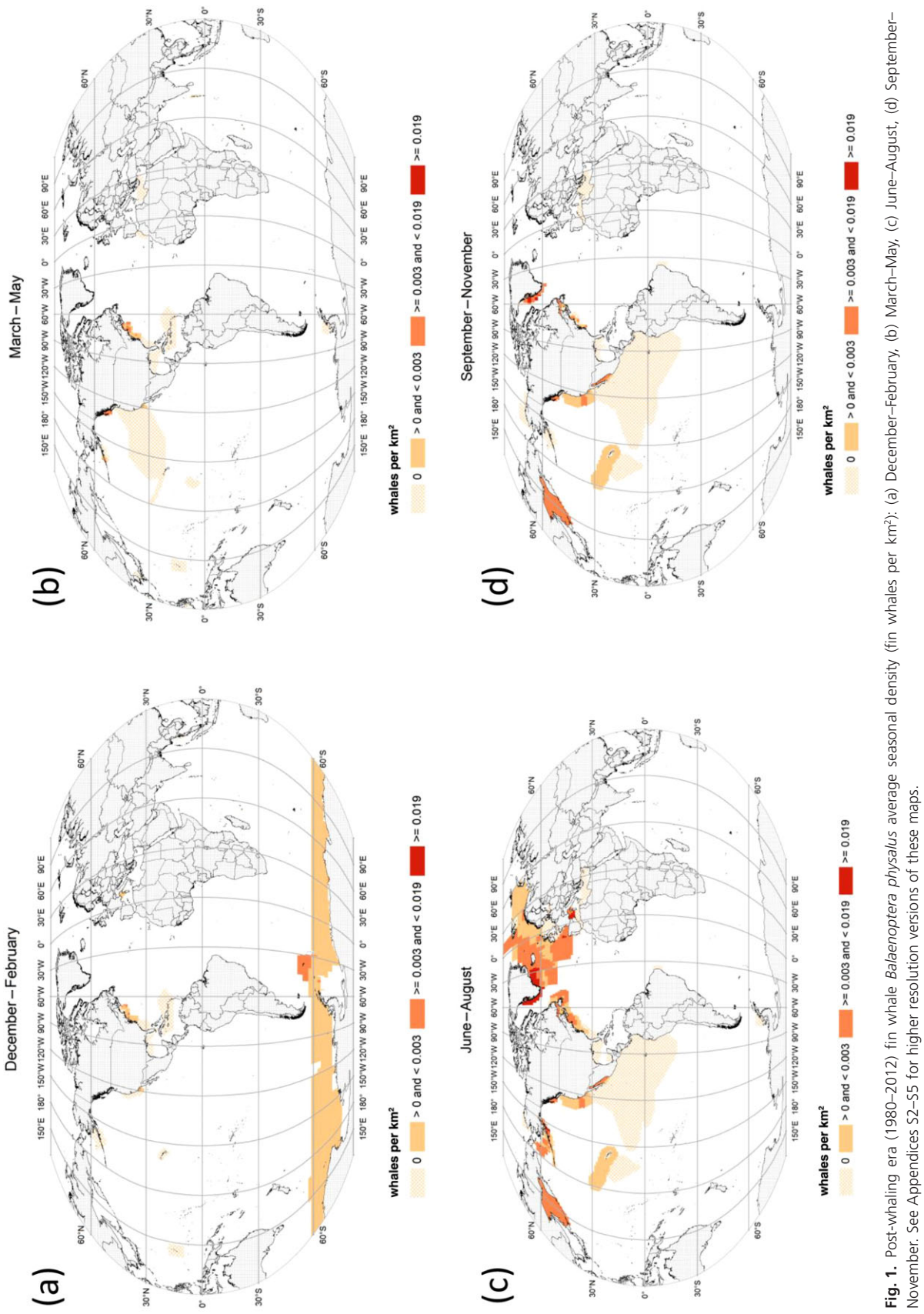


Fig. 1. Post-whaling era (1980–2012) fin whale *Balaenoptera physalus* average seasonal density (fin whales per km²): (a) December–February, (b) March–May, (c) June–August, (d) September–November. See Appendices S2–S5 for higher resolution versions of these maps.

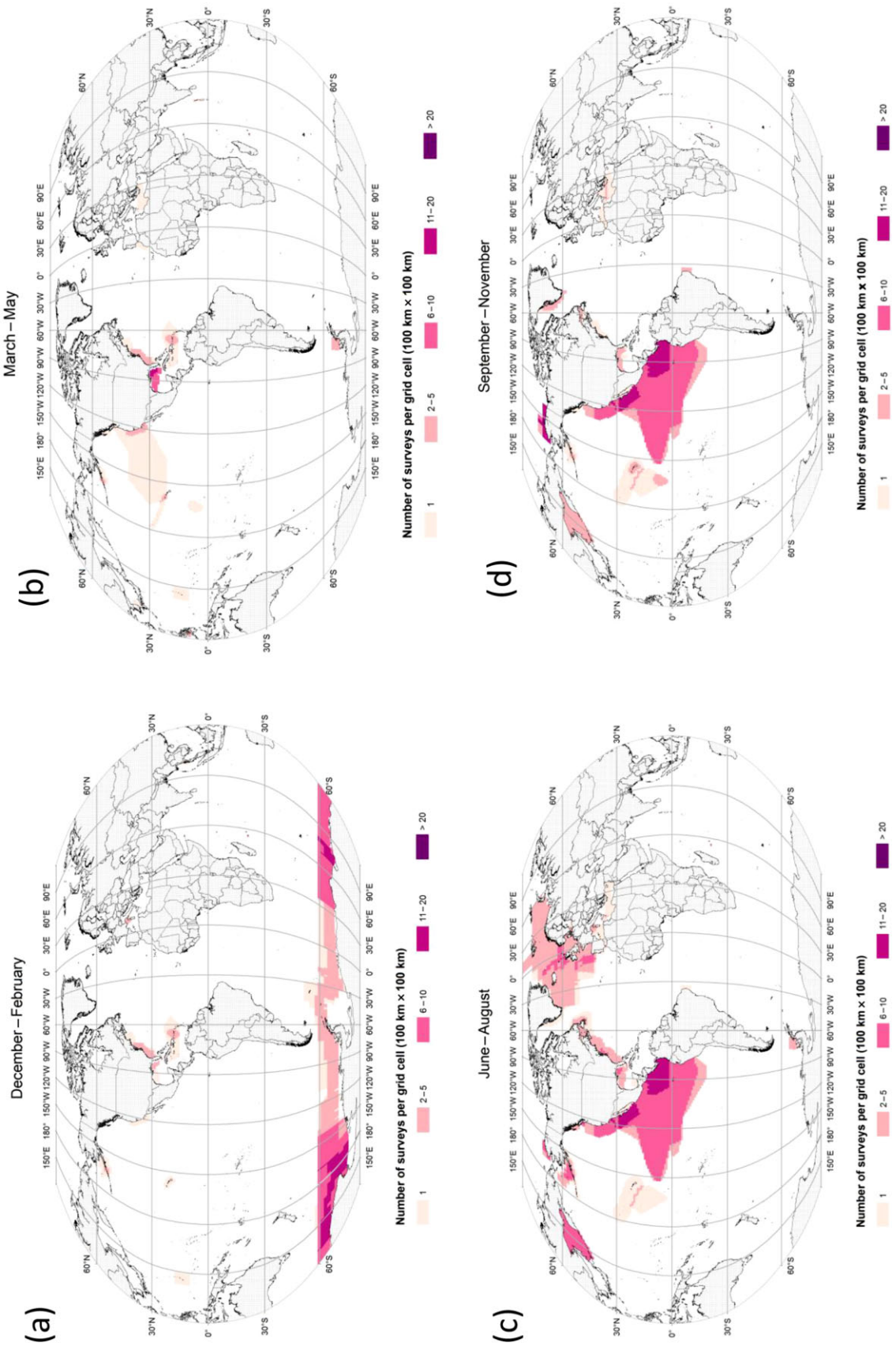


Fig. 2. Post-whaling era (1980–2012) seasonal line-transect survey effort (number of surveys per 100 × 100 km grid cell): (a) December–February, (b) March–May, (c) June–August, (d) September–November. See Appendices S6–S9 for higher resolution versions of these maps.

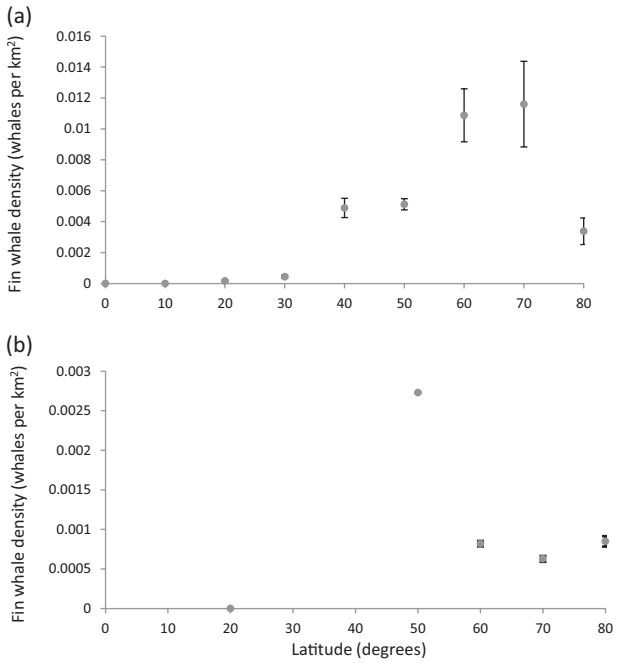


Fig. 3. Post-whaling era (1980–2012) fin whale *Balaenoptera physalus* average summer density (a) June–August in the Northern Hemisphere and (b) December–February in the Southern Hemisphere, in 10° latitudinal bands. Error bars represent ± 2SE.

(December–February; Fig. 5; Appendices S14–S17). Post-whaling era data are very limited in other seasons, but some sightings have been documented during all seasons between Argentina and Antarctica (near the Falkland Islands at approximately 50°S–55°S) and west of Chile (approximately 30°S; Fig. 5; Appendices S14–S17). Acoustic detections have also been documented in the Southern Ocean during summer, autumn and winter (December–August; Fig. 4; Appendices S10–S13). In 40 non-standardised studies (Appendix S18), fin whales were not detected in only four locations at latitudes higher than 30° north or south: the Black Sea (Notarbartolo di Sciara 2002, Dede & Tonay 2010), the North Indian Ocean (Ballance & Pitman 1998), and in fjords in eastern Canada (Diemer et al. 2011) and New Zealand (Lusseau & Slooten 2002). The northernmost observations of fin whales in the Pacific Ocean were made in the southern Chukchi Sea, at approximately 70°N, between June and August (Figs 4 and 5; Appendices S10–S17). In the Atlantic Ocean, the northernmost observations of fin whales were also made between June and August, at approximately 80°N between eastern Greenland and Svalbard, and approaching the ice edge at approximately 70°N between Canada and western Greenland (Figs 4 and 5; Appendices S10–S17). The southernmost observations of fin whales were made between December and February. They were found approaching the ice edge in the Southern Ocean at approximately 80°S (Figs 4 and 5; Appendices S10–S17).

Line-transect surveys suggest that fin whales are rare to absent in equatorial latitudes between 20°N and 20°S (Figs 1 and 2; Appendices S2–S9). Several of these surveys were conducted over large spatial scales and multiple seasons: 13 surveys were conducted in the Gulf of Mexico (all seasons; approximately 25°N–30°N), 10 surveys were conducted off the east coast of the USA, south of Cape Hatteras (December–August; approximately 25°N–35°N), and 20 surveys were conducted in the eastern tropical Pacific Ocean (July–December; approximately 30°N–20°S). Additionally, several smaller-scale surveys were conducted, including off the east coast of Brazil (August–October; Andriolo et al. 2010), near the Maldives Islands (April; Ballance et al. 2001), in the Bay of Bengal (February; Smith et al. 2008), in the Mergui Archipelago (February–March; Smith & Tun 2008), and near Reunion Island (all seasons; Dualu-Drouout et al. 2008; Figs 1 and 2; Appendices S1–S9). An equatorial hiatus is also consistent with the rarity of fin whale acoustic detections and sightings between approximately 20°N and 20°S (Figs 4 and 5; Appendices S10–S18).

DISCUSSION

Our synthesis of information from published literature, publicly available reports and studies conducted by various organisations suggests that the global distribution of fin whales in the post-whaling era (1980–2012) includes temperate and polar latitudes higher than approximately 20°N in the North Pacific Ocean, 30°N in the North Atlantic Ocean, and 20°S in the Southern Hemisphere (Fig. 6). It also suggests that the distribution of fin whales in the Northern and Southern Hemispheres is separated by an equatorial hiatus (Fig. 6). This global distribution pattern conflicts with maps suggesting that fin whales are distributed from pole to pole (Aguilar 2009, Anonymous 2013a); instead, it agrees with maps showing an equatorial hiatus (Mizroch et al. 1984, Meredith & Campbell 1988, Perry et al. 1999, Anonymous 2013b, Reilly et al. 2013). The latitudinal boundaries proposed for the equatorial hiatus in the global distribution of fin whales do not represent strict boundaries, because both fin whale abundance and habitat are spatially and temporally dynamic.

An equatorial hiatus in the global distribution of fin whales during the post-whaling era is supported by line-transect surveys in multiple oceans (Figs 1 and 2; Appendices S2–S9) and by a general lack of sightings (Fig. 5; Appendices S14–S18). For example, only two fin whale sightings (at approximately 16°N and 15°S) were made during 10 years of dedicated line-transect surveys conducted in the eastern tropical Pacific Ocean from July to December (Hamilton et al.

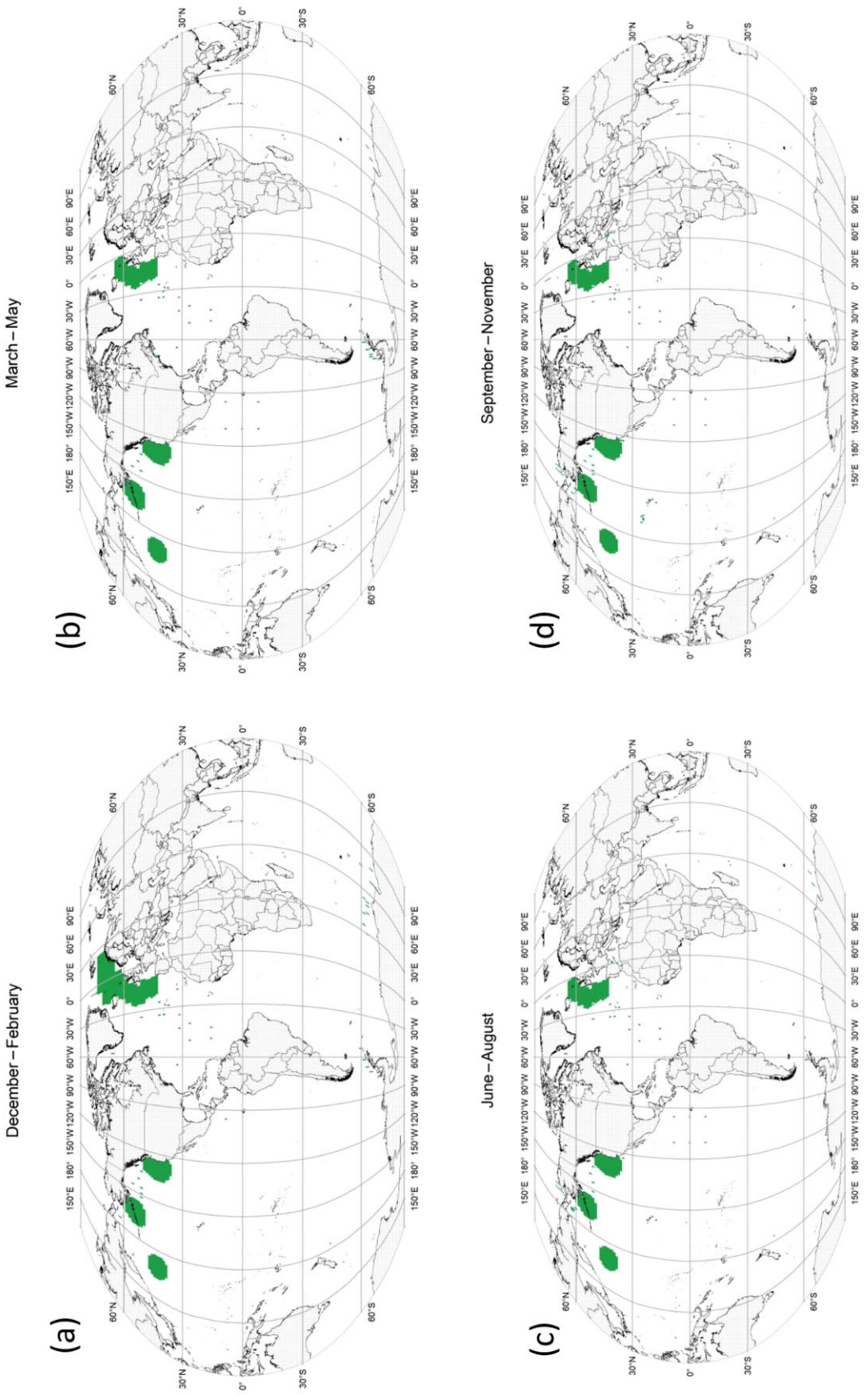


Fig. 4. Post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal acoustic detections [green (dark grey in grey-scale) indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS (US Navy Sound Surveillance System) hydrophones]: (a) December–February, (b) March–May, (c) June–August, (d) September–November. See Appendices S10–S13 for higher resolution versions of these maps.

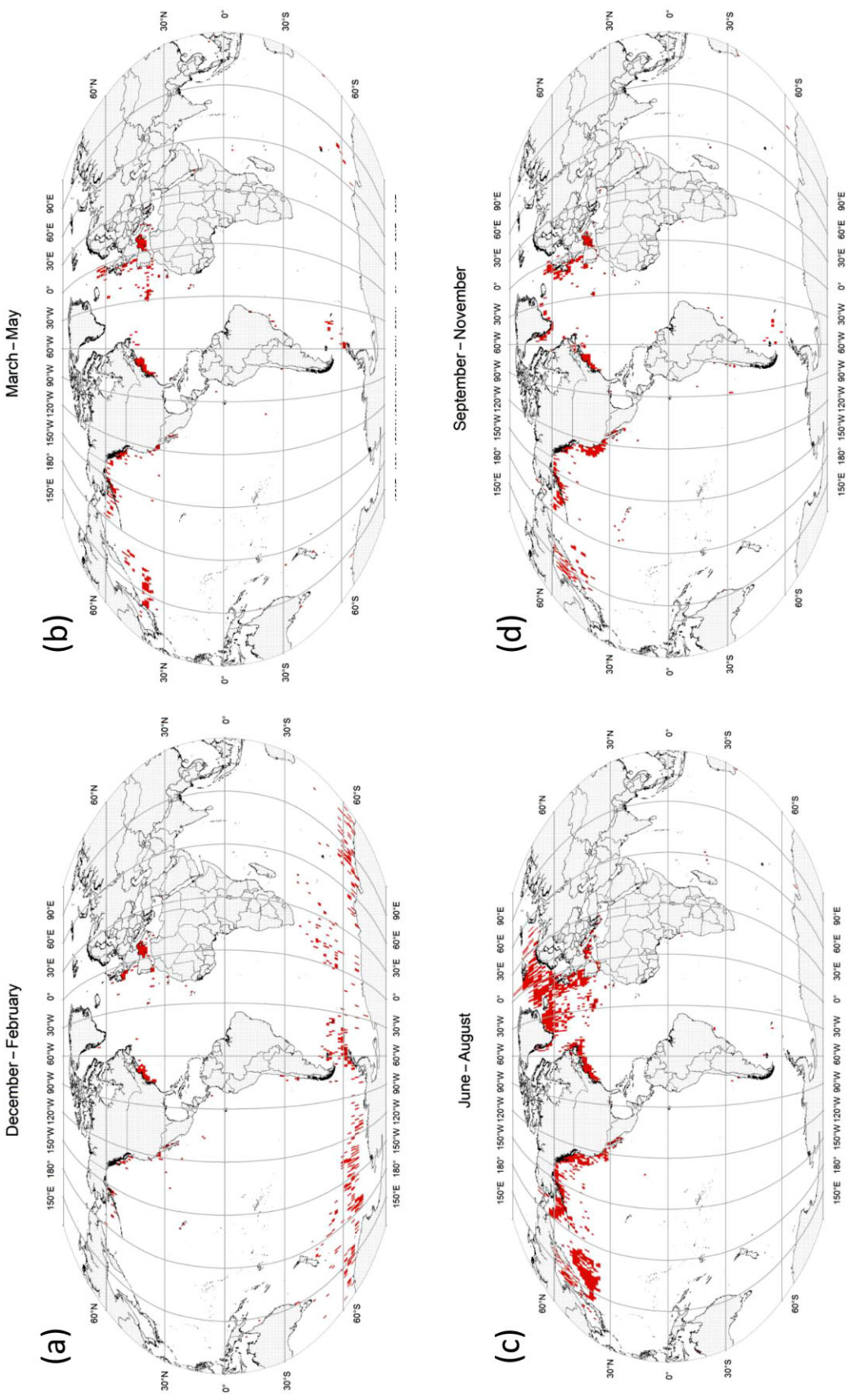


Fig. 5. Post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal sightings [red (dark grey in grey-scale) indicates at least one fin whale sighting in that grid cell]: (a) December–February, (b) March–May, (c) June–August, (d) September–November. See Appendices S14–S17 for higher resolution versions of these maps.

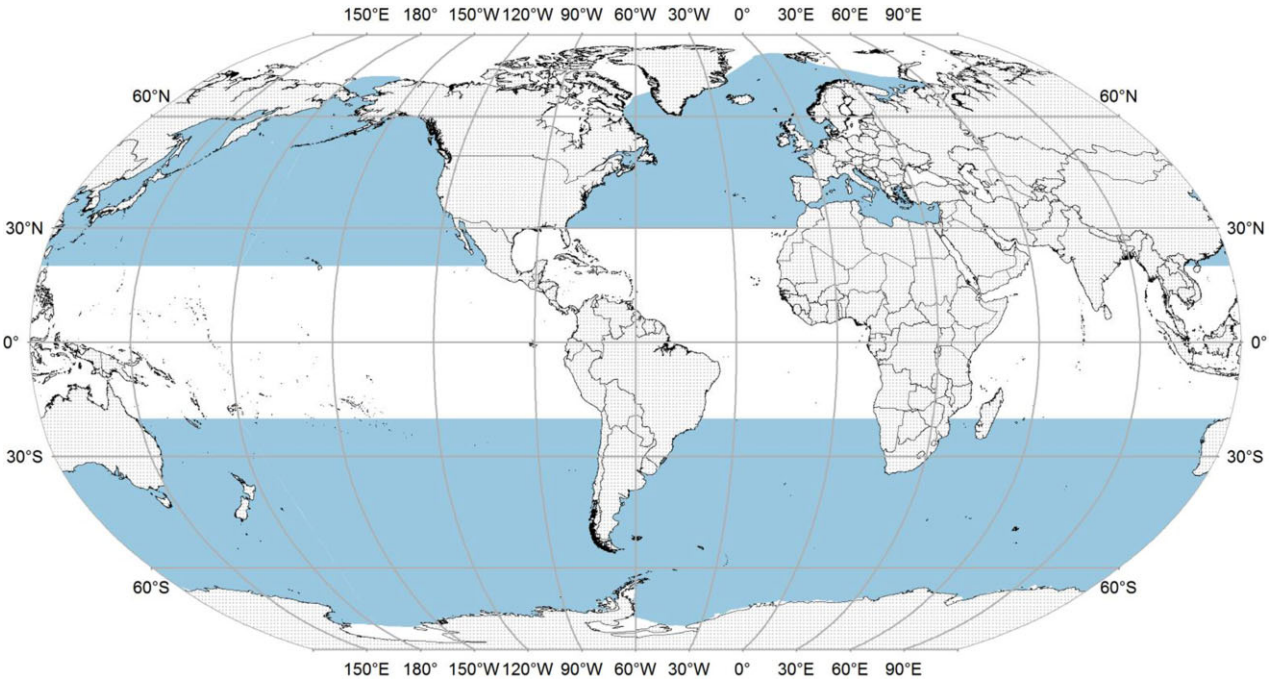


Fig. 6. Global distribution of fin whales *Balaenoptera physalus* in the post-whaling era (1980–2012). Blue (dark grey in grey-scale) indicates fin whale occupancy.

2009). Additionally, only six fin whale sightings out of 997 sightings of large whales identified to species were made in the same general area during all seasons between 1980 and 1990 on more than 470 tuna purse-seine trips carrying trained scientific observers (Jackson 2012). Although there have been some acoustic detections of fin whales between 15°N and 30°N in the Atlantic Ocean, these detections were much less common at the southernmost than at the northernmost hydrophones (Nieukirk et al. 2004). Pulse series similar to those attributed to fin whales in the North Atlantic have been recorded between 8°N and 8°S in the eastern tropical Pacific Ocean (Stafford et al. 1999). However, attributing these series to fin whales is not consistent with the significant survey effort in this region, as noted by Stafford et al. (1999). Additionally, fin whales were not reported in 34 cetacean presence studies conducted between 23°N and 12°S (Appendix S18).

An equatorial hiatus in the global distribution of fin whales is also corroborated by whaling era reports, morphological analyses, and genetic analyses. Specifically, most catches of fin whales occurred north of approximately 30°N in both the North Atlantic and North Pacific Oceans, and south of approximately 20°S in the Southern Hemisphere (Kellogg 1929, Mackintosh 1946, Nishiwaki 1966, Tomilin 1967, Christensen et al. 1992). A few whaling era records exist of fin whale catches in equatorial regions: off the coast of Ecuador (approximately 0°; Clarke 1962), off the coast of Peru (approximately 15°S; Clarke 1962, Reeves & Smith 2006), off the coast of Congo (approximately 0°; Mackintosh 1942) and off the coast of Angola (approximately 15°S; Mackintosh 1942). However, although significant whaling effort occurred in these areas (thousands of humpback whales *Megaptera novaeangliae* were caught; Mackintosh 1942), fin whale catches were infrequent and did not lead to sustained fin whale fisheries. Whaling reports suggest that an equatorial hiatus in the global distribution of fin whales is likely to have existed during the whaling era as well as during the post-whaling era.

Fin whales in the Northern and Southern Hemispheres have been designated as separate subspecies based on morphological differences (Aguilar 2009), suggesting reproductive isolation within each hemisphere. Recent genetic analyses suggest that populations in the North Pacific and North Atlantic Oceans should not be considered the same subspecies (Archer et al. 2013), implying that they are also reproductively isolated. These patterns of reproductive isolation are consistent with an equatorial hiatus in the global distribution of fin whales. An equatorial hiatus is also consistent with the near-complete absence of fin whale sightings within the North Indian Ocean during the whaling era (Tomilin 1967) and thereafter (Figs 1 and 5; Appendices S2–S5 and S14–S18).

Questions remain about the seasonal distribution of fin whales within temperate and polar areas (see Mizroch et al. 2009). Although relative abundances may change seasonally

in the northern and southern portions of these areas, fin whales are found in many regions year-round, which has important management implications. Line-transect surveys conducted during multiple seasons at three higher-latitude locations in the post-whaling era provide results consistent with those of other studies showing that fin whales are more abundant at higher latitudes during warmer months and more abundant at lower latitudes (although these latitudes are still greater than 20°) during colder months. For example, fin whales catches and sightings were more common during summer months than during winter months at latitudes greater than 50°N in the Northern Hemisphere off Labrador-Newfoundland (Hay 1982), around Greenland, Iceland, the Faroe Islands, and Norway (Jonsgard 1966), and in the Bering Sea, Chukchi Sea, and Gulf of Alaska (Mizroch et al. 2009). Similarly, catches and sightings were more common during summer months south of about 50°S in the Southern Hemisphere (Kellogg 1929, Tomilin 1967). Tagging studies in Antarctica (Brown 1962) and the North Pacific (Mizroch et al. 2009) have documented fin whale movement from higher latitudes to lower latitudes during winter months.

Both our synthesis of post-whaling era data and results from other studies suggest that some fin whales remain in higher latitudes during colder months and in lower latitudes during warmer months, indicating that not all fin whales perform concerted seasonal migrations. For example, fin whales have been observed at higher latitudes during all seasons in the North Atlantic Ocean off Norway between approximately 60°N and 70°N (Kellogg 1929, Jonsgard 1966), near the Faroe Islands at approximately 62°N (Jonsgard 1966), and off Newfoundland at approximately 55°N (Jonsgard 1966). In the North Pacific Ocean, numerous fin whale acoustic detections and sightings have been made north of 40°N during winter months (Mizroch et al. 2009). In the Southern Hemisphere, fin whales were observed year-round near South Georgia at approximately 54°S (Mackintosh 1942) and off the coast of Chile (Tomilin 1967, exact location not reported). During the summer months, numerous fin whale sightings have been made at lower latitudes (north of approximately 20–30°N) in both the North Atlantic and North Pacific Oceans (Fig. 5; Appendices S14–S17). Although they are less frequent, summer sightings have also been made at lower latitudes (south of approximately 20–30°S) in the Southern Hemisphere (Fig. 5; Appendices S14–S17). These observations at higher latitudes during cold months and lower latitudes during warm months support the suggestion by Mizroch et al. (2009) that some individuals may remain at these latitudes year-round, that some individuals may make short migrations before returning to these latitudes, or that the population structure of fin whales is more complicated than is suggested by a simple seasonal migratory movements model.

The important question of where fin whales breed remains to be answered. Morphological data collected during the whaling era indicate that fin whales breed primarily during winter in both Northern and Southern Hemispheres (Lockyer 1986). Increased sightings during winter, rather than summer, months are uncommon. In both hemispheres, the few reports available of higher abundance during winter months come from lower, temperate latitudes (approximately 30–35°), including off the coasts of Japan and Korea (Omura 1950, Tomilin 1967) and around the tip of South Africa, at Saldanha Bay on the south-western coast and Durban on the south-eastern coast (Mackintosh & Wheeler 1929). Tagging studies during and after the whaling era provide some additional information about fin whale movements within temperate and polar latitudes. Specifically, movements have been observed between the Southern Ocean and the coasts of Chile, Brazil and South Africa (30–70°S; Brown 1962), between the Azores and Iceland (40–65°N; Silva et al. 2013), between the northwest coast of Mexico (central Baja California) and the west coast of the USA (northern California, 26–40°N; Falcone & Schorr 2014), between the Faroes and westward of the Bay of Biscay (46–62°N; Mikkelsen et al. 2001), and along the coasts of the western and eastern North Pacific (30–60°N; Mizroch et al. 2009). Recent satellite tagging conducted off the south-western coast of the USA found that fin whales aggregated along the coast during autumn and winter, dispersed farther offshore during spring and summer, and used several areas year-round (Falcone & Schorr 2014). None of the tagged fin whales travelled south of approximately 26°N (Falcone & Schorr 2014).

Based on the scarcity of winter sightings and catch records, Wheeler (1946) and Hain et al. (1992) suggested that fin whales generally disperse to unobserved, open ocean areas during their winter breeding season. While our maps cannot be used to identify breeding areas, they do suggest that fin whale breeding areas differ from those of blue whales and humpback whales. In particular, blue whales and humpback whales are known to migrate from high-latitude, temperate feeding grounds to low-latitude, tropical breeding grounds (Clapham 2009, Sears & Perrin 2009). The line-transect surveys in the eastern tropical Pacific were conducted between August and November, when southern hemisphere whales would be expected to breed in this area. Blue whales and humpback whales were observed on these surveys, but fin whales were not (Hamilton et al. 2009). The equatorial hiatus in the global distribution of fin whales suggests that fin whales do not conduct the same long-distance, seasonal migrations to tropical latitudes as blue whales and humpback whales.

Our maps highlight important geographical and temporal data gaps in our knowledge of global fin whale

distribution. As seen in a global review of cetacean line-transect surveys conducted by Kaschner et al. (2012), line-transect survey data were biased towards the Northern vs. the Southern Hemisphere, summer vs. winter seasons, and near-shore vs. pelagic areas. Even in the Northern Hemisphere, most areas have been surveyed only once, generally during a single season, and there are many data gaps (Fig. 2; Appendices S6–S9). In the Southern Hemisphere, data are available primarily from the Southern Ocean during austral summer, from December to February (Fig. 2; Appendices S6–S9). The Southern Hemisphere is a particularly important data gap because the majority of fin whale catches occurred in this hemisphere (Reilly et al. 2013). In particular, surveys that have been conducted in the post-whaling era in the Southern Hemisphere do not include formerly important winter whaling areas such as Saldanha Bay and Durban on the west and east coasts of South Africa (Kellogg 1929, Mackintosh & Wheeler 1929, Mackintosh 1942, 1966, Best 1994), and along the east and west coasts of South America (Clarke 1962, Zenkovich 1962, Jose Perez et al. 2006, Reeves & Smith 2006). Also, the post-whaling era Southern Ocean surveys (Branch & Butterworth 2001a) may not have included a potentially large number of fin whales occupying feeding grounds somewhat north of the Southern Ocean boundary (Miyashita et al. 1995, Branch & Butterworth 2001b). The one line-transect survey conducted just north of the Southern Ocean (Hedley et al. 2001) did record higher fin whale density (Fig. 1; Appendices S2–S5). In the Pacific Ocean, there are very few post-whaling era data from the former whaling areas around Japan and Korea (Omura 1950), and none south of Japan (approximately 35°N), including in the East China Sea between Japan and Taiwan where a separate stock of fin whales may have been exterminated by whaling (Nishiwaki 1966). Similarly, very few post-whaling era data are available from the southern Indian Ocean despite the importance of various whaling areas there (Miyashita et al. 1995, Reeves & Smith 2006). Conducting surveys within these identified data gaps is important, as is collecting data to characterise more accurately the seasonal distributions and movements of fin whales in areas of known presence.

Our seasonally stratified maps of fin whale global distribution during the post-whaling era show that an equatorial hiatus exists between fin whale distributions in the temperate and polar latitudes of the Northern and Southern Hemispheres. This hiatus suggests that fin whales do not make the long-range, seasonal migrations into tropical regions that are typical of other large baleen whales (blue whales and humpback whales). While changes in abundance can be seen between the higher and lower latitudes within their temperate and polar distributions, fin whales occupy many regions during all seasons, which suggests a need for year-round management considerations. To gain a more complete understanding of fin whale distributions, we must address the important geographical and temporal data gaps highlighted by our global maps. This information can provide fine-scale knowledge of distribution patterns, which could improve our understanding of fin whale taxonomy and enhance our ability to identify areas of elevated fin whale densities that may require management of threats, such as ship strikes.

ACKNOWLEDGEMENTS

This study was significantly improved through the generosity of many organisations and individuals willing to share original fin whale sightings data. Our use of contributed data conforms to the terms and conditions specified by each contributing organisation, or if no terms were specified, our data use conforms to the comprehensive regulations specified in the 'Terms and Conditions for use of data provided by the Joint Nature Conservation Committee'. We gratefully acknowledge valuable contributions from: the Azores Islands Marine Research/Department of Oceanography and Fisheries of the University of the Azores, IMAR-DOP/UA data, with funding from FEDER, FCT, CETAMARH and TRACE, Azorean Regional Government, Shipowners Proprietors and Association of the Tuna Canning Industries, data contributed by Dr Monica Silva; the British Columbia Cetacean Sightings Network (BCCSN) data, 2012, Vancouver Aquarium Marine Science Centre and Fisheries and Oceans Canada, Vancouver, BC, data contributed by Dr John Ford and Ms Heather Lord; the Hebridean Whale and Dolphin Trust (HWDT), online sightings database, records available at http://whaledolphintrust.co.uk; the Irish Whale and Dolphin Group (IDWG), online sightings database, all records are validated and available on http://www.iwdg.ie, data advisor Dr Padraig Whooley; the International Whaling Commission (IWC), IDCR and SOWER data, contributed by Drs Cherry Allison and Marion Hughes; JNCC (the Joint Nature Conservation Committee), data from various sources, contributed by Drs Jim Reid, Tim Dunn, Mark Lewis, Carolyn Stone-Barton and Karen Hall; the MARINElife/Biscay Bay Dolphin Project, data contributed by Drs Tom Brereton and Colin MacLeod; the National Marine Mammal Laboratory (NMML), data from various sources, contributed by Dr Sally Mizroch; NASS survey data collected by Norway, data contributed by Dr Nils Oien; NASS survey data collected by Iceland and the Faroe Islands, data contributed by Dr T. Gunnlaugsson, permission given to use the Faroe Islands data by Dr B. Mikkelsen; NASS survey data collected by Greenland, data contributed by Dr M. P. Heide-Jorgensen; CODA survey data, data contributed by Dr Phil Hammond; SCANS and SCANS-II

survey data contributed by Dr Phil Hammond; SWF (Sea Watch Foundation), data contributed by Dr Peter Evans; SWFSC (Southwest Fisheries Science Center) tuna vessel observer data, contributed by Mr Al Jackson. We also thank the following contributors to OBIS-SEAMAP, who kindly granted us permission to use their organisation's data: AADC-NWDSSD (Australian Antarctic Data Centre National Whale and Dolphin Sightings and Strandings Database; permission statement on OBIS-SEAMAP website), AADC-CSSSOCP (Australian Antarctic Data Centre Cetacean Sightings Survey and Southern Ocean Cetacean Program; permission statement on OBIS-SEAMAP website), Fauk Huettmann (CWS/PIROP: Canadian Wildlife Service-PIROP), Daniel Kerem (IMMRAC: Israel Marine Mammal Research and Assistance Center), Robin Baird (Cascadia Research Collective), Jay Barlow (SWFSC/NMFS/NOAA), Sagarminaga van Buiten (ALNITAK; Alboran Sea cetacean monitoring program), Janet Clark (NMML/NMFS/NOAA), Tim Cole (NEFSC/NMFS/NOAA), Lea David (EcoOcean Institute and partners SCS, CybellePlanete, ParticipeFutur, EPHE, WWF-France, FNH), Dan DenDanto (College of the Atlantic, Allied Whale), Bruno Diaz-Lopez (BDRI: The Bottlenose Dolphin Research Institute), Annie Douglas (Cascadia Research Collective), Charlotte Dunn (Bahamas Marine Mammal Research Organization), Megan Ferguson (NMML/NMFS/NOAA and BOEM), Carmelo Franizza (JDC, Jonian Dolphin Conservation), Sylvia Frey (OceanCare), P. Gauffier (CIRCE: Conservation, Information and Study on Cetaceans), Tim Gerrodette (SWFSC/NMFS/NOAA), Oriol Giralt (RecercaiConservació, AssociacioCetacea), Guido Gnone (Acquario di Genova), Patricia Gozalbes (InstitutoCavanilles de Biodiversidad y BiologiaEvolutiva, Unidad de Zoologia Marina, University of Valencia), Rod Hobbs (AFSC/NMML/NMFS/NOAA), Poul Holm (HMAP – History of Marine Animal Populations), Meike Holst (Lamont-Doherty/LGL-Limited), Erich Hoyt, for Olga Filatova (RCHP: Russian Cetacean Habitat Project), Lewis Incze (Gulf of Maine Census of Marine Life Program), iOBIS and Argentinean RON (references on OBIS-SEAMAP website), Arthur Kopelman (Coastal Research and Education Society of Long Island), Ben Maughan (UK Hydrographic Office, UK Royal Navy), William McLellan (The Marine Mammal Program, UNC, Wilmington), MMS: Minerals Management Service (final report references on OBIS-SEAMAP website), Debra Palka (NEFSC/NMFS/NOAA), Richard Sears (Minghan Island Cetacean Study), Mari Smultea and Cathy Bacon (Smultea Environmental Services, LLC, and US NAVY NAVFAC SW), Dana Spontak (HDR Environmental, Operations, and Construction, Inc., and US Fleet Forces Command and NAVFAC Atlantic), Zach Swaim (Duke University Marine Laboratory), and Janice Waite (NMML/NMFS/NOAA and BOEM).

REFERENCES

Aguilar A (2009) Fin whale (*Balaenoptera physalus*). In: Perrin WF, Wursig B, Thewissen JGM (eds) *Encyclopedia of Marine Mammals*, 2nd ed., 433–437. Academic Press, New York City, New York, USA.

Aguilar A, Grau E, Sanpera C, Donovan G (1983) Report of the 'Ballena 1' whale marking and sighting cruise in the waters off Western Spain. *Report of the International Whaling Commission* 3: 649–656.

Aissi M, Celona A, Comparetto G, Mangano R, Wurtz M, Moulins A (2008) Large-scale seasonal distribution of fin whales (*Balaenoptera physalus*) in the central Mediterranean Sea. *Journal of the Marine Biological Association of the United Kingdom* 88: 1253–1261.

Andriolo A, da Rocha JM, Zerbini AN, Simoes-Lopez PC, Moreno IB, Lucena A et al. (2010) Distribution and relative abundance of large whales in a former whaling ground off eastern South America. *Zoologia* 27: 741–750.

Anonymous (2007) *Seismic Surveys in the Beaufort and Chukchi Seas, Alaska*. OCS EIS/EA MMS 2007-00, BOEMRE-MMS, US Department of the Interior, Minerals Management Service, Alaska OCS region.

Anonymous (2010) *ArcGIS for Desktop 10*. ESRI (Environmental Systems Research Institute), Redlands, California, USA.

Anonymous (2013a) *Species Range Map for* Balaenoptera physalus *(Fin Whale)*. http://seamap.env.duke.edu/species/180527

Anonymous (2013b) *Computer Generated Native Distribution Map for* Balaenoptera physalus *(Fin Whale)*. Aug. 2013. www.aquamaps.org

Anonymous (2014) Fin Whale, *Balaenoptera Physalus*. OBIS-SEAMAP; *Duke University Online Species Map: Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations*. http://seamap.env.duke.edu/species/180527

Archer FI, Morin PA, Hancock-Hauser B, Robertson KA, Leslie MS, Berube M et al. (2013) Mitogenomic phylogenetics of fin whales (*Balaenoptera physalus spp.*): genetic evidence for revision of subspecies. *PLOS ONE* 8: e63396.

Ballance L, Pitman RL (1998) Cetaceans of the western tropical Indian Ocean. *Marine Mammal Science* 14: 429–459.

Ballance L, Anderson RC, Pitman RL, Stafford KM, Shaan A, Waheed Z et al. (2001) Cetacean sightings around the Republic of the Maldives, April 1998. *Journal of Cetacean Research and Management* 3: 213–218.

Barlow J (2010) *Cetacean Abundance in the California Current Estimated from a 2008 Ship-Based Line-Transect Survey*. *NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS -SWFSC-456.

Barlow J, Taylor B (2005) Estimates of sperm whale abundance in the northeastern temperate Pacific from a combined acoustic and visual survey. *Marine Mammal Science* 21: 429–445.

Best PB (1994) A review of the catch statistics for modern whaling in Southern Africa, 1908–1930. *Report of the International Whaling Commission* 44: 467–486.

Boisseau O, Lacey C, Lewis T, Moscop A, Danbolt M, McLanaghan R (2010) Encounter rates of cetaceans in the Mediterranean Sea and contiguous Atlantic. *Journal of the Marine Biological Association of the United Kingdom* 90: 1589–1599.

Branch TA, Butterworth DS (2001a) Estimates of abundance south of 60°S for cetacean species sighted frequently on the 1978/79 to 1997/98 IWC/IDCR-SOWER sighting surveys. *Journal of Cetacean Research and Management* 3: 251–270.

Branch TA, Butterworth DS (2001b) Southern Hemisphere minke whales: standardized abundance estimates from the 1978/79 to 1997/98 IDCR-SOWER surveys. *Journal of Cetacean Research and Management* 3: 143–174.

Brown SG (1962) The movements of fin and blue whales in the Antarctic zone. *Discovery Reports* 33: 1–54.

Brownell RL, Yablokov A (2009) Whaling, illegal and pirate. In: Perrin WF, Wursig B, Thewissen JGM (eds) *Encyclopedia of Marine Mammals*, 2nd ed., 1235–1239. Academic Press, New York City, New York, USA.

Brueggeman JJ, Green GA, Grotefendt RA, Chapman DG (1987) *Aerial Surveys of the Endangered Cetaceans and Other Marine Mammals in the Northwestern Gulf of Alaska and Southeastern Bering Sea. Final Report: Outer Continental Shelf Environmental Assessment Program*, Research Unit 673, Envirosphere Company, Bellevue Washington 98004.

Charif RA, Clark CW (2009) *Acoustic Monitoring of Large Whales in Deep Waters North and West of the British Isles: 1996–2005: Preliminary Report 19 January 2009. Cornell Lab of Ornithology Technical Report* 08-07, Cornell University, Ithaca, New York, USA.

Christensen I, Haug T, Oien N (1992) Seasonal distribution, exploitation and present abundance of stocks of large baleen whales (Mysticeti) and sperm whales (*Physeter macrocephalus*) in Norwegian and adjacent waters. *ICES Journal of Marine Science/Journal du Conseil* 49: 341–355.

Clapham P (2009) Humpback whale (*Megaptera novaeangliae*). In: Perrin WF, Wursig B, Thewissen JGM (eds) *Encyclopedia of Marine Mammals*, 2nd ed., 582–585. Academic Press, New York City, New York, USA.

Clapham P, Irene E (1991) Resightings of independent fin whales, *Balaenoptera physalus*, on maternal summer ranges. *Journal of Mammalogy* 72: 788–790.

Clarke J, Ferguson M (2011) Appendix 6: Aerial surveys of large whales in the Northeastern Chukchi Sea, 2008–2009, with a review of 1982–1991 data (SC/62/BRG13). In: Clarke J, Ferguson M, Christman CL, Grassia SL, Brower AA, Morse LJ (eds) *Chukchi Offshore Monitoring in Drilling Area (COMIDA): Distribution and Relative Abundance of Marine Mammals: Aerial Surveys; Final Report OCS Study BOEMRE 2011-06*, 269–286. National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, Seattle, Washington, USA.

Clarke J, Ferguson M, Christman CL, Grassia SL, Brower AA, Morse LJ (2011) *Chukchi Offshore Monitoring in Drilling Area (COMIDA): Distribution and Relative Abundance of Marine Mammals: Aerial Surveys. Final Report: OCS Study BOEMRE 2011-06*, National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA Seattle, Washington, USA.

Clarke R (1962) Whale observation and whale marking off the coast of Chile in 1958 and from Ecuador towards and beyond the Galapagos Islands in 1958. *Norsk Hvalfangst-Tidende* 7: 265–286.

Dede A, Tonay AM (2010) Cetacean sightings in the Black Sea in Autumn 2007. *Journal of Environmental Protection and Ecology* 11: 1491–1494.

Delarue J, Martin B, Hannay D, Berchok C (2013) Acoustic occurrence and affiliation of fin whales detected in the Northeastern Chukchi Sea, July to October 2007–10. *Arctic* 66: 159–172.

Diemer DM, Conroy MJ, Ferguson SH, Hauser DD, Grgicak-Mannion A, Fisk AT (2011) Marine mammal and seabird summer distribution and abundance in the fjords of northeast Cumberland Sound of Baffin Island, Nunavut, Canada. *Polar Biology* 34: 41–48.

Dolar ML, Perrin WF, Taylor B, Kooyman GL, Alava MN (2006) Abundance and distributional ecology of cetaceans in the central Philippines. *Journal of Cetacean Research and Management* 8: 93–112.

Dualu-Drouout V, Boucaud V, Rota B (2008) Cetacean diversity off La Reunion Island. *Journal of the Marine Biological Association of the United Kingdom* 88: 1263–1272.

Falcone EA, Schorr GS (2014) *Distribution and Demographics of Marine Mammals in SOCAL Through Photoidentification, Genetics, and Satellite Telemetry*. Naval Postgraduate School, Monterey, California, USA.

Forcada J, Aguilar A, Hammond P, Pastor X, Aguilar R (1996) Distribution and abundance of fin whales (*Balaenoptera physalus*) in the western Mediterranean Sea during the summer. *Journal of Zoology* 238: 23–34.

Forney KA, Barlow J (1998) Seasonal patterns in the abundance and distribution of California cetaceans, 1991–1992. *Marine Mammal Science* 14: 460–489.

Forney KA, Wade PR (2006) Chapter 12: worldwide distribution and abundance of killer whales. In: Estes J, Demaster DP, Doak DF, Williams TM, Brownell RL (eds) *Whales, Whaling, and Ocean Ecosystems*, 145–162. University of California Press, Berkely, California, USA.

Forney KA, Barlow J, Carretta JV (1995) The abundance of cetaceans in California waters. Part II: aerial surveys in winter and spring of 1991 and 1992. *Fishery Bulletin* 93: 15–26.

Gannier A (2005) Summer activity pattern of fin whales (*Balaenoptera physalus*) in the northwestern Mediterranean Pelagos Sanctuary. *Mesogee* 61: 35–41.

Hain JH, Mary JR, Robert DK, Howard EW (1992) The fin whale, *Balaenoptera physalus*, in waters of the northeastern

United States Continental Shelf. *Report of the International Whaling Commission* 42: 653–669.

Hamilton TA, Redfern J, Barlow J, Ballance L, Gerrodette T, Holt R et al. (2009) *Atlas of Cetacean Sightings for Southwest Fisheries Science Center Cetacean and Ecosystem Surveys: 1986–2005. NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-SWFSC-440.

Hammond P (2006) *FINAL REPORT: SCANS-II: Small Cetaceans in the European Atlantic and North Sea. LIFE04NAT/GB/000245*, Sea Mammal Research Unit, University of St. Andrews, St. Andrews, UK.

Hammond P, Berggren P, Benke H, Borchers DL, Collet A, Heide-Jorgensen MP et al. (2002) Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters. *Journal of Applied Ecology* 39: 361–376.

Hay K (1982) Aerial line-transect estimates of abundance of humpback, fin, and long-finned pilot whales in the Newfoundland-Labrador area. *Report of the International Whaling Commission* 32: 475–486.

Hedley S, Reilly S, Borberg J, Holland R, Hewitt R, Watkins J et al. (2001) *Modelling Whale Distribution: A Preliminary Analysis of Data Collected on the CCAMLR-IWC Krill Synoptic Survey, 2000. IWC Scientific Committee Paper* SC/53/E9: 1–38.

Heide-Jorgensen MP, Witting L, Jensen MV (2003) Inshore-offshore movements of two fin whales (*Balaenoptera physalus*) tracked by satellite off West Greenland. *Journal of Cetacean Research and Management* 5: 241–246.

Heide-Jorgensen MP, Laidre KL, Simon M, Burt ML, Borchers DL, Rasmussen M (2010) Abundance of fin whales in West Greenland in 2007. *Journal of Cetacean Research and Management* 11: 83–88.

Ireland DS, Koski WR, Thomas TA, Beland J, Reiser CM, Funk DW et al. (2009) Updated distribution and abundance of cetaceans in the eastern Chukchi Sea in 2006–2008 (SC/61/BRG4). *Report of the International Whaling Commission* 61: 1–14.

Jackson A (2012) *TVOD Observer Sighting Forms for NMFS Data 1971–1995. Contributed data*, Tuna/Porpoise Program, Southwest Fisheries Science Center, La Jolla, California, USA.

Jackson A, Gerrodette T, Chivers S, Lynn M, Olson P, Rankin S (2004) *Marine Mammal Data Collected During a Survey in the Eastern Tropical Pacific Ocean Aboard the NOAA Ships McArthur and David Starr Jordan, July 29–December 10, 2003. NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-SWFSC-366.

Jackson A, Gerrodette T, Chivers S, Lynn M, Rankin S, Mesnick SL (2008) *Marine Mammal Data Collected During a Survey in the Eastern Tropical Pacific Ocean Aboard the NOAA ships McArthur and David Starr Jordan, July 28–December 7, 2006. NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-SWFSC-421.

Jewell R, Thomas L, Harris CM, Kaschner K, Wiff R, Hammond P et al. (2012) Global analysis of cetacean line-transect surveys: detecting trends in cetacean density. *Marine Ecology Progress Series* 453: 227–240.

Jonsgard A (1966) The distribution of Balaenopteridae in the North Atlantic ocean. In: Norris KS (ed) *Whales, Dolphins and Porpoises*, 114–124. University of California Press, Los Angeles, California, USA.

Jose Perez M, Thomas F, Uribe F, Flores M, Moraga R, Sepulveda MS (2006) Fin whales (*Balaenoptera physalus*) feeding on *Euphausia mucronata* in nearshore waters off North-Central Chile. *Aquatic Mammals* 32: 109–113.

Kaschner K, Watson R, Trites AW, Pauly D (2006) Mapping world-wide distributions of marine mammal species using a relative environmental suitability [RES] model. *Marine Ecology Progress Series* 316: 285–310.

Kaschner K, Quick NJ, Jewell R, Williams R, Harris CM (2012) Global coverage of cetacean line-transect surveys: status quo, data gaps, and future challenges. *PLOS ONE* 7: e44075.

Kellogg R (1929) What is known of the migrations of some of the whalebone whales. *Smithsonian Institution Annual Report of the Board of Regents* 1928: 467–494.

Kenney RD, Hyman MA, Winn HE (1985) *Calculation of Standing Stocks and Energetic Requirements of the Cetaceans of the Northeast United States Outer Continental Shelf. NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-NEFSC41.

Kesner-Reyes K, Kaschner K, Kullander S, Garilao C, Barile J, Froese R (2012) AquaMaps: algorithm and data sources for aquatic organisms. In: Froese R, Pauly D (eds) *FishBase*, 1–24. World Wide Web Electronic Publication. http://www.fishbase.org; version (04/2012).

Kinzey D, Gerrodette T, Barlow J, Dizon AE, Perryman WL, Olson P (1999) *Marine Mammal Data Collected During a Survey in the Eastern Tropical Pacific Ocean Aboard the NOAA Ships McArthur and David Starr Jordan and the UNOLS ship Endeavor July 31–December 9, 1998. NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-SWFSC-283.

Kinzey D, Gerrodette T, Barlow J, Dizon AE, Perryman WL, Olson P (2000) *Marine Mammal Data Collected During a Survey in the Eastern Tropical Pacific Ocean Aboard the NOAA Ships McArthur and David Starr Jordan, July 28–December 9, 1999 NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-SWFSC-293.

Lafortuna CL, Jahoda M, Azzellino A, Saibene F, Colombini A (2003) Locomotor behaviors and respiratory pattern of the Mediterranean fin whale (*Balaenoptera physalus*). *European Journal of Applied Physiology* 90: 387–395.

Laist DW, Knowlton AR, Mead JG, Collet AS, Podesta M (2001) Collisions between ships and whales. *Marine Mammal Science* 17: 35–75.

Laran S, Drouot-Dulau V (2007) Seasonal variation of striped dolphins, fin- and sperm whales' abundance in the Ligurian Sea (Mediterranean Sea). *Journal of the Marine Biological Association of the United Kingdom* 87: 345–352.

Ljungblad DK, Moore SE, Clarke J, Bennett JC (1988) *Distribution, Abundance, Behavior and Bioacoustics of Endangered Whales in the Western Beaufort and Northeastern Chukchi Seas, 1979–1987. OCS Study, MMS-87-0122*, Anchorage, Alaska, USA.

Lockyer C (1986) Body fat condition in Northeast Atlantic fin whales, *Balaenoptera physalus*, and its relationship with reproduction and food resource. *Canadian Journal of Fisheries and Aquatic Science* 43: 142–147.

Lusseau D, Slooten E (2002) Cetacean sightings off the Fiordland coastline. *Science for Conservation (New Zealand Department Conservation)* 187: 1–42.

Mackintosh NA (1942) The southern stocks of whalebone whales. *Discovery Reports* XXII: 197–300.

Mackintosh NA (1946) The natural history of whalebone whales. *Biological Reviews* 21: 60–74.

Mackintosh NA (1966) The distribution of southern blue and fin whales. In: Norris KS (ed) *Whales, Dolphins and Porpoises*, 126–144. University of California Press, Los Angeles, California, USA.

Mackintosh NA, Wheeler JFG (1929) Southern blue and fin whales. *Discovery Reports* 1: 257–540.

Matsuoka K, Kiwada H, Fujise Y, Miyashita T (2009) *Distribution of Blue (*Balaenoptera musculus*), Fin (*B. physalus*), Humpback (*Megaptera novaeangliae*) and North Pacific Right (*Eubalaena japonica*) Whales in the Western North Pacific based on JARPN and JARPN II Sighting Surveys (1994 to 2007)*. IWC Scientific Committee Paper SC/J09/JR35: 1–12.

Meredith GN, Campbell RR (1988) Status of the fin whale, *Balaenoptera physalus*, in Canada (English). *The Canadian Field-Naturalist* 102: 351–368.

Mikkelsen B, Bloch D, Heide-Jorgensen MP (2001) A note on movements of two fin whales (*Balaeanoptera physalus*) tracked by satellite telemetry from the Faroe Islands in 2001. *Journal of Cetacean Research and Management* 9: 115–120.

Miyashita T, Kato H, Kasuya T (1995) *Worldwide Map of Cetacean Sighting Distribution Based on Japanese Sighting Data*. National Research Institute of Far Seas Fisheries, Shimizu, Shizuoka, Japan.

Mizroch SA, Dale WR, Jeffrey MB (1984) The fin whale, *Balaenoptera physalus*. *Marine Fisheries Review* 46: 20–24.

Mizroch SA, Rice DW, Zwiefelhofer D, Waite J, Perryman WL (2009) Distribution and movements of fin whales in the North Pacific Ocean. *Mammal Review* 39: 193–227.

Moore JE, Barlow J (2011) Bayesian state-space model of fin whale abundance trends from a 1991–2008 time series of line-transect surveys in the California Current. *Journal of Applied Ecology* 48: 1195–1205.

Moore SE, Stafford KM, Dahlheim ME, Fox CG, Braham HW, Polovina JJ et al. (1998) Seasonal variation in reception of fin whale calls at five geographic areas in the north Pacific. *Marine Mammal Science* 14: 617–627.

Mullin KD, Fulling GL (2003) Abundance of cetaceans in the southern U.S. Atlantic Ocean during summer 1998. *Fishery Bulletin* 101: 603–613.

Nieukirk SL, Stafford KM, Mellinger DK, Dziak RP, Fox CG (2004) Low-frequency whale and seismic airgun sounds recorded in the mid-Atlantic Ocean. *Journal of the Acoustical Society of America* 115: 1832–1843.

Nieukirk SL, Mellinger DK, Moore SE, Klinck K, Dziak RP, Goslin J (2012) Sounds from airguns and fin whales recorded in the mid-Atlantic Ocean, 1999–2009. *Journal of the Acoustical Society of America* 131: 1102–1112.

Nishiwaki M (1966) Distribution and migration of the larger cetaceans of the North Pacific as shown by Japanese whaling results. In: Norris KS (ed) *Whales, Dolphins and Porpoises*, 171–191. University of California Press, Los Angeles, California, USA.

Notarbartolo di Sciara G (2002) Section 3: cetacean species occurring in the Mediterranean and Black Seas. In: Notarbartolo di Sciara G (ed) *Cetaceans of the Mediterranean and Black Seas: State of Knowledge and Conservation Strategies*, 1–17. Instituto Centrale per la Ricerca Applicata al Mare, Roma, Italy. Report to the ACCOBAMS Secretariat, February 2002, Monaco.

Notarbartolo di Sciara G, Zanardelli M, Jahoda M, Panigada S, Airoldi S (2003) The fin whale *Balaenoptera physalus* (L. 1758) in the Mediterranean Sea. *Mammal Review* 33: 105–150.

Omura H (1950) Whales in the adjacent waters of Japan. *Scientific Report of the Whales Research Institute* 4: 27–113.

Panigada S, Pesante G, Zanardelli M, Capoulade F, Gannier A, Weinrich MT (2006) Mediterranean fin whales at risk from fatal ship strikes. *Marine Pollution Bulletin* 52: 1287–1298.

Payne R, Webb D (1971) Orientation by means of long range acoustic signaling in baleen whales. *Annals of the New York Academy of Sciences* 188: 110–140.

Perry SL, DeMaster DP, Silber GK (1999) The great whales: history and status of six species listed as endangered under the U.S. Endangered Species Act of 1973. *Marine Fisheries Review* 61: 1–74.

Ray GC, Mitchell ED, Wartzok D, Kozicki VM, Maiefski R (1978) Radio tracking of a fin whale (*Balaenoptera physalus*). *Science* 202: 521–524.

Redfern J, McKenna MF, Moore TJ, Calambokidis J, DeAngelis ML, Becker EA et al. (2013) Assessing the risk of ships striking large whales in marine spatial planning. *Conservation Biology* 27: 292–302.

Reeves RR, Smith TD (2006) A taxonomy of whaling. In: Estes JA, Demaster DP, Doak DF, Williams TM, Brownell RL (eds) *Whales, Whaling and Ocean Ecosystems*, 82–101. UCLA, Los Angeles, California, USA.

Reid JB, Evans PG, Northridge SP (2003) *Atlas of Cetacean Distribution in North-west European Waters*, Joint Nature Conservation Committee, Peterborough, UK.

Reilly SB, Bannister JL, Best PB, Brown M, Brownell RL, Butterworth DS et al. (2013) Balaenoptera physalus. *IUCN 2011 Red List of Threatened and Endangered Species. Version 2013.2*. http://www.iucnredlist.org.

Sanpera C, Grau E, Jover L, Recasens E, Aguilar A, Olmos M et al. (1985) Report of the 'Ballena 3' fin whale marking and sightings cruise off Spain, 1983. *Report of the International Whaling Commission* 35: 495–498.

Schorr GS, Falcone EA, Calambokidis J, Andrews RD (2010) *Satellite Tagging of Fin Whales off California and Washington in 2010 to Identify Movement Patterns, Habitat use, and Possible use of Stock Boundaries*. Report prepared under Order No. JG133F09SE4477 to Cascadia Research Collective, Olympia, Washington from the Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, California, USA.

Sears R, Perrin WF (2009) Blue whale (*Balaenoptera physalus*). In: Perrin WF, Wursig B, Thewissen JGM (eds) *Encyclopedia of Marine Mammals*, 2nd ed., 120–124. Academic Press, New York City, New York, USA.

Silva MA, Prieto R, Jonsen ID, Baumgartner MF, Santos RS (2013) North Atlantic blue and fin whales suspend their spring migration to forage in middle latitudes: building up energy reserves for the journey? *PLOS ONE* 8: e76507.

Simon M, Stafford KM, Beedholm K, Lee CM, Madsen PT (2010) Singing behavior of fin whales in the Davis Strait with implications for mating, migration, and foraging. *Journal of the Acoustical Society of America* 128: 3200–3210.

Sirovic A, Hildebrand JA, Wiggins SM (2007) Blue and fin whale call source levels and propagation range in the Southern Ocean. *Journal of the Acoustical Society of America* 122: 1208–1215.

Smith BD, Tun M (2008) A note on the species occurrence, distributional ecology and fisheries interactions of cetaceans in the Mergui (Myeik) Archipelago, Myanmar. *Journal of Cetacean Research and Management* 10: 37–44.

Smith BD, Ahmed B, Mowgli RM, Strindberg S (2008) Species occurrence and distributional ecology of nearshore cetaceans in the Bay of Bengal, Bangladesh, with abundance estimates for Irrawaddy dolphins *Orcaella brevirostris* and finless porpoises *Neophocaena phocaenoides*. *Journal of Cetacean Research and Management* 10: 45–58.

Stafford KM, Nieukirk SL, Fox CG (1999) Low-frequency whale sounds recorded on hydrophones moored in the eastern tropical Pacific. *Journal of the Acoustical Society of America* 106: 3687–3698.

Stafford KM, Mellinger DK, Moore SE, Fox CG (2007) Seasonal variability and detection range modelling of baleen whales in the Gulf of Alaska, 1999–2002. *Journal of the Acoustical Society of America* 122: 3378–3391.

Stoett P (2011) Irreconcilable differences: the International Whaling Commission and Cetacean Futures. *Review of Policy Research* 28: 631–634.

Tomilin AG (1967) *Balaenoptera physalus* (Linn.) 1758. Fin whale (Razorback) [Sel'dyanoi polosatik (finval)]. In: Heptner VG (ed) *Mammals of the U.S.S.R. and Adjacent Countries: Cetacea*, 112–176. Israel Program for Scientific Translations, Jerusalem, Israel.

Vikingsson G, Pike DG, Desportes G, Oien N, Gunnlaugsson T, Bloch D (2009) Distribution and abundance of fin whales (*Balaenoptera physalus*) in the Northeast and Central Atlantic as inferred from the North Atlantic Sightings Surveys 1987–2001. *NAMMCO Scientific Publications* 7: 49–72.

Watkins W, Moore K, Wartzok D, Johnson J (1981) Radio tracking of finback (*Balaenoptera physalus*) and humpback (*Megaptera novaeangliae*) whales in Prince William Sound, Alaska. *Deep Sea Research* 28A: 577–588.

Watkins WA, Maiefski RR, Sigurjonsson J, Wartzok D, Daher MA, Howey PW (1996) Fin whale tracked by satellite off Iceland. *Marine Mammal Science* 12: 564–569.

Wheeler JFG (1946) Observations on whales in the South Atlantic Ocean in 1943. *Proceedings of the Zoological Society of London* 116: 221–224.

Williams R, Kaschner K, Hoyt E, Reeves RR, Ashe E (2011) *Mapping Large-scale Spatial Patterns in Cetacean Density: Preliminary Work to Inform Systematic Conservation Planning and MPA Network Design in the Northeastern Pacific*. Whale and Dolphin Conservation Society, Chippenham, UK.

Zenkovich BA (1962) Sea mammals as observed by the round the world expedition of the Academy of Sciences of the USSR in 1957–58. *Norsk Hvalfangst-Tidende* 51: 198–210.

Zerbini AN, Waite JM, Laake JL, Wade PR (2006) Abundance, trends and distribution of baleen whales off Western Alaska and the central Aleutian Islands. *Deep-Sea Research Part I, Oceanographic Research Papers* 53: 1772–1790.

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's web-site.

Appendix S1. Data sources for fin whale *Balaenoptera physalus* distribution maps.

Appendix S2. Higher resolution version of Fig. 1a: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* average seasonal density (fin whales per km^2) in December–February.

Appendix S3. Higher resolution version of Fig. 1b: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* average seasonal density (fin whales per km^2) in March–May.

Appendix S4. Higher resolution version of Fig. 1c: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* average seasonal density (fin whales per km^2) in June–August.

Appendix S5. Higher resolution version of Fig. 1d: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* average seasonal density (fin whales per km^2) in September–November.

Appendix S6. Higher resolution version of Fig. 2a: post-whaling era (1980–2012) seasonal line-transect survey effort (number of surveys per 100×100 km grid cell) in December–February.

Appendix S7. Higher resolution version of Fig. 2b: post-whaling era (1980–2012) seasonal line-transect survey effort (number of surveys per 100×100 km grid cell) in March–May.

Appendix S8. Higher resolution version of Fig. 2c: post-whaling era (1980–2012) seasonal line-transect survey effort (number of surveys per 100×100 km grid cell) in June–August.

Appendix S9. Higher resolution version of Fig. 2d: post-whaling era (1980–2012) seasonal line-transect survey effort (number of surveys per 100×100 km grid cell) in September–November.

Appendix S10. Higher resolution version of Fig. 4a: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in December–February.

Appendix S11. Higher resolution version of Fig. 4b: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in March–May.

Appendix S12. Higher resolution version of Fig. 4c: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in June–August.

Appendix S13. Higher resolution version of Fig. 4d: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in September–November.

Appendix S14. Higher resolution version of Fig. 5a: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in December–February.

Appendix S15. Higher resolution version of Fig. 5b: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in March–May.

Appendix S16. Higher resolution version of Fig. 5c: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in June–August.

Appendix S17. Higher resolution version of Fig. 5d: post-whaling era (1980–2012) fin whale *Balaenoptera physalus* seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in September–November.

Appendix S18. Studies in which fin whales *Balaenoptera physalus* would have been reported if they had been present.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Author(s)	Publ. Year	Study Area	Study name	Study Type	Study Subtype	Data Year(s)	Data Collection Months
Atlantic Ocean; north, east:							
Moore et al.	2012	Fram Strait		DPS	AD	2008 - 2009	all months
Clark	1995	northwest of Norway		DPS	AD	1993	winter
Christensen et al.	1992	Norway	NASS89	LTS	ship	1989	July
Oien	2009	Norway	1995-2001	LTS	ship	1995 - 2001	June - August
Mikkelsen et al.	2007	northeast Atlantic		DPS	ST	2001	August - December
Buckland et al.	1992a	Iceland-Faroes	NASS87, NASS89	DPS	ship	1987, 1989	June - August
Pike et al.	2008	Iceland-Faroes	TNASS2007	LTS	ship	2007	June - July
Vikingsson et al.	2009	Iceland-Faroes	NASS95, NASS2001	LTS	ship	1995, 2001	July
Macleod et al.	2006	northwest of Scotland		LTS	ship	1998	July - August
HWDT	2012	Hebrides Islands		DPS	OS	2009 - 2011	all months
ESAS/JNCC	2012	Europe	Europ.Seabirds Sea	DPS	OS	1982 - 2009	all months
SWF	2012	Europe	Sea Watch Fnd.	DPS	OS	1991 - 2012	all months
MMO/JNCC	2012	Europe	Mar. Mamm. Obsv.	DPS	OS	1997 - 2010	May - November
MARINElife/ARC	2012	Europe	Atlantic Res. Coalit.	DPS	OS	2003 - 2008	all months
Hammond et al.	2002	coastal UK	SCANS	LTS	ship	1994	June - August
Hammond	2006	coastal UK	SCANS-II	LTS	ship	2005	July
SCANS	2012	coastal UK	fin whale sightings	LTS	OS	1994	July
SCANS-II	2012	coastal UK	fin whale sightings	LTS	OS	2005	July
Hammond et al.	2011	offshore UK	CODA	LTS	ship	2007	July
Charif and Clark	2009	west of UK		DPS	AD	1996 - 2005	all months
Pikesley et al.	2011	Cornwall		DPS	OS	1991 - 2008	all months
IWDG	2012	Ireland		DPS	OS	1989 - 2012	all months
Sanpera et al.	1985	northwest of Spain	Ballena 3	DPS	MR	1983	August - October
Sanpera and Jover	1985	northwest of Spain	Ballena 3	LTS	ship	1983	July - August
Sanpera and Jover	1986	northwest of Spain	Ballena 4	LTS	ship	1984	July - August
Sanpera and Jover	1989	northwest of Spain	Spanish NASS-87	LTS	ship	1987	July - August
Buckland et al.	1992b	northwest of Spain	Spanish NASS-89	LTS	ship	1989	July - August
Aguilar et al.	1983	west of Spain	Ballena 1	DPS	OS	1981	September
Gaspa Rebull et al.	2006	west of Spain		DPS	AD	2003	August - September

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Mizroch and Sanpera	1984	west of Bay of Biscay	Ballena 2	LTS	ship	1982	August
Goujon et al.	1995	west of Bay of Biscay	IFREMER	LTS	ship	1993	July - August
CIRCE	2012	Iberian Peninsula		DPS	OS	1999 - 2011	all months
de Stephanis et al.	2008	Strait of Gibraltar		DPS	OS	2001 - 2004	July - September
Gauffier et al.	2009	Strait of Gibraltar		DPS	OS	1999 - 2008	all months
Cotte et al.	2009	Gibraltar-Mediterranean		DPS	ST	2003 - 2004	all months
Boisseau et al.	2010	Morroco, Mediterranean Sea		LTS	ship	2003 - 2007	April - November
ALNITAK	2012	Alboran Sea area		DPS	OS	1990 - 2006	all months
Notarbartolo et al.	2003	Mediterranean		DPS	OS	1980 - 2001	all months
Forcada et al.	1995	Mediterranean		LTS	ship	1992	August
Forcada et al.	1996	Mediterranean		LTS	ship	1991	August
Panigada et al.	2011	northwestern Mediterranean		LTS	aerial	2009	Jan. - Feb.; July - Aug.
Clark et al.	2002	Ligurian Mediterranean		DPS	AD	1999	August - October
Laran et al.	2010	Ligurian Mediterranean		LTS	ship	2001 - 2004	all months
Laran and Drouot-Dulau	2007	Ligurian Mediterranean		DPS	OS	2001 - 2004	all months
Aissi et al.	2008	central Mediterranean		DPS	OS	2002 - 2006	all seasons
Marini et al.	1996	central Mediterranean		DPS	OS	1990 - 1994	January-September
Lipej et al.	2004	northern Adriatic		DPS	OS	1980 - 2003	July - October
Frantzis et al.	2003	Greek Seas		DPS	OS	1991 - 2002	February - September
Kerem et al.	2012	Levantine Basin		DPS	OS	1993 - 2009	February - November
Castellote et al.	2010	Azores-Mediterranean		DPS	AD	2006 - 2009	all months
Villa et al.	2011	Azores		DPS	OS	2010	April - September
Visser et al.	2011	Azores		DPS	OS	2004 - 2007	April - Decmember
Castellote et al.	2012	Azores		DPS	AD	2006 - 2009	August - January
Silva	2012	Azores		DPS	OS	2001 - 2010	March - September
POPA	2012	Azores	POPA	DPS	OS	1998 - 2012	all months
Gordon et al.	1995	Azores and Madiera		DPS	OS	1988 - 1991	April - October
Perez-Valleza et al.	2008	Canary Islands		DPS	OS	2003 - 2005	all months
Carrillo et al.	2010	Canary Islands		DPS	OS	1997 - 2006	all months
Folkow and Blix	1991	Madeira, Cape Verde		DPS	AD, OS	1989	December
Reiner et al.	1996	Cape Verde		DPS	OS	1993	April
Moore et al.	2003	Cape Verde		DPS	OS	2000 - 2001	November - May

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Waring et al.	2008	mid-Atlantic Ridge		DPS	OS	2004	June - July
Nieukirk et al.	2012	mid-Atlantic Ocean		DPS	AD	1999 - 2009	all months
Atlantic Ocean; south, east:							
Weir	2007	northern Angola		DPS	OS	2004, 2005	August, September
Atlantic Ocean; north, west:							
Heide-Jorgensen et al.	2003	west Greenland		DPS	ST	2000, 2001	August - December
Larsen et al.	1989	west Greenland	NASS-1987	DPS	aerial	1987	July - August
Heide-Jorgensen et al.	2007	west Greenland		LTS	ship	2005	September
Heide-Jorgensen et al.	2008	west Greenland		LTS	aerial	2005	August - September
Heide-Jorgensen et al.	2010	west Greenland		LTS	aerial	2007	August - September
Simon et al.	2010	Davis Strait		DPS	AD	2006 - 2008	all months
Lawson and Gosselin	2009	Atlantic Canada	CA-TNASS	LTS	aerial	2007	July - August
Hay	1982	Atlantic Canada		LTS	aerial	1980	August
CWS	2012	Atlantic Canada	PIROP	DPS	OS	1980 - 1992	all months
Lamont-Doherty/LGL	2012	Atlantic Canada		DPS	OS	2003 - 2008	August
Potter et al.	2007	Atlantic Canada		DPS	OS	2003	May
Kingsley and Reeves	1998	Gulf of St. Lawrence		LTS	aerial	1995, 1996	July - September
Delarue et al.	2009	Gulf St. Lawrence; Gulf Maine		DPS	AD	2005 - 2007	all months
Kenney et al.	1985	Nova Scotia-Cape Hatteras	CETAP	LTS	aerial	1978 - 1982	all months
Palka	2006	Maine-Virginia		LTS	ship+aerial	1998 - 2004	June - September
Koltz	2007	Cape Cod Bay		DPS	AD	2001, 2005	March, April
Sadove	1992	New York Bight		DPS	OS	1981 - 1989	April - October
Watkins et al.	1987	Bermuda		DPS	AD	1959 - 1979	all months
SEFSC	1985	southest coast, USA		LTS	ship	1985	April - June
SEFSC	1992	southest coast, USA		LTS	ship	1992	January - February
Blaylock and Hoggard	1994	southest coast, USA		LTS	aerial	1992	January - March
SEFSC	2002	southest coast, USA		LTS	ship, OS	2002	February - April
Garrison et al.	2003	southest coast, USA		LTS	ship	2002	February - April
Mullin and Fulling	2003	southest coast, USA		LTS	ship, OS	1998	July - August
SEFSC	2005	southest coast, USA		LTS	ship, OS	2005	June - August
SEFSC	2006	southest coast, USA		LTS	ship	2006	June - August
Garrison et al.	2010	southest coast, USA		LTS	ship	2004	July - August

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

SEFSC	2011	southest coast, USA		LTS	ship, OS	2011	June - August
SEFSC	1981	Gulf of Mexico		LTS	ship	1981	August - September
SEFSC	1993	Gulf of Mexico		LTS	ship	1993	January - February
Mullin et al.	1994	Gulf of Mexico		DPS	OS	1989	fall
SEFSC	1994	Gulf of Mexico		LTS	ship	1994	August - September
Jefferson and Schiro	1997	Gulf of Mexico		review	OS	unknown	summer
SEFSC	1999	Gulf of Mexico		LTS	ship	1999	August - September
Davis et al.	2000	Gulf of Mexico	GULFCET II	LTS	ship+aerial	1996 - 1998	all months
SEFSC	2001a	Gulf of Mexico		LTS	ship	2001	August - September
SEFSC	2003	Gulf of Mexico		LTS	ship	2003	June - August
SEFSC	2004	Gulf of Mexico		LTS	ship	2004	April-June
Maze-Foley and Mullin	2006	Gulf of Mexico		LTS	ship	1991 - 2001	spring
SEFSC	2007	Gulf of Mexico		LTS	ship	2007	June - August
SEFSC	2009	Gulf of Mexico		LTS	ship	2009	June - August
SEFSC	1995	Carribean		LTS	ship	1995	January - March
SEFSC	2001b	Puerto Rico		LTS	ship	2001	February - April
Swartz and Burks	2000	Venezuela		DPS	OS	2000	February - April
Ridoux et al.	2010	French Guiana	AAMP-France	DPS	OS	2008	October
Atlantic Ocean; south, west:							
Andriolo et al.	2010	Brazil		LTS	ship	1998 - 2001	August - October
Siciliano et al.	2011	Brazil		review	OS	2002 - 2006	March - July
White et al.	2002	Southwest Atlantic (Falklands)		DPS	OS	1998 - 2001	all months
SWA/JNCC	2012	Southwest Atlantic (Falklands)		DPS	OS	1998 - 2001	all months
Pacific Ocean; north:							
Moore et al.	1998	north Pacific Ocean		DPS	AD	1991 - 1992	all months
Mizroch et al.	2009	north Pacific Ocean	NMML/POP	DPS	OS	1980 - 2001	all months
Matsuoka et al.	2011	north central Pacific Ocean	IWC/Japan survey	DPS	OS	2010	July - August
Pacific Ocean; north, east:							
McDonald et al.	1995	northeast Pacific Ocean		DPS	AD	1990	August
Moore et al.	1999	northeast Pacific Ocean		DPS	OS/AD	1994	July-Aug., Jan.-Nov.
Jones et al.	2011	northeast Pacific Ocean		DPS	AD	2000 - 2010	September - November
SWFSC/Research Cruises	2012	northeast Pacific Ocean		DPS	OS	1980 - 2010	all months

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Brueggeman et al.	1987	Alaska		LTS	aerial	1985	April - December
Treacy	2002	Beaufort Sea		LTS	aerial	2000	September - October
BOEMRE-MMS Alaska	2007	Bering, Beaufort, Chukchi Seas		LTS	aerial, OS	1981 - 2004	July - October
Ljungblad et al.	1982	Chukchi Sea		DPS	OS	1981	July
Ljungblad et al.	1988	Beaufort and Chukchi Seas		LTS	aerial	1979 - 1987	September - October
Clarke et al.	2011	Chukchi Sea		LTS	aerial, OS	2008 - 2010	June - November
Clarke and Ferguson	2011	Chukchi Sea		LTS	aerial	1989 - 1991	September - October
Ireland et al.	2009	eastern Chukchi Sea		LTS	aerial	2006 - 2008	July - November
NMML/CHAOZ	2011	Bering and Chukchi Seas		DPS	AD	2011	August - September
Moore et al.	2002	Bering Sea		LTS	ship	1999, 2000	June - August
Tynan	2004	Bering Sea		LTS	ship	1997, 1999	June - August
Friday et al.	2012	Bering Sea		LTS	ship	1999 - 2004	June - July
Baretta and Hunt	1994	Pribilof Islands		DPS	OS	1987 - 1989	July - August
Stafford et al.	2010	southeast Bering Sea		DPS	AD	2006 - 2007	all months
Stewart et al.	1987	Aleutian Islands		DPS	OS	1984	July - August
Zerbini et al.	2006	Aleutian Islands		LTS	ship	2001 - 2003	July - August
Troy	1992	Unimak Pass, Alaska		LTS	ship	1986 - 1987	September - May
Stafford et al.	2007	Gulf of Alaska		DPS	AD	1999 - 2002	all months
Dahlheim et al.	2009	southeast Alaska bays		DPS	OS	1991 - 2007	summer
Maynard	2011	Uganik Bay, Alaska		DPS	OS	2008	December
Gregr et al.	2006	British Columbia		DPS	OS	2002 - 2004	Spring, Summer
Williams and Thomas	2007	British Columbia		LTS	ship	2004, 2005	summer
Best and Halpin	2009	British Columbia		LTS	ship	2006 - 2008	spring-fall
Ford et al.	2010	British Columbia		DPS	AD	2006 - 2007	February - September
CRP/FOC	2012	British Colombia	Cetac. Res. Prog.	DPS	OS	2002 - 2010	January - October
BCCSN	2012	British Colombia		DPS	OS	1983 - 2012	all months
Victoria Times Colonist	2011	British Columbia		DPS	OS	2011	September
Wilcock and Thomson	2009	Juan de Fuca Ridge		DPS	AD	2003 - 2006	all months
Calambokidis et al.	2004	northern Washington		LTS	ship	1995 - 2002	June - July
Barlow and Taylor	2005	northeastern temperate Pacific	SWAPS	LTS	OS	1997	March-June
Barlow	1994	California-Mexico		LTS	ship	1979, 1980	June - October
Forney et al.	1995	California		LTS	aerial	1991, 1992	February - April

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Barlow	2010	Washington, Oregon, California		LTS	ship	1991 - 2008	July - November
Gerrodette and Palacios	1996	Mexico	PODS93	LTS	ship	1993	July - November
Mangels and Gerrodette	1994	Central America	PODS92	LTS	ship	1992	July - November
Wade and Gerrodette	1993	eastern tropical Pacific Ocean	MOPS 1986-1990	LTS	ship	1986 - 1990	July - December
Kinzey et al.	1999	eastern tropical Pacific Ocean	STAR 1998	LTS	ship	1998	July - December
Kinzey et al.	2000	eastern tropical Pacific Ocean	STAR 1999	LTS	ship	1999	July - December
Kinzey et al.	2001	eastern tropical Pacific Ocean	STAR 2000	LTS	ship	2000	July - December
Jackson et al.	2004	eastern tropical Pacific Ocean	STAR 2003	LTS	ship	2003	July - December
Jackson et al.	2008	eastern tropical Pacific Ocean	STAR 2006	LTS	ship	2006	July - December
Stafford et al.	1999	eastern tropical Pacific Ocean		DPS	AD	1996 - 1997	all months
SWFSC/TVOD	2011	eastern tropical Pacific Ocean	tuna vessel obsrvr.	DPS	OS	1980 - 1995	all months
Thompson and Friedl	1982	Oahu, Hawaii		DPS	AD	1978 - 1981	all months
Mobley et al.	1996	Kaua'I, Hawaii		DPS	OS	1994	February
Barlow	2003	Hawaii EEZ	HICEAS02	LTS	ship	2002	July - December
McDonald and Fox	1999	Oahu, Hawaii		DPS	AD	1992 - 1993	all months
PIFSC	2007	northwest Hawaiian Islands		LTS	ship	2007	March - April
Barlow et al.	2008	southwest of Hawaiian Islands	PICEAS2005	LTS	ship	2005	July - November
PIFSC	2009	main Hawaiian Islands		LTS	ship	2009	February
PIFSC	2011	Palmyra Atoll		LTS	ship	2011	October - November
PIFSC	2012	Palmyra Atoll		LTS	ship	2012	April - May
Henry	2012	Hawaii EEZ		LTS	ship	2010	August - December
Pacific Ocean; south, east:							
Chile-CCC	2005	northern Chile		DPS	OS	2004	September
Jose Perez et al.	2006	north-central Chile		DPS	OS	1993 - 2005	all months
Acevedo et al.	2012	southeastern Pacific Ocean		DPS	OS	2012	May
Aguayo et al.	1998	southeastern Pacific Ocean		DPS	OS	1993,'94,'95	September, June
Pacific Ocean; north, west:							
Miyashita et al.	1996	northwestern Pacific Ocean		DPS	OS	1993 - 1995	February - March
Matsuoka et al.	2009	northwestern Pacific Ocean		DPS	OS	1994 - 2007	April - September
RCHP	2012	Commander Islands		DPS	OS	2007 - 2009	May - September
Miyashita et al.	2005	Sea of Okhotsk		LTS	ship	1989 - 2003	July - September
Miyashita and Yochida	2003	Japan/Korea		DPS	OS	2002	June

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Miyashita	2004	Japan/Korea		DPS	OS	2003	June
Yong-Rock et al.	2011	Korea East Sea		LTS	ship	2010	May - June
Miyashita	2007	Japan		DPS	OS	2006	May - June
de Boer	2000	South China Sea		DPS	OS	1999	March - April
Fulling et al.	2011	Guam, Marianas		LTS	ship	2007	January - April
Dolar et al.	2006	central Phillipines		LTS	ship	1994, 1995	May - June
Dolar	2006	Phillipines		DPS	OS	1999	July
Pacific Ocean; south, west:							
AADC-NWDSSD	2012	Australia		DPS	OS	1980 - 1999	all months
Miller et al.	2012	Australia	SORP 2012	DPS	OS	2012	March
McDonald	2006	New Zealand		DPS	AD	1997	all months
Indian Ocean							
Keller et al.	1982	Seychelle Islands, Indian Ocean		DPS	OS	1980	April - June
Jayasankar et al.	2007	SW of Madagascar, Indian Ocean		DPS	OS	2004	January - March
de Boer et al.	2002	Indian Ocean/Southern Ocean		DPS	OS	1999 - 2000	all months
Corbett	1994	Mauritius area		DPS	OS	1991; 1992	August, June
Ballance et al.	2001	Maldives		LTS	ship	1998	April
Smith et al.	2008	Bay of Bengal		LTS	ship	2004	February
Smith and Than Tun	2008	Mergui Archipelago, Myanmar		LTS	ship	2005	February - March
Dulau-Drouot et al.	2008	La Reunion Island		LTS	ship	2004 - 2007	all months
Southern Ocean							
IWC	2012	Southern Ocean	IDCR-SOWER	DPS	OS	1978 - 2010	December - March
Branch and Butterworth	2001	Southern Ocean	IDCR-SOWER	LTS	ship	1978 - 1998	December - February
AADC-CSSSOCP	2012	Southern Ocean		DPS	ship	1995 - 2004	
Bowles et al.	1994	Heard Island		DPS	AD	1991	January - February
Moore et al.	1999	South Georgia		DPS	OS	1979 - 1998	all months
Burkhardt and Lanfredi	2012	Elephant Island	ANT-XXVIII/4	DPS	OS	2012	March - April
Hedley et al.	2001	Antarctic peninsula, Scotia Sea	CCAMLR-IWC	LTS	ship	2000	January - February
Sirovic et al.	2004	west Antarctic peninsula		DPS	AD	2001 - 2003	all months
Thiele et al.	2004	west Antarctic peninsula	SO GLOBEC	LTS	ship	2001 - 2002	April -June
Matsuoka et al.	2006	Southern Ocean (35^{o}E-145^{o}W)	JARPA	LTS	ship	1989 - 2005	January - February
Gedamke et al.	2007	east Antarctic, south Australia		DPS	AD	2004 - 2007	all months

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Sirovic et al.	2009	Antarctic		DPS	AD	2003 - 2004	all months
Gedamke and Robinson	2010	east Antarctic	BROKE-West	DPS	AD	2006	January - February
Scheidat et al.	2011	Antarctic		DPS	OS	2006 - 2009	November - January

Appendix S1 References

AADC-CCSSSOCP (2012) Australian Antarctic Data Centre Cetacean Sightings Survey and Southern Ocean Cetacean Program fin whale sightings. *OBIS-SEAMAP*. Data downloaded June 2012. http://seamap.env.duke.edu/species/180527.

AADC-NWDSSD (2012) Australian Antarctic Data Centre National Whale and Dolphin Sightings and Strandings Database. *OBIS-SEAMAP*. Data downloaded June 2012. http://seamap.env.duke.edu/species/180527.

Acevedo A, O'Grady M, Wallis B (2012) A note on a sighting of a large school of fin whales in the Eastern Subtropical South Pacific. *IWC Scientific Committee Paper*, SC/64/SH2.

Aguayo AL, Bernal R, Olavarria C, Vallejos V, Hucke-Gaete, R (1998) Observaciones de cetaceos realizadas entre Valparaiso e isla de Pasua, Chile, durante los inviernos de 1993, 1994, 1995. *Revista de Biologia y Oceanograffa* 33: 101-123.

Aguilar A, Grau E, Sanpera C, Donovan G (1983) Report of the 'Ballena 1' Whale Marking and Sighting Cruise in the Waters off Western Spain. *Report of the International Whaling Commission* 33: 649-656.

Aissi M, Celona A, Comparetto G, Mangano R, Wurtz M, Moulins A (2008) Large-scale seasonal distribution of fin whales (*Balaenoptera physalus*) in the central Mediterranean Sea. *Journal of the Marine Biological Association of the United Kingdom* 88: 1253-1261.

ALNITAK (2012) ALNITAK (Alboran Sea cetacean monitoring program) fin whale sightings: contributed dataset. *OBIS-SEAMAP*. Data downloaded June 2012. http://seamap.env.duke.edu/species/180527.

Andriolo A, da Rocha JM, Zerbini AN, Simoes-Lopez PC, Moreno IB, Lucena A, et al. (2010) Distribution and relative abundance of large whales in a former whaling ground off eastern South America. *Zoologia* 27: 741-750.

Ballance L, Anderson RC, Pitman RL, Stafford KM, Shaan A, Waheed Z, et al. (2001) Cetacean Sightings around the Republic of the Maldives, April 1998. *Journal of Cetacean Research and Management* 3: 213-218.

Baretta L, Hunt, GL (1994) Changes in the numbers of cetaceans near the Pribilof Islands, Bering Sea, between 1975-78 and 1987-89. *Arctic* 47: 321-326.

Barlow J (1994) Abundance of Large Whales in California Coastal Waters: A Comparision of Ship Surveys in 1979/80 and in 1991. *Report of the International Whaling Commission* 44: 399-406.

Barlow J (2003) Cetacean abundance in Hawaiian waters during summer/fall 2002. *Southwest Fisheries Science Center Administrative Report* LJ-03-13.

Barlow J (2010) Cetacean abundance in the California Current estimated from a 2008 ship-based line transect survey. *NOAA Technical Memorandum NMFS* NOAA-TM-NMFS-SWFSC-456.

Barlow J, Rankin S, Jackson A, Henry A (2008) Marine mammal data collected during the Pacific Islands cetacean and ecosystem assessment survey (PICEAS) conducted aboard the NOAA Ship McArthur II, July - November 2005. *NOAA Technical Memorandum* NOAA-TM-NMFS-SWFSC-420.

Barlow J, Taylor B (2005) Estimates of sperm whale abundance in the northeastern temperate Pacific from a combined acoustic and visual survey. *Marine Mammal Science* 21: 429-445.

BCCSN (2012) British Columbia Cetacean Sightings Network data; contributed dataset.*Vancouver Aquarium Marine Science Centre and Fisheries and Oceans Canada*, Vancouver, BC.

Best B, Halpin P (2009) Predictive Marine Mammal Modeling for Queen Charlotte Basin, British Columbia. *Technical Report, Research Contract #2008-03.* Duke University Marine Geospatial Ecology Lab, Duke University, Durham, NC.

Blaylock RA, Hoggard W (1994) Preliminary estimates of bottlenose dolphin abundance in southern U.S. Atlantic and Gulf of Mexico continental shelf waters. *NOAA Technical Memorandum NMFS.* NMFS-SEFSC-356.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

BOEMRE-MMS (2007) Seismic Surveys in the Beaufort and Chukchi Seas, Alaska. *Draft Programmatic Environmental Impact Statement*. OCS EIS/EA MMS 2007-001. U.S. Department of the Interior Minerals Management Service Alaska OCS Region. Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE).

Boisseau O, Lacey C, Lewis T, Moscop A, Danbolt M, Mclanaghan R (2010) Encounter rates of cetaceans in the Mediterranean Sea and contiguous Atlantic. *Journal of the Marine Biological Association of the United Kingdom* 90: 1589-1599.

Bowles AE, Smultea M, Wursig B, DemasterDP, Palka D (1994) Relative abundance and behavior of marine mammals exposed to transmissions from the Heard Island Feasibility Test. *Journal of the Acoustical Society of America* 96: 2469-2484.

Branch TA, Butterworth DS (2001) Estimates of abundance south of 60°S for cetacean species sighted frequently on the 1978/79 to 1997/98 IWC/IDCR-SOWER sighting surveys. *Journal of Cetacean Research and Management* 3:251-270.

Brueggeman JJ, Green GA, Grotefendt, RA, Chapman DG (1987) Aerial surveys of the endangered cetaceans and other marine mammals in the northwestern Gulf of Alaska and southeastern Bering Sea: Final Report. O*uter Continental Shelf Environmental Assessment Program.* Research Unit 673. Envirosphere Company, Bellevue, WA.

Buckland ST, Cattanach KL, Gunnlaugsson T (1992a) Fin whale abundance in the North Atlantic, estimated from Icelandic and Faroese NASS-87 and NASS-89 data. *Report of the International Whaling Commission* 42: 645-652.

Buckland, ST, Cattanach KL, Lens S (1992b) Fin whale abundance in the eastern north Atlantic, estimated from Spanish NASS-89 data. *Report of the International Whaling Commission* 42: 457-460.

Burkhardt E, Lanfredi C (2012) Fall feeding aggregation of fin whales off Elephant Island (Antarctica). *IWC Scientific Committee Paper* SC/64/SH9.

Calambokidis J, Steiger GH, Ellifrit DK, Troutman BL, Bowlby CE (2004) Distribution and abundance of humpback whales (*Megaptera novaeangliae*) and other marine mammals off the northern Washington coast. *Fishery Bulletin* 102: 563-580.

Carrillo M, Perez-Vallazza C, Alvarez-Vazquez R (2010) Cetacean diversity and distribution off Tenerife (Canary Islands). *Marine Biodiversity Records* 3. doi:10.1017/S1755267210000801.

Castellote M, Clark C, Lammers MO (2010) Population identity and migration movements of fin whales (*Balaenoptera physalus*) in the Mediterranean Sea and Strait of Gibraltar. *IWC Scientific Committee Paper*, SC/62/SD2.

Castellote M, Clark C, Lammers MO (2012) Fin whale (*Balaenoptera physalus*) population identity in the western Meditteranean Sea. *Marine Mammal Science* 28: 325-344.

Charif RA, Clark CW (2009) Acoustic monitoring of large whales in deep waters north and west of the British Isles: 1996-2005: Preliminary Report 19 January 2009. *Cornell Lab of Ornithology Technical Report* 08-07.

Chile-CCC (2005) Chile. Progress Report on cetacean research, April 2004 to March 2005, with statistical data for the season 2004/05. *IWC Scientific Committee Paper* SC/57/ProgRep Chile.

Christensen I, Haug, T, Oien N (1992) Seasonal distribution, exploitation and present abundance of stocks of large baleen whales (Mysticeti) and sperm whales (*Physeter macrocephalus*) in Norwegian and adjacent waters. *ICES Journal of Marine Science /Journal du Conseil* 49: 341-355.

CIRCE. (2012) Fin whale sightings contributed to OBIS-SEAMAP by CIRCE (Conservation, Information and Study on Cetaceans). *OBIS-SEAMAP,* Data downloaded June 2012. http://seamap.env.duke.edu/species/180527.

Clark C (1995) Annex M1: Applications of US Navy underwater hydrophone arrays for scientific research on whales. *Report of the International Whaling Commission* 45: 210-212.

Clark CW, Borsani JF, Notarbartolo di Sciara G (2002) Vocal activity of fin whales, *Balaenoptera physalus*, in the Ligurian Sea. *Marine Mammal Scienc,*18: 286-295.

Clarke J, Ferguson M (2011) Appendix 6: Aerial Surveys of Large Whales in the Northeastern Chukchi Sea, 2008-2009, with a review of 1982-1991 data (SC/62/BRG13). In: J. Clarke, M. Ferguson, C. L. Christman, S. L. Grassia, A. A. Brower & L. J. Morse (eds) *Chukchi Offshore Monitoring in Drilling Area (COMIDA): Distribution and Relative Abundance of Marine Mammals: Aerial Surveys; Final Report OCS Study BOEMRE 2011-06*. National Marine Mammal Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, 7600 Sand Point Way NE, F/AKC3, Seattle, WA 98115-6349.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Clarke J, Ferguson M, Christman CL, Grassia SL, Brower AA, Morse LJ (2011) Chukchi offshore monitoring in drilling area (COMIDA): Distribution and relative abundance of marine mammals: aerial surveys. *National Marine Mammal Laboratory*, Alaska Fisheries Science Center, NMFS, NOAA, 7600 Sand Point Way NE, F/AKC3, Seattle, WA 98115-6349.

Corbett HD (1994) The Occurrence of Cetaceans off Mauritius and Adjacent Waters. *Report of the International Whaling Commission* 44: 393-396.

Cotte C, Guinet C, Taupier-Letage I, Mate B, Petiau E (2009) Scale-dependent habitat use by a large free-ranging predator, the Mediterranean fin whale. *Deep-Sea Research Part I* 56: 801-811.

CRP/FOC (2012) Cetacean Research Program (CRP) fin whale sightings: contributed dataset. *Fisheries and Oceans Canada database*, Pacific Biological Station, 3190 Hammond Bay Rd, Nanaimo, British Columbia.

CWS (2012) Canadian Wildlife Service PIROP database fin whale sightings: permitted sightings. *OBIS-SEAMAP*. Data downloaded June 2012. http://seamap.env.duke.edu.

Dahlheim ME, White PA, Waite JM (2009) Cetaceans of southeast Alaska: distribution and seasonal occurrence. *Journal of Biogeography* 36: 410-426.

Davi, RW, Evans WE, Wursig B (2000) Cetaceans, sea turtles and seabirds in the northern Gulf of Mexico: Distribution, abundance and habitat associations. Volume II; Technical Report. OCS Study MMS 2000-003. *Prepared by Texas A&M University at Galveston and the National Marine Fisheries Service*. U.S. Department of the Interior, Geological Survey, Biological Resources Division, USGS/BRD/CR-1999-0006 and Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.

de Boer MN (2000) A note on cetacean observations in the Indian Ocean Sanctuary and the South China Sea, Mauritius to the Philippines, April 1999. *Journalof Cetacean Research and Management* 2: 197-200.

de Boer M, Baldwin R, Burton CL, Eyre EL, Jenner KC, Jenner, MN, et al. (2002) Cetaceans in the Indian Ocean Sanctuary: A Review. *Whale and Dolphin Conservation Society*, Plymouth, MA, USA.

de Stephanis R, Cornulier T, Verborgh P, Salazar Sierra J, Perez Gimeno N, Guinet C (2008) Summer spatial distribution of cetaceans in the Strait of Gibraltar in relation to the oceanographic context. *Marine Ecology-Progress Series* 353: 275-288.

Delarue J, Todd S K, Van Parijs SM, Di Iorio L (2009) Geographic variation in Northwest Atlantic fin whale (*Balaenoptera physalus*) song: Implications for stock structure assessment. *Journal of the Acoustical Society of America* 125: 1774-1782.

Dolar ML (2006) Marine mammals of the marine biodiversity conservation corridors in the Phillipines: Verde Island Passage, Balabac Strait, and the Cagayan Ridge. A technical report submitted to Conservation International-Phillipines. http://archive.fieldmuseum.org/phillipine_mammals/species/SP_39.asp.

Dolar ML, Perrin WF, Taylor B, KooymanGL, Alava,MN (2006) Abundance and distributional ecology of cetaceans in the central Phillipines. *Journal of Cetacean Research and Management* 8: 93-112.

Dulau-Drouout V, Boucaud V, Rota B (2008) Cetacean diversity off La Reunion Island. *Journal of the Marine Biological Association of the United Kingdom* 88: 1263-1272.

ESAS/JNCC (2012) European Seabirds at Sea (ESAS) fin whale sightings: contributed dataset. *Joint Nature Conservation Committee database*, Peterborough, England.

Folkow LP, Blix AS (1991) Norwegian Whale Sighting and Acoustic Surveys in the Atlantic Ocean During the Winter of 1989/90. *Report of the International Whaling Commission* 41: 531-538.

Forcada J, Aguilar A, Hammond P, Pastor X, Aguilar R (1996) Distribution and abundance of fin whales (*Balaenoptera physalus*) in the western Mediterranean Sea during the summer. *Journal of Zoology* 238: 23-34.

Forcada J, Notarbartolo Di Sciara G, Fabbri F (1995) Abundance of fin whales and striped dolphins summering in the Corso-Ligurian Basin. *Mammalia* 59: 127-140.

Ford JK, Koot B, Vagle S, Hall-Patch N, Kamitakahara G (2010) Passive acoustic monitoring of large whales in offshore waters of British Columbia. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2898, v + 30.

Forney KA, Barlow J, Carretta JV (1995) The abundance of cetaceans in California waters. Part II: Aerial surveys in winter and spring of 1991 and 1992. *Fishery Bulletin* 93: 15-26.

Frantzis A, Alexiadou P, Paximadis G, Politi E, Gannier A, Corsini-Foka M (2003) Current knowledge of the cetacean fauna of the Greek Seas. *Journalof Cetacean Research and Management* 5: 219-232.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Friday NA, Waite J, Zerbini AN, Moore SE (2012) Cetacean distribution and abundance in relation to oceanographic domains on the eastern Bering Sea shelf: 1994-2004. *Deep Sea Research II: Topical Studies in Oceanography* 65: 260-272.

Fulling GL, Thorson PH, Rivers J (2011) Distribution and abundance estimates for cetaceans in the waters off Guam and the Commonwealth of the Northen Mariana Islands. *Pacific Science* 65: 321-343.

Garrison LP, Martinez A, Maze-Foley K (2010) Habitat and abundance of cetaceans in Atlantic Ocean continental slope waters off the eastern USA. *Journal of Cetacean Research & Managemen,* 11: 267-277.

Garrison LP, Swartz S, Martinez A, Burks C, Stamates J (2003) A Marine Mammal Assessment Survey of the Southeast US Continental Shelf: February -April 2002. *NOAA Technical Memorandum NMFS* NMFS-SEFSC-492.

Gaspa Rebull O, Diaz Cusi J, Ruiz Fernandez M, Gallart Muset J (2006) Tracking fin whale calls offshore the Galicia Margin, North East Atlantic Ocean. *Journal of the Acoustical Society of America* 120: 2077-2085.

Gauffier P, Verborgh P, Andreu E, Esteban R, Medina B, Gallego P, et al. (2009) An update on fin whales (*Balaenoptera physalus*) migration through intense maritime traffic in the Strait of Gibralter. *Report of the InternationalWhaling Commission* SC/61/B6.

Gedamke J, Gales N, Hildebrand J, Wiggins S (2007) Seasonal occurance of low frequency whale vocalizations across eastern Antarctic and southern Australian waters, February 2004 to February 2007. *Report of the International Whaling Commission* SC/59/SH5.

Gedamke J, Robinson SM (2010) Acoustic survey for marine mammal occurrence and distribution off East Antarctica (30-80°E) in January-February 2006. *Deep-Sea Research Part II, Topical Studies in Oceanography* 57: 968-981.

Gerrodette T, Palacios DM (1996) Estimates of cetacean abundance in EEZ waters of the eastern tropical Pacific. *Southwest Fisheries Science Center Administrative Report* LJ-96-10.

Gordon JC, Steiner L, Martins HR (1995) Observations of fin whales (*Balaenoptera physalus* L., 1758) around the central North Atlantic islands of the Azores and Madeira. *Life and Marine Sciences* 13A: 79-84.

Goujon M, Forcada J, Desportes G (1995) Fin whale abundance in the eastern temperate North Atlantic for 1993. *Report of the International Whaling Commission* 45: 287-292.

Gregr EJ, Calambokidis J, Convey L, Ford JK, Perry RI, Spaven L, et al. (2006) Recovery strategy for blue, fin and sei whales (*Balaenoptera musculus, B. physalus*, and *B. borealis*) in Pacific Canadian waters. *Species at Risk Act Recovery Strategy Series,* Vancouver: Fisheries and Oceans Canada, vii + 53.

Hammond P (2006) *FINAL REPORT: SCANS-II: Small Cetaceans in the European Atlantic and North Sea*. Sea Mammal Research Unit, Univ. St. Andrews, St. Andrews, U.K.

Hammond P, Berggren P, Benke H, Borchers DL, Collet A, Heide-Jorgensen MP, et al. (2002) Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters. *Journal of Applied Ecology* 39: 361-376.

Hammond, P, Macleod K, Burt L, Canadas A, Lens S, Mikkelsen, B, et al. (2011) Abundance of baleen whales in the European Atlantic. *IWC Scientific Committee Paper* SC/63/RMP24.

Hay K (1982) Aerial line-transect estimates of abundance of humpback, fin, and long-finned pilot whales in the Newfounland-Laborador area. *Report of the International Whaling Commission* 32: 475-498.

Hedley S, Reilly S, Borberg J, Holland R, Hewitt R, Watkins J, et al. (2001) Modelling whale distribution: a preliminary analysis of data collected on the CCAMLR-IWC Krill Synoptic Survey, 2000. *IWC Scientific Committee Paper* SC/53/E9.

Heide-Jorgensen MP, Witting L, Jensen MV (2003) Inshore-offshore movements of two fin whales (*Balaenoptera physalus*) tracked by satellite off West Greenland. *Journal of Cetacean Research and Management* 5: 241-246.

Heide-Jorgensen MP, Simon MJ, Laidre KL (2007) Estimates of large whale abundance in Greenlandic waters from a ship-based survey in 2005. *Journal of Cetacean Research and Managemen,* 9: 95-104.

Heide-Jorgensen MP, Borchers DL, Witting L, Laidre KL, Simon MJ, Rosing-Asvid A, et al. (2008) Estimates of large whale abundance in West Greenland waters from an aerial survey in 2005. *Journal of Cetacean Research snd Management* 10: 119-129.

Heide-jorgensen MP, Laidre KL, Simon M, Burt ML, Borchers DL, Rasmussen M (2010) Abundance of fin whales in West Greenland in 2007. *Journal of Cetacean Research and Managemen,* 11: 83-88.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Henry A (2012) Cruise Results, HICEAS2010; NOAA Ship McArthur II; Hawaiian EEZ, August-December, 2010. *email correspondence from cruise data manager* 10/04/2012.

HWDT (2012) Hebrides Whale and Dolphin Trust fin whale sightings. *Hebridean Whale and Dolphin Trust online database* http://www.whaledolphintrust.co.uk/sightings-recent-sightings.asp.

Ireland DS, Koski WR, ThomasTA., Beland J, Reiser CM, Funk DW, et al. (2009) Updated distribution and abundance of cetaceans in the eastern Chukchi Sea in 2006-2008. *Report of the International Whaling Commission* SC/61/BRG4.

IWC (2012) International Whaling Commission (IWC) International Decade of Cetacean Research (IDCR) and Southern Ocean Whale and Ecosystem Research (SOWER) fin whale sightings: contributed dataset. *International Whaling Commission database*, Cambridge, England.

IWDG (2012) Irish Whale and Dolphin Group (IWDG) fin whale sightings. *Irish Whale and Dolphin Group (IWDG) online database* http://www.iwdg.ie/iscope/sightings.

Jackson A, Gerrodette T, Chivers S, Lynn M, Olson P, Rankin S (2004) Marine mammal data collected during a survey in the eastern tropical Pacific Ocean aboard the NOAA ships McArthur and David Starr Jordan, July 29 - December 10, 2003. *NOAA Technical Memorandum NMFS* NOAA-TM-NMFS-SWFSC-366.

Jackson A, Gerrodette T, Chivers S, Lynn M, Rankin S, Mesnick SL (2008) Marine mammal data collected during a survey in the eastern tropical Pacific Ocean aboard the NOAA ships McArthur and David Starr Jordan, July 28 - December 7, 2006. *NOAA Technical Memorandum NMFS* NOAA-TM-NMFS-SWFSC-421.

Jayasankar P, Krishnan AA, Rajagopalan M, Krishnakumar PK (2007) A note on observations on cetaceans in the western Indian sector of the Southern Ocean (20-56^{o}S and 45-57^{o}30'E), January to March 2004. *Journal of Cetacean Research and Management* 9: 263-267.

Jefferson TA, Schiro AJ (1997) Distribution of Cetaceans in the Gulf of Mexico. *Mammal Review* 27: 27-50.

Jones B, Rankin S, Archer A (2011) Fin whale acoustics as a tool to assess stock structure in the North Pacific *NOAA Technical Memorandum NMFS,* NOAA-TM-NMFS-SWFSC-485.

Jose Perez M, Thomas F, Uribe F, Flores M, Moraga R, Sepulveda MS (2006) Fin whales (*Balaenoptera physalus*) feeding on *Euphausia mucronata* in nearshore waters off North-Central Chile. *Aquatic Mammals* 32: 109.

Keller RW, Leatherwood S, Holt SJ (1982) Indian Ocean Cetacean Survery, Seychelle Islands, April through June 1980. *Report of the International Whaling Commission* 32: 503-514.

Kenney RD, Hyman MA, Winn HE (1985) Calculation of standing stocks and energetic requirements of the cetaceans of the northeast United States outer continental shelf. *NOAA Technical Memorandum NMFS,* NOAA-TM-NMFS-NEFSC-41.

Kerem D, Hadar N, Goffman A, Scheinin A, Kent R, Boisseau O, et al. (2012) Update on the cetacean fauna of the Mediterranean Levantine Basin. *The Open Marine Biology Journal* 6: 6-27.

Kingsley M, Reeves RR (1998) Aerial surveys of cetaceans in the Gulf of St. Lawrence in 1995 and 1996. *Canadian Journal of Zoology* 76: 1529-1550.

Kinzey D, Gerrodette T, Barlow J, Dizon AE, Perryman WL, Olson P, et al. (1999) Marine mammal data collected during a survey in the eastern tropical Pacific Ocean aboard the NOAA ships McArthur and David Starr Jordan and the UNOLS ship Endeavor July 31 - December 9, 1998. *NOAA Technical Memorandum NMFS,* NOAA-TM-NMFS-SWFSC-283.

Kinzey D, Gerrodette T, Barlow J, Dizon AE, Perryman WL, Olson P (2000) Marine mammal data collected during a survey in the eastern tropical Pacific Ocean aboard the NOAA ships McArthur and David Starr Jordan, July 28 - December 9, 1999. *NOAA Technical Memorandum NMFS,* NOAA-TM-NMFS-SWFSC-293.

Kinzey D, Gerrodette T, Dizon AE, Perryman WL, Olson P, Rankin S (2001) Marine mammal data collected during a survey in the eastern tropical Pacific Ocean aboard the NOAA ships McArthur and David Starr Jordan, July 28 - December 9, 2000. *NOAA Technical Memorandum,* NOAA-TM-NMFS-SWFSC-303.

Koltz A (2007) Changes in fin whale (*Balaenoptera physalus*) song over a forty-four year period in New England waters. *Honors Thesis in Biological Sciences*. College of Agriculture and Life Sciences, Cornell University, Ithaca, NY.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Lamont-Doherty/LGL (2012) Fin whale sightings collected by observers during marine geophysical seismic research surveys by Lamont-Doherty Earth Observatory, LGL Limited and the National Science Foundation: contributed dataset. *OBIS-SEAMAP*, Data downloaded June 2012. http://seamap.env.duke.edu/species/180527.

Laran S, Drouot-Dulau V (2007) Seasonal variation of striped dolphins, fin- and sperm whales' abundance in the Ligurian Sea (Mediterranean Sea). *Journal of the Marine Biological Association of the United Kingdom* 87: 345-352.

Laran,S, Joiris C, Gannier A, Kenney RD (2010) Seasonal estimates of densities and predation rates of cetaceans in the Ligurian Sea, northwestern Mediterranean Sea: an initial examination. *Journal of Cetacean Research and Management* 11: 31-40.

Larsen F, Martin AR, Nielsen R (1989) North Atlantic Sightings Survey 1987: Report of the Greenland Aerial Survey. *Report of the International Whaling Commission* 39: 443-446.

Lawson JW, Gosselin JF (2009) Distribution and preliminary abundance estimates for cetaceans seen during Canada's marine megafauna survey – a component of the 2007 TNASS. *DFO Canadian Science Advisory Secretariat Research Document* 031: 1-28.

Lipej L, Dulcic J,Krystufek B (2004) On the occurance of the fin whale (*Balaenoptera physalus*) in the northern Adriatic. *Journal of the Marine Biological Association of the United Kingdom* 84: 861-862.

Ljungblad, DK, Moore SE, Van Schoik DR, Winchell CS (1982) Aerial surveys of endangered whales in the Beaufort, Chukchi and northern Bering Seas. *NOSC Technical Report 486.* Washington, DC.

Ljungblad DK, Moore SE, Clarke J, Bennett JC (1988) Distribution, abundance, behavior and bioacoustics of endangered whales in the western Beaufort and northeastern Chukchi Seas, 1979-1987. *OCS Study*, MMS-87-0122, Anchorage, AK.

Macleod K, Simmonds MP, Murray E (2006) Abundance of fin (*Balaenoptera physalus*) and sei whales (*B. borealis*) amid oil exploration and development off northwest Scotland. *Journal of Cetacean Research and Management* 8: 247-254.

Mangels KF, Gerrodette T (1994) Report of cetacean sightings during a marine mammal survey in the eastern tropical Pacific Ocean and the Gulf of California aboard the NOAA ships MacArthur and David Star Jordan, July 28-November 6, 1993. *NOAA Technical Memorandum NMFS*, NOAA-TM-NMFS-SWFSC-211.

MARINElife/ARC (2012) MARINElife and Atlantic Research Coalition (ARC) fin whale sightings: contributed dataset. *MARINElife database*. info@marine-life.org.uk.

Marini L, Consiglio C, Angradi A, Catalano B, Sanna A, Valentini T (1996) Distribution, abundance and seasonality of cetaceans sighted during scheduled ferry crossings in the central Tyrrhenian Sea: 1989-1992. *Italian Journal of Zoology* 63: 381-388.

Matsuoka K, Hakamada T, Kiwada H, Murase H, Nishiwaki M. (2006) Distributions and standardized abundance estimates for humpback, fin and blue whales in the Antarctic Areas IIIE, IV, V, and VIW (35°E-145°S), south of 60°S. *Report of the International Whaling Commission* SC/D06/J7.

Matsuoka K, Kiwada, H, Fujise Y, Miyashita, T (2009) Distribution of blue (*Balaenoptera musculus*), fin (*B. physalus*), humpback (*Megaptera novaeangliae*) and north pacific right (*Eubalaena japonica*) whales in the western North Pacific based on JARPN and JARPN II sighting surveys (1994 to 2007). *IWC Scientific Committee Paper* SC/J09/JR35.

Matsuoka K, Hakala S, Woo Kim H, Aki M, Shinyasiki Y (2011) 2010 ICW/Japan Joint Cetacean Sighting Survey Cruise in the North Pacific. *IWC Scientific Committee Paper* SC/63/O5.

Maynard M (2011) Researchers nab rarely tagged fin whale in Uganik. *Kodiak Daily Mirror* 1/10/2011.

Maze-Foley K, Mullin KD (2006) Cetaceans of the oceanic northern Gulf of Mexico: distributions, groups sizes and interspecific associations. *Journal of Cetacean Research and Management* 8: 203-214.

McDonald MA (2006) An acoustic survey of baleen whales off Great Barrier Island, New Zealand. *New Zealand Journal of Marine and Freshwater Research* 40: 519-529.

McDonald MA, Fox CG (1999) Passive acoustic methods applied to fin whale population density estimation. *Journal of the Acoustical Society of America* 105: 2643-2651.

McDonald MA, Hildebrand JA, Webb SC (1995) Blue and Fin Whales Observed on a Sea Floor Array in the Northeast Pacific. *Journal of the Acoustical Society of America* 98: 712-721.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Mikkelsen B, Bloch D, Heide-Jorgensen MP (2001) A note on movements of two fin whales (*Balaeanoptera physalus*) tracked by satellite telemetry from the Faroe Islands in 2001. *Journal of Cetacean Research and Management* 9: 115-120.

Miller BS, Kelly N, Double MC, Childerhouse SJ, Laverick S, Gales,N (2012) Cruise Report on SORP 2012 blue whale voyages: Development of acoustic methods. *IWC Scientific Committee Paper* SC/64/SH11.

Miyashita T (2004) Report of the Japanese sighting survey under the Japan/Korea joint project in 2003. *Report of the International Whaling Commission* SC/56/RMP2.

Miyashita, T. (2007) Cruise report of the IO sighting survey in the northern Sea of Japan in 2006. *Report of the International Whaling Commission*, SC/59/NPM3.

Miyashita T, Kishiro T, Higashi N, Sato F, Mori K, Kato H (1996) Winter Distribution of Cetaceans in the Western North Pacific Inferred from Sighting Cruises 1993-1995. *Report of the International Whaling Commission* 46: 438-442.

Miyashita T, Yoshida H (2003) Report of Japanese sighting survey under the Japan/Korea joint project in 2002. *Report of the International Whaling Commission* SC/55/RMP5.

Miyashita T, Vladimirov VA, Kato H (2005) Current status of cetaceans in the Sea of Okhotsk (S3-2489) *PICES Fourteenth Annual Meeting*. PICES (North Pacific Marine Science Organization), Vladivostock, Russia.

Mizroch SA, Sanpera C (1984) A preliminary estimate of abundance of fin whales in the Atlantic waters near Spain. *Report of the International Whaling Commission* 34: 395-398.

Mizroch SA, Rice DW, Zwiefelhofer D, Waite J, Perryman WL (2009) Distribution and movements of fin whales in the North Pacific Ocean. *Mammal Review* 39:193-227.

MMO/JNCC (2012) Seismic survey opportunistic sightings of fin whales: contributed dataset. *Joint Nature Conservation Committee Marine Mammal Observer database*, Peterborough, England.

Mobley JR, Smultea M, Norris T, Weller D (1996) Fin whale sighting north of Kaua'i, Hawai'i. *Pacific Science* 50: 230-233.

Moore, M, Steiner L, Jann B (2003) Cetacean surveys in the Cape Verde Islands and the use of cookiecutter shark bite lesions as a population marker for fin whales. *Aquatic Mammals* 29: 383-389.

Moore MJ, Berrow SD, Jensen BA, Carr P, Sears R, Rowntree VJ, et al. (1999) Relative abundance of large whales around South Georgia (1979-1998). *Marine Mammal Science* 15: 1287-1302.

Moore SE, Stafford KM, Dahlheim ME, Fox CG, Braham HW, Polovina JJ, et al. (1998) Seasonal variation in reception of fin whale calls at five geographic areas in the north Pacific. *Marine Mammal Science* 14: 617-627.

Moore SE, Dahlheim ME, Stafford KM, Fox CG, Braham HW, McDonald MA, et al. (1999) Acoustic and Visual Detection of Large Whales in the Eastern North Pacific Ocean. *NOAA Technical Memorandum NMFS* NMFS-AFSC-107.

Moore SE, Waite JM, Friday NA, Honkalehto T (2002) Cetacean distribution and relative abundance on the central eastern and the southeastern Bering Sea shelf with reference to oceanographic domains. *Progress in Oceanography* 55: 249-261.

Moore SE, Stafford KM, Melling H, Berchok C, Wiig O, Kovacs KM, et al. (2012) Comparing marine mammal acoustic habitats in Atlantic and Pacific sectors of the High Arctic: year-long records from Fram Strait and the Chukchi Plateau. *Polar Biology* 35: 475-480.

Mullin KD, Fulling GL (2003) Abundance of cetaceans in the southern U.S. Atlantic ocean during summer 1998. *Fishery Bulletin* 101: 603-613.

Mullin KD, Hoggard W, Roden C, Lohoefener RR, Rogers CM (1994) Cetaceans on the upper continental slope in the north-central Gulf of Mexico. *Fishery Bulletin* 92, 773-786.

Nieukirk SL, Mellinger DK, Moore SE, Klinck K, Dziak RP, Goslin J (2012) Sounds from airguns and fin whales recorded in the mid-Atlantic Ocean, 1999-2009. *Journal of the Acoustical Society of America* 131: 1102-1112.

NMML/CHAOZ (2011) CHAOZ (Chukchi Acoustic, Oceanographic and Zooplankton) Study: 2011 Cruise Report. *Bureau of Land Management: Interagency Agreement Number M09PG00016 (AKC 083)*.

Notarbartolo Di Sciara G, Zanardelli M, Jahoda M, Panigada S, Airoldi S (2003) The fin whale *Balaenoptera physalus* (L. 1758) in the Mediterranean Sea. *Mammal Review* 33: 105-150.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Oien N (2009) Distribution and abundance of large whales in Norwegian and adjacent waters based on ship surveys 1995-2001. *NAMMCO Scientific Publications* 7: 31-48.

Palka D (2006) Summer Abundance Estimates of Cetaceans in the US North Atlantic Navy Operating Areas. *Northeast Fisheries Science Center Reference Document 06-03.*

Panigada S, Lauriano G, Burt L, Pierantonio N, Donovan G (2011) Monitoring Winter and Summer Abundance of Cetaceans in the Pelagos Sanctuary Northwestern Mediterranean Sea) Through Aerial Surveys. *PLOS ONE* 6: e22878.

Perez-Vallazza C, Alvarez-Vazquez R, Cardona L, Pintado C, Hernandez-Brito J (2008) Cetacean diversity at the west coast of La Palma Island (Canary Islands). *Journal of the Marine Biological Association of the United Kingdom* 88: 1289-1296.

PIFSC (2007) Cruise Report: NOAA Ship *Oscar Elton Sette*, Cruise OES-07-02 (OES-50): Northwestern Hawaiian Islands. *Pacific Islands Fisheries Science Center Cruise Report* 4.

PIFSC (2009) Cruise Report: NOAA Ship *Oscar Elton Sette*, Cruise 09-01 (SE-69); Main Hawaiian Islands. *Pacific Islands Fisheries Science Center Cruise Report* 11.

PIFSC (2011) Cruise Report: NOAA Ship *Oscar Elton Sette*, Cruise SE-11-08; Palmyra Atoll Exclusive Economic Zone (EEZ). *Pacific Islands Fisheries Science Center Cruise Report* 11.

PIFSC (2012) Cruise Report: NOAA Ship *Oscar Elton Sette*, Cruise SE-12-03; Palmyra Atoll Exclusive Economic Zone (EEZ). *Pacific Islands Fisheries Science Center Cruise Report* 10.

Pike DG, Gunnlaugsson T, Víkingsson GA, Mikkelsen B (2008) Estimates of the abundance of fin whales (*Balaenoptera physalus*) from the T-NASS Icelandic and Faroese ship surveys conducted in 2007. *IWC Scientific Committee Paper* SC/60/PFI13-revised.

Pikesley SK, Witt MJ, Hardy T, Loveridge J, Williams R et al. (2011) Cetacean sightings and strandings : evidence for spatial and temporal trends? *Journal of the Marine Biological Association of the United Kingdom* 92: 1809-1820.

POPA (2012) Fin whale sightings data in OBIS-SEAMAP contributed by POPA (Azores Fisheries Observer Program). *OBIS-SEAMAP* Data downloaded June 15, 2012. http://seamap.env.duke.edu/species/18052727.

Potter JR, Thillet M, Douglas C, Chitre MA, Doborzynski S, Seekings PJ (2007) Visual and passive acoustic marine mammal observations and high-frequency seismic source characteristics recorded during a seismic survey. *IEEE Journal of Oceanic Engineering* 32: 469-483.

RCHP (2012) Russian Cetacean Habitat Project fin whale sightings from Poludennaya Bay, Beringa Island 2007-2009; contributed dataset. *OBIS-SEAMAP* Data downloaded June 15, 2012. http://seamap.env.duke.edu/species/18052727.

Reiner F, Dos Santos ME, Weinzel FW (1996) Cetaceans of the Cape Verde Islands. *Marine Mammal Science* 12: 434-443.

Ridoux V, Certain G, Doremus G, Laran S, Van Canneyt O, Watremez P (2010) Mapping diversity and relative density of cetaceans and other pelagic megafauna across the tropics: general design and progress of the REMMOA aerial surveys conducted in the French EEZ and adjacent waters. *IWC Scientific Committee Paper* SC/62/E14.

Sadove SS (1992). Occurance and Distribution of Fin Whales (*Balaenoptera physalus*) in the New York Bight 1981-1989. *Report of the International Whaling Commission* 42: 770-776.

Sanpera C, Jover L (1985) Population Estimates of Fin Whales Inhabiting Atlantic Waters Near Spain. *Report of the International Whaling Commission* 35: 353-356.

Sanpera C, Grau E, Jover L, Recasens E, Aguilar A, Olmos M, et al. (1985) Report of the 'Ballena 3' Fin Whale Marking and Sightings Cruise off Spain, 1983. *Report of the International Whaling Commission* 35: 495-498.

Sanpera C, Jover L (1986) Results of the 'Ballena 4' Fin Whale Sighting Cruise. *Report of the International Whaling Commission* 36: 253-256.

Sanpera C, Jover L (1989) Density Estimate of Fin Whales in the North Atlantic fromn NASS-87 Spanish Cruise Data. *Report of the International Whaling Commission* 39: 427-430.

SCANS (2012) Small cetaceans in the European Atlantic and North Sea (SCANS) survey fin whale sightings: contributed dataset. *Sea Mammal Research Unit (SMRU),* School of Biology, University of St. Andrews, Scotland, UK.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

SCANS-II (2012) Second Small cetaceans in the European Atlantic and the North Sea (SCANS-II) survey fin whale sightings: contributed dataset. *Sea Mammal Research Unit (SMRU),* School of Biology, University of St. Andrews, Scotland, UK.

Scheidat M, Friedlaender AS, Kock K, Lehnert L, Boebel O, Roberts J, et al. (2011) Cetacean surveys in the Southern Ocean using icebreaker-supported helicopters. *Polar Biology* 34: 1513-1522.

SEFSC (1981) Cruise Results NOAA Ship FRS Oregon II Cruise No. 120; 8/14 - 9/2/81; Gulf of Campeche. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (1985) Cruise Reports NOAA Ship Oregon II Cruise 152; 4/23 - 5/28/85; U.S. mid-Atlantic survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (1992) Cruise Results NOAA Ship Oregon II Cruise No. 199; 17 April - 8 june 1992; Shipboard Visual Survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (1993) Cruise Results NOAA Ship Oregon II Cruise 93-01 (23); 01/05 - 02/13/93; Marine Mammals/Ichthyoplankton Survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (1994) Oregon II Cruise 212 (94-04); August 16- September 9, 1994. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (1995) Cruise Results NOAA Ship Oregon II Cruise 215 (95-01); 26 January - 11 March 1995. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (1999) Cruise Results NOAA Ship Gordon Gunter Cruise 99-02 (3); 31 August - 30 September 1999; Fall southeast area monitoring and assessment program (SEAMAP) Icthyoplankton and cetacean survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2001a) Cruise Results NOAA Ship Gordon Gunter Cruise GU-01-01 (14); 28 August - 29 September 2001; Fall southeast area monitoring and assessment program (SEAMAP) ichthyoplankton survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2001b) Cruise Results NOAA Ship Gordon Gunter Cruise GU-01-01 (11). *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL, 48.

SEFSC (2002) Cruise Results NOAA Ship Gordon Gunter Cruise GU-02-01; 6 February - 8 April 2002; Mid Atlantic Cetacean Survey ("MACS"). *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL, 1-40.

SEFSC (2003) Cruise Results NOAA Ship Gordon Gunter Cruise GU-03-02 (023); 12 June - 18 August 2003; A study of oceanic cetaceans in the northern Gulf of Mexico. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2004) Cruise Results NOAA Ship Gordon Gunter Cruise GU-04-02 (027); a study of sperm whales and other oceanic cetaceans in the northern Gulf of Mexico. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2005) Cruise Results NOAA Ship Gordon Gunter Crusie GU-05-03; 14 June - 16 August 2005; A survey of the U.S. mid-Atlantic to collect biospy samples for analysis of population structure in bottlenose dolphins and whales. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2006) Cruise Results NOAA Ship Gordon Gunter Cruise GU-06-03 (038); 19 June 2007 - 17 August 2006: Mid-Atlantic Cetacean habitat survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2007) Cruise Results NOAA Ship Gordon Gunter Cruise GU-07-04 (044); 14 June 2007- 14 August 2007: A cetacean abundance and biopsy sampling survey of the Gulf of Mexico continental shelf with an emphasis on bottlenose dolphins. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2009) Cruise Results NOAA Ship Gordon Gunter Cruise GU-09-03 (054) 10 June 2009 - 13 August 2009; A cetacean abundance and distribution Survey of the Gulf of Mexico deep water (>200m) with an emphasis on sperm whales and their prey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

SEFSC (2011) Cruise Results NOAA Ship Gordon Gunter Cruise GU-11-02 (063) 21 June - 2 August 2011; Southeast Atlantic Marine Mammal Assessment Survey. *SEFSC Cruise Reports,* Southeast Fisheries Science Center, Miami, FL.

Siciliano S, Moura J, Emin-Lima R, Arcoverde D, Sousa M, Martins B, et al. (2011) Large baleen whales on the coast of Brazil: a review of post 1997 data on strandings and sightings. *IWC Scientific Committee Paper* SC/63/SH2.

Silva M. (2012) Azores Island area fin whale sightings 2001-2011. Contributed dataset. *Institute of Marine Research/Department of Oceanography and Fisheries of the University of the Azores (IMAR-DOP/UAç).*

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Simon M, Stafford KM, Beedholm K, Lee CM, Madsen PT (2010) Singing behavior of fin whales in the Davis Strait with implications for mating, migration, and foraging. *Journal of the Acoustical Society of America* 128: 3200-3210.

Sirovic A, Hildebrand JA, Wiggins SM, McDonald MA, Moore SE, Thiele D (2004) Seasonality of blue and fin whale calls and the influence of sea ice in the Western Antarctic Peninsula. *Deep-Sea Research Part II* 51: 2327-2344.

Sirovic A, Hildebrand JA, Wiggins SM, Thiele D. (2009) Blue and fin whale acoustic presence around Antarctica during 2003 and 2004. *Marine Mammal Science* 25: 125-136.

Smith BD, Ahmed B, Mowgli RM, Strindberg S (2008) Species occurance and distributional ecology of nearshore cetaceans in the Bay of Bengal, Bangladesh, with abundance estimates for Irrawaddy dolphins *Orcaella brevirostris* and finless porpoises *Neophocaena phocaenoides*. *Journal of Cetacean Research and Management* 10: 45-58.

Smith BD, Than Tun, M (2008) A note on the species occurance, distributional ecology and fisheries interactions of cetaceans in the Mergui (Myeik) Archipelago, Myanmar. *Journal of Cetacean Research and Management* 10: 37-44.

Stafford KM, Nieukirk SL, Fox CG (1999) Low-frequency whale sounds recorded on hydrophones moored in the eastern tropical Pacific. *Journal of the Acoustical Society of America* 106: 3687-3698.

Stafford KM, Mellinger DK, Moore SE, Fox CG (2007) Seasonal variability and detection range modeling of baleen whales in the Gulf of Alaska, 1999-2002. *Journal of the Acoustical Society of America*, 122: 3378-3391.

Stafford KM, Moore SE, Stabeno PJ, Holliday DV, Napp JM, Mellinger DK (2010) Biophysical Ocean Observations in the Southeastern Bering Sea. *Geophysical Research Letters* 37: L02606 (doi:10.1029/2009GL040724).

Stewart BS, Karl SA, Yochem PK, Leatherwood S, Laake JL (1987) Aerial surveys for cetaceans in the former Akutan, Alaska, whaling grounds. *Arctic* 40: 33-42.

SWA/JNCC (2012) Southwest Atlantic Ocean (Falkland Islands) fin whale sightings. *Joint Nature Conservation Committee database,* Peterborough, England.

Swartz S, Burks C (2000) Cruise Results Windwards Humpback (Megaptera novaeangliae) Survey: NOAA Ship Gordon Gunter Cruise GU-00-01; 9 February to 3 April 2000. *NOAA Technical MemorandumNMFS* NMFS-SEFSC-438.

SWF (2012) Sea Watch Foundation fin whale sightings: contributed dataset. *Sea Watch Foundation (United Kingdom) database,* Milton Keynes, UK.

SWFSC/Research (2012) Southwest Fisheries Science Center research vessel fin whale sightings. *Contributed dataset NOAA database*. Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA.

SWFSC/TVOD. (2011) Tuna Vessel Observer Data fin whale sightings. *Contributed dataset NOAA database*. Southwest Fisheries Science Center, National Marine Fisheries Service, La Jolla, CA.

Thiele D, Chester ET, Moore SE, Sirovic A, Hildebrand JA, Friedlander AS (2004) Seasonal variability in whale encounters in the Western Antarctic Peninsula. *Deep Sea Research Part II* 51: 2311-2325.

Thompson PO, Friedl WA (1982) A long term study of low frequency sounds from several species of whales off Oahu, Hawaii. *Cetology* 45: 1-19.

Treacy SD (2002) Aerial surveys of Endangered Whales in the Beaufort Sea, Fall 2000. *MMS OCS Study* MMS 2002-014.

Troy D (1992) Seabird and marine mammal use of the Unimak Pass Region. In *Proceedings of the Forth Information Transfer Meeting: Conference Proceedings* (Ed. by B.A.O. Region). U.S. Department of the Interior Minerals Management Service: Alaska OCS Region.

Tynan CT (2004) Cetacean populations on the SE Bering Sea shelf during the late 1990s: implications for decadal changes in ecosystem structure and carbon flow. *Marine Ecology-Progress Series* 272: 281-300.

Victoria Times Colonist (2011) Fin whale sightings in Robson Bight, Vancourver Island 9/21/2011; verified by M. Fournier, J. Towers. *Victoria Times Colonist newspaper.*

Vikingsson G, Pike DG, Desportes G, Oien N, Gunnlaugsson T, Bloch D (2009) Distribution and abundance of fin whales (*Balaenoptera physalus*) in the Northeast and Central Atlantic as inferred from the North Atlantic Sightings Surveys 1987-2001. *NAMMCO Scientific Publications* 7: 49-72.

Villa E, Hart JD, Baker AC, Rossin V (2011) Fin whales feeding on Northern Krill off Pico Island (Azores) during spring migration. *Abstract: Annual Conference of the European Cetacean Society*. March 20-23, 2011.

Visser F, Hartman KL, Pierce GJ, Valavanis VD, Huisman J (2011) Timing of migratory baleen whales at the Azores in relation to the North Atlantic spring bloom. *Marine Ecology Progress Series* 440: 267-2011.

Appendix S1. Data sources for fin whale (*Balaneoptera physalus*) distribution maps. DPS = detected presence study, LTS = line transect study, AD = acoustic detections,OS = opportunistic sightings, MR = mark/recapture, ST = satellite tags.

Wade PR, Gerrodette T (1993) Estimates of Cetacean Abundance and Distribution in the Eastern Tropical Pacific. *Report of the International Whaling Commission* 43: 447-493.

Waring GT, Nottestad L, Olsen E, Skov H, Vikingson G. (2008) Distribution and density estimates of cetaceans along the mid-Atlantic Ridge during summer 2004. *Journal of Cetacean Research and Management* 10: 137-146.

Watkins WA, Tyack PL, Moore SE, Bird J (1987) The 20-Hz signals of finback whales (*Balaenoptera physalus*). *Journal of the Acoustical Society of America* 82: 1901-1912.

Weir CR (2007) Occurrence and distribution of cetaceans off northern Angola, 2004/05. *Journal of Cetacean Research and Management* 9: 225-239.

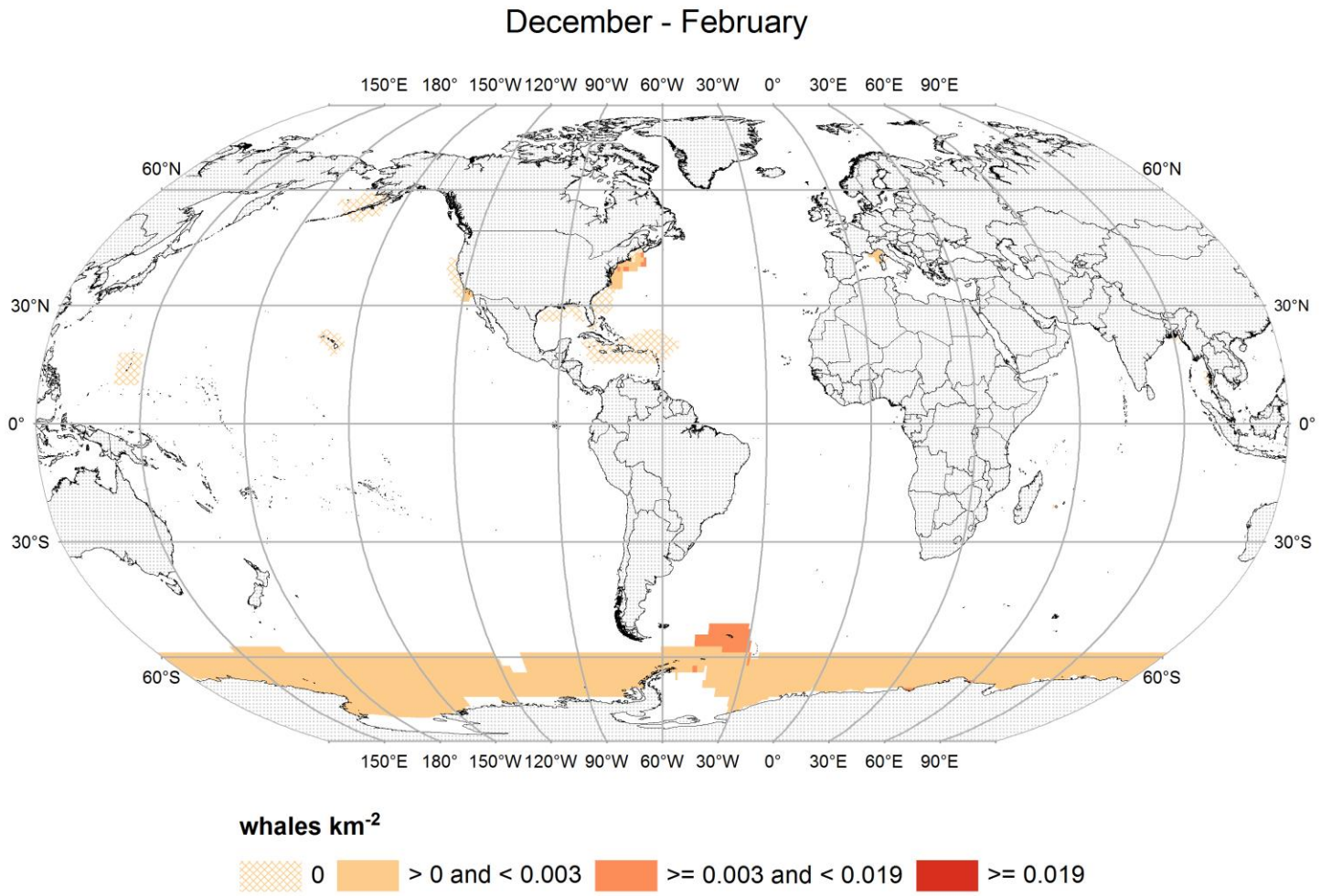
White RW, Gillon KW, Black AD, Reid JB (2002) The distribution of seabirds and marine mammals in Falkland Island waters. *Joint Nature Conservation Committee,* Peterborough, England.

Wilcock WS, Thomson RE (2009) Investigating the relationship between fin and blue whale locations, zooplankton concentrations, and hydrothermal venting on the Juan de Fuca Ridge. *ONR Report* doi:http://www.onr.navy.mil/reports/FY09/mb2wilco.pdf.

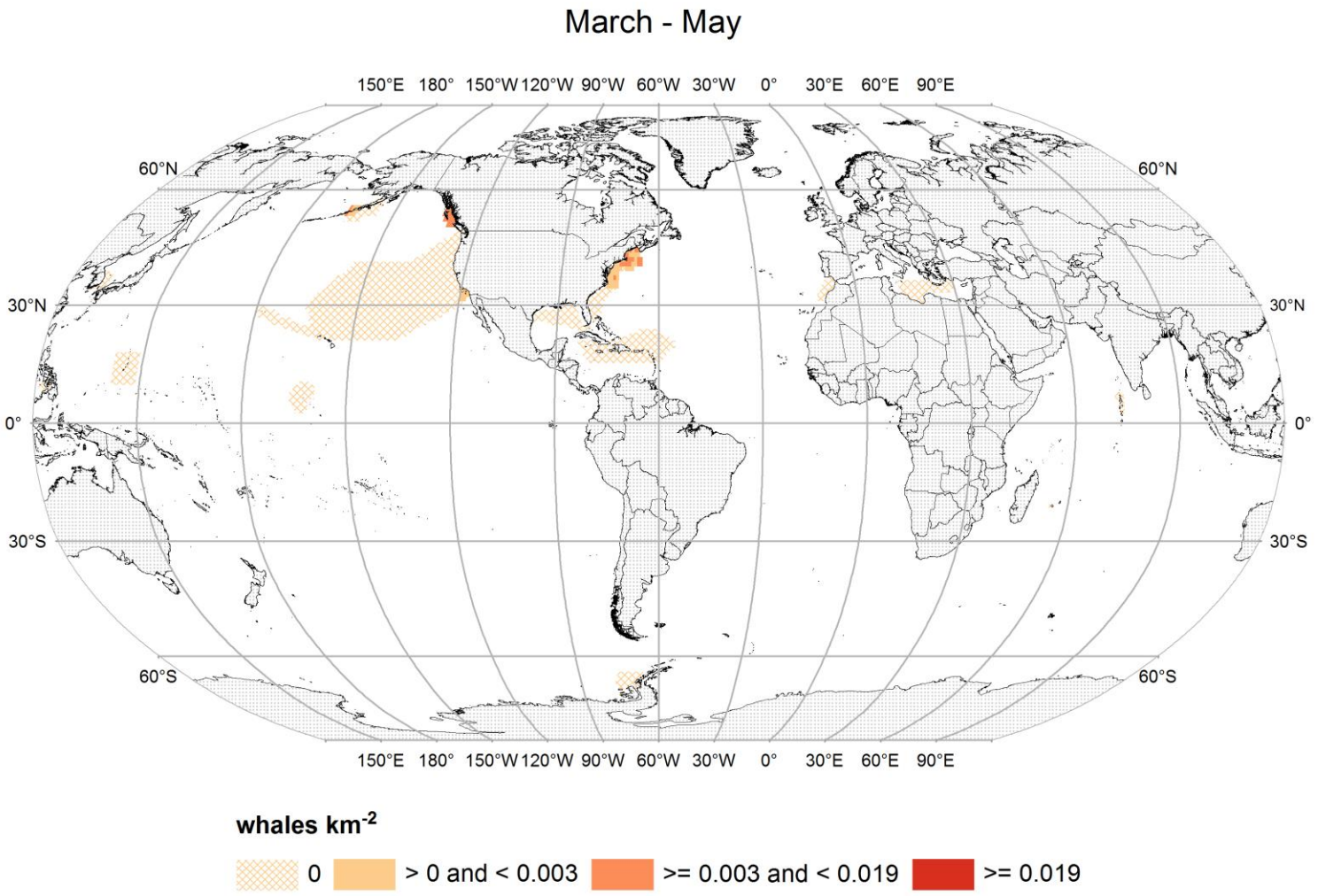
Williams R, Thomas L (2007) Distribution and abundance of marine mammals in the coastal waters of British Columbia, Canada. *Journal of Cetacean Research and Management* 9: 15-28.

Yong-Rock A, Choi S, Moon D, Kim H, Park J (2011) Cruise report of the Korean cetacean sighting survey in the East Sea, May-June 2010. *IWC Scientific Committee Paper* SC/63/RMP27.

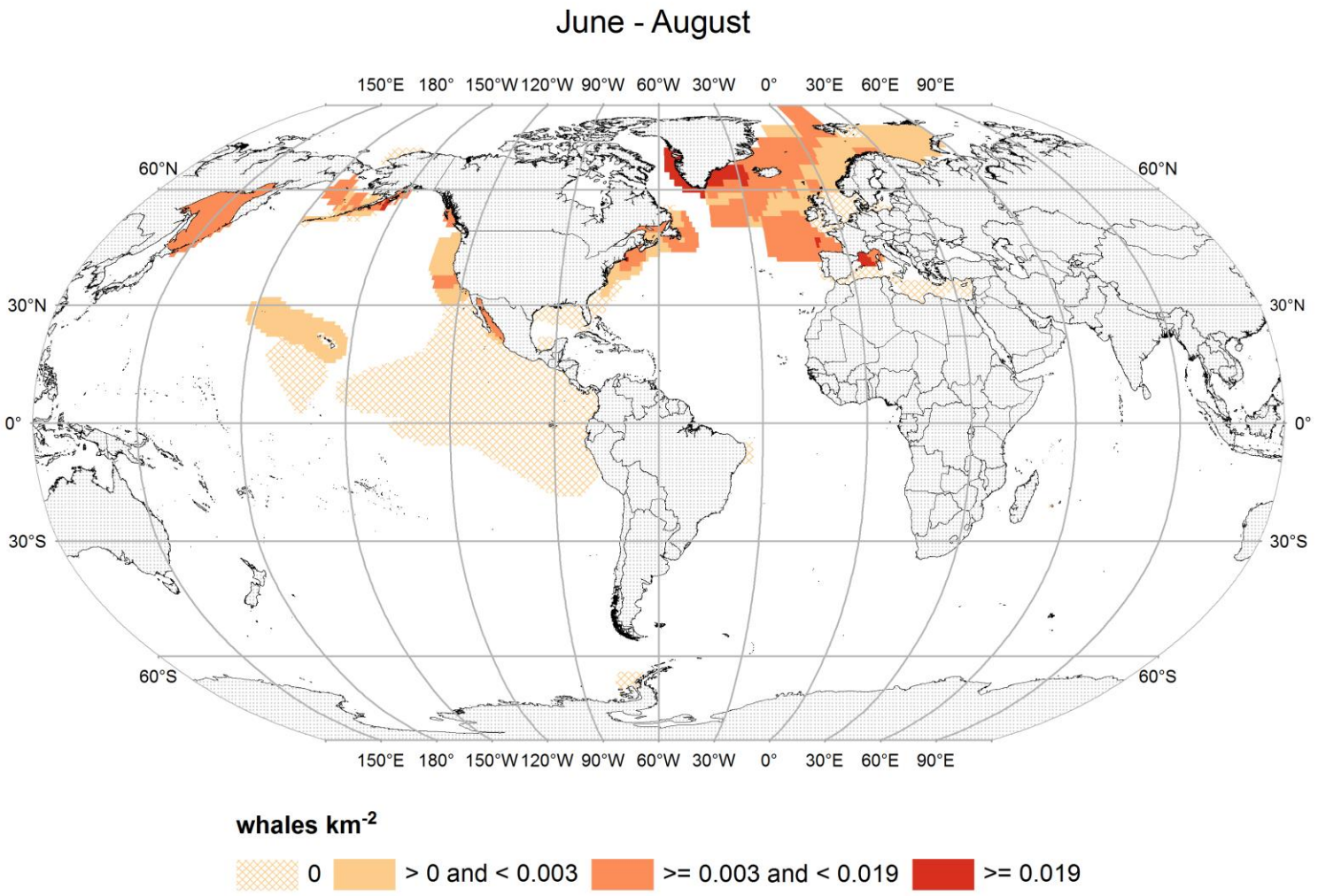
Zerbini AN, Waite JM, Laake JL, Wade PR (2006) Abundance, trends and distribution of baleen whales off Western Alaska and the central Aleutian Islands. *Deep-Sea Research Part I, Oceanographic Research Papers* 53: 1772-1790.



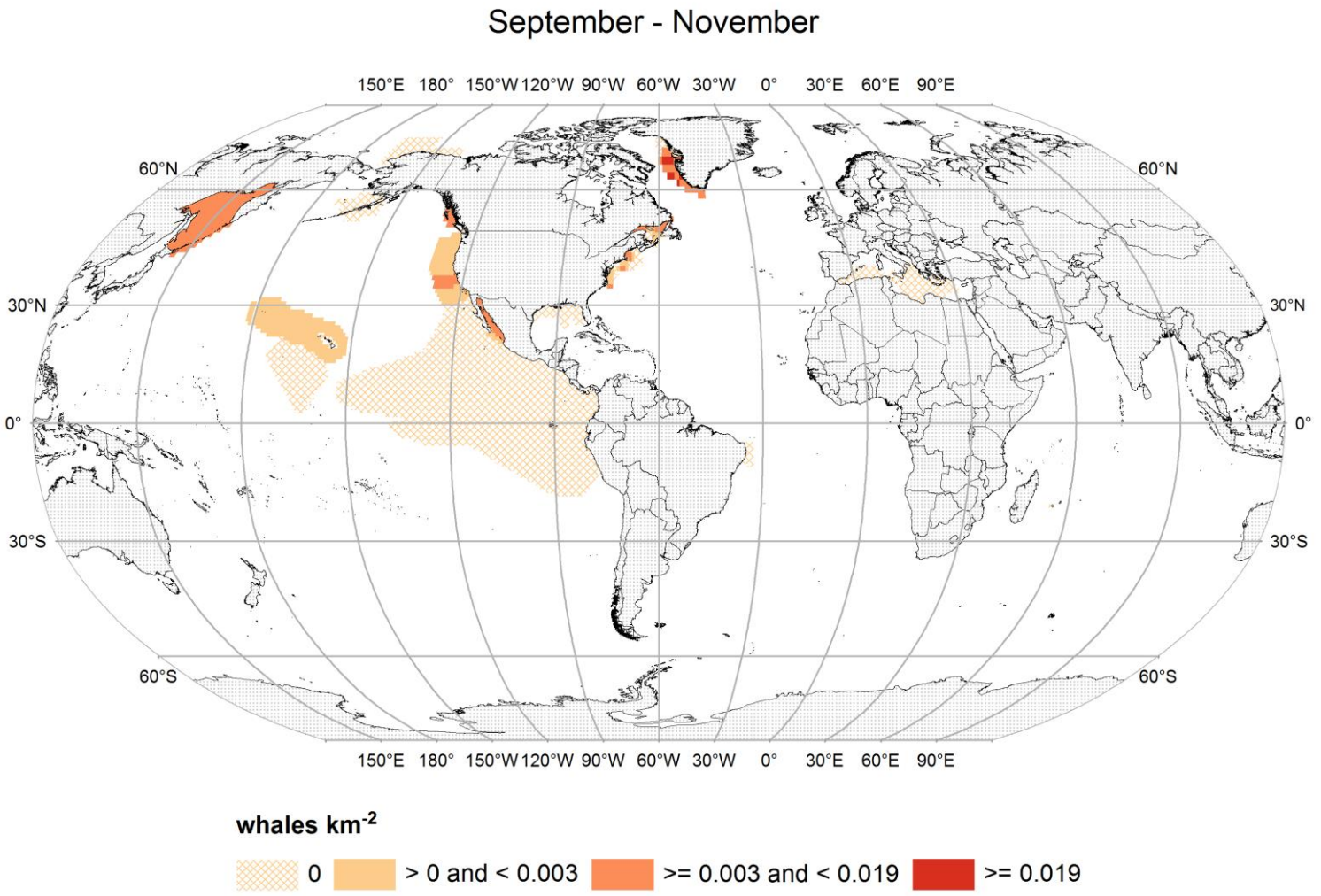
Appendix S2. Higher resolution version of Figure 1a: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) average seasonal density (fin whales km^{-2}) in December-February.



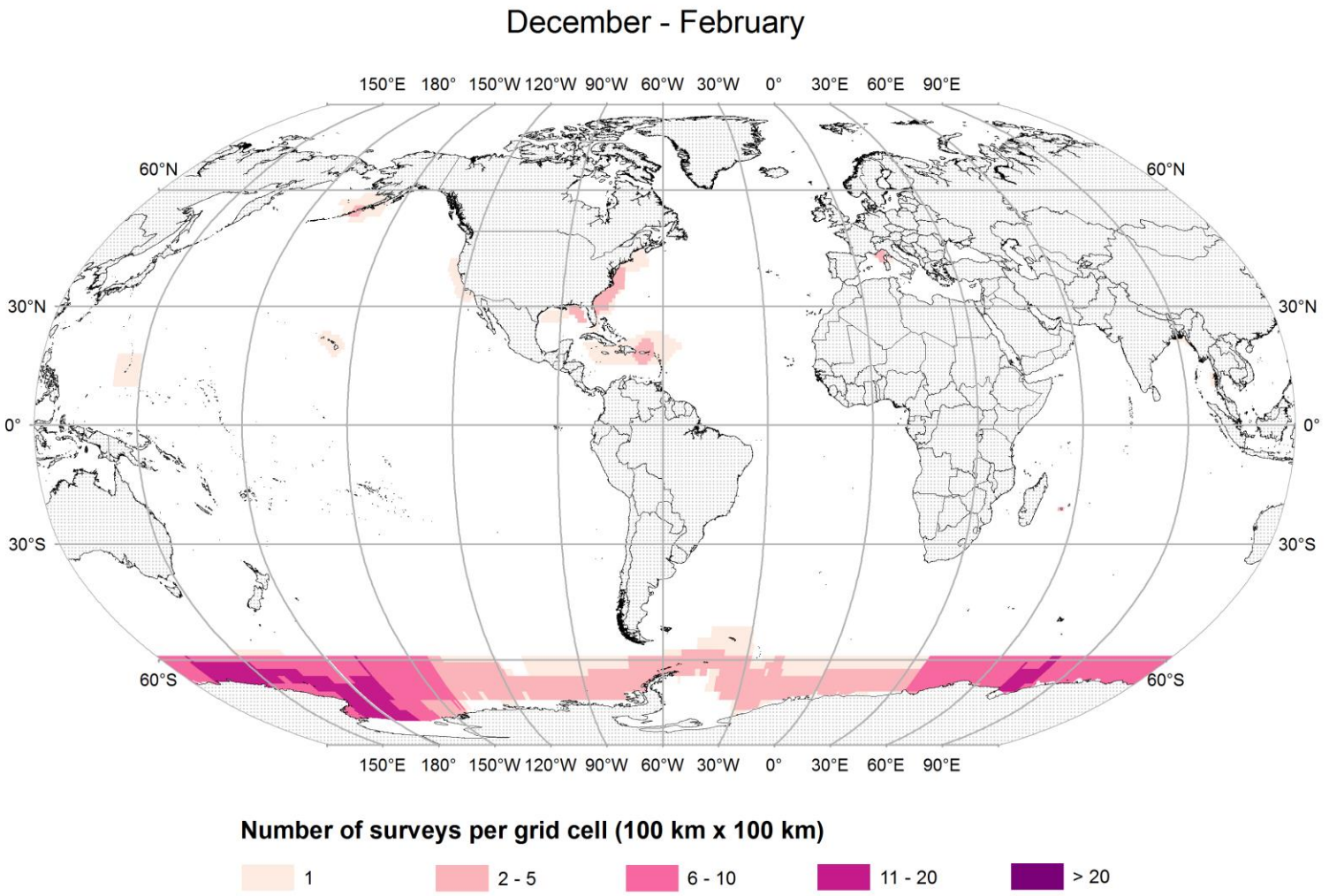
Appendix S3. Higher resolution version of Figure 1b: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) average seasonal density (fin whales km^{-2}) in March-May.



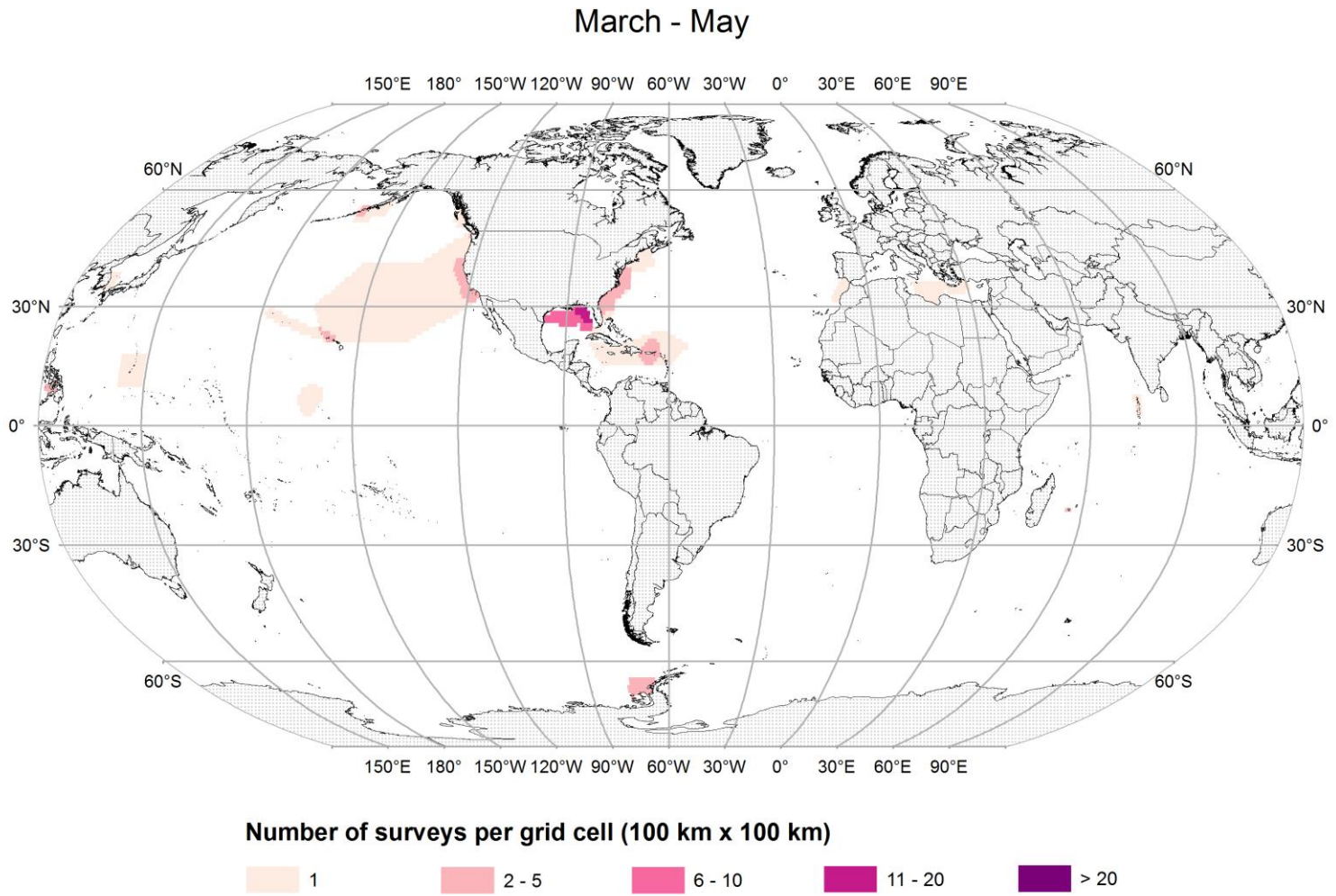
Appendix S4. Higher resolution version of Figure 1c: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) average seasonal density (fin whales km^{-2}) in June-August.



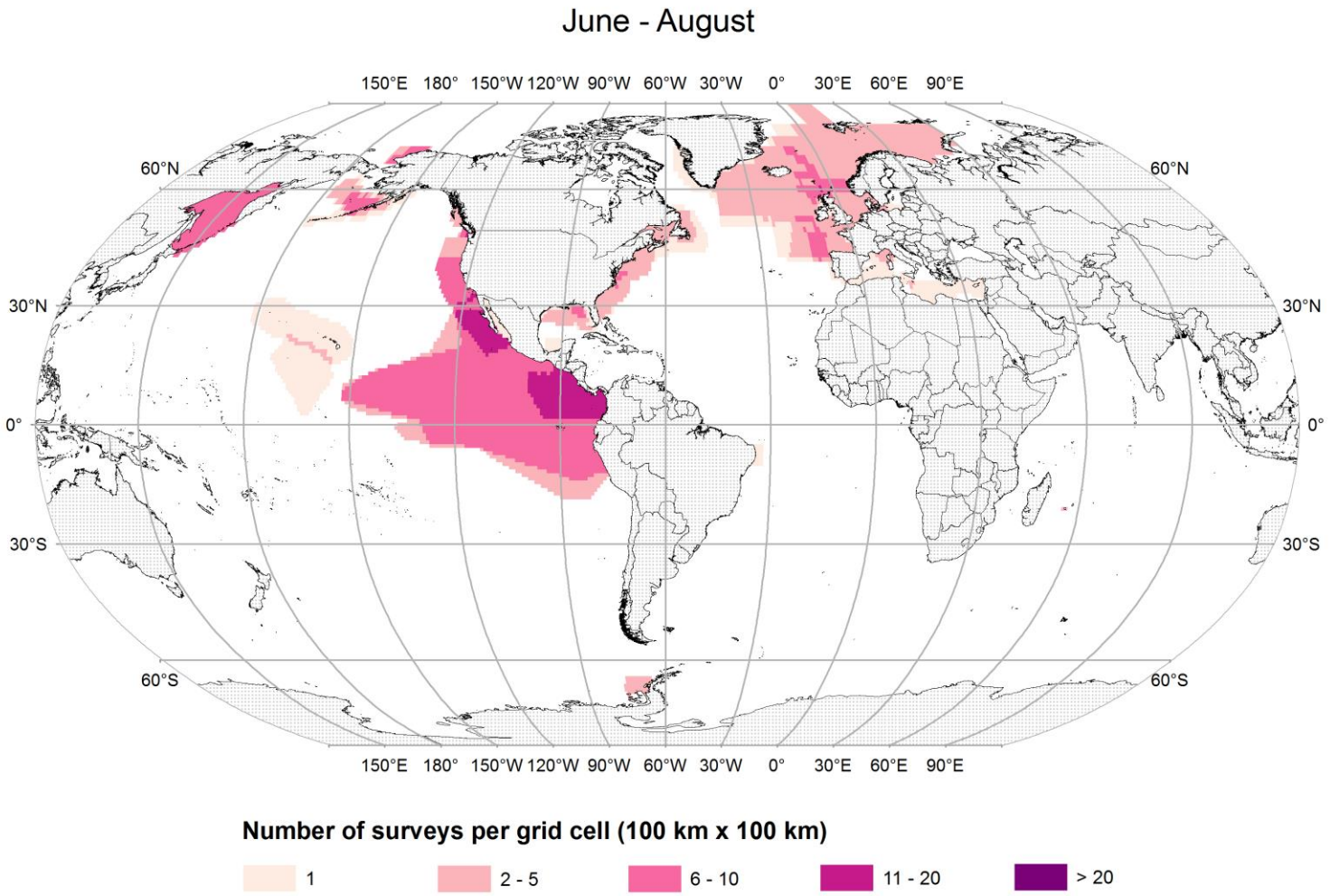
Appendix S5. Higher resolution version of Figure 1d: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) average seasonal density (fin whales km^{-2}) in September-November.



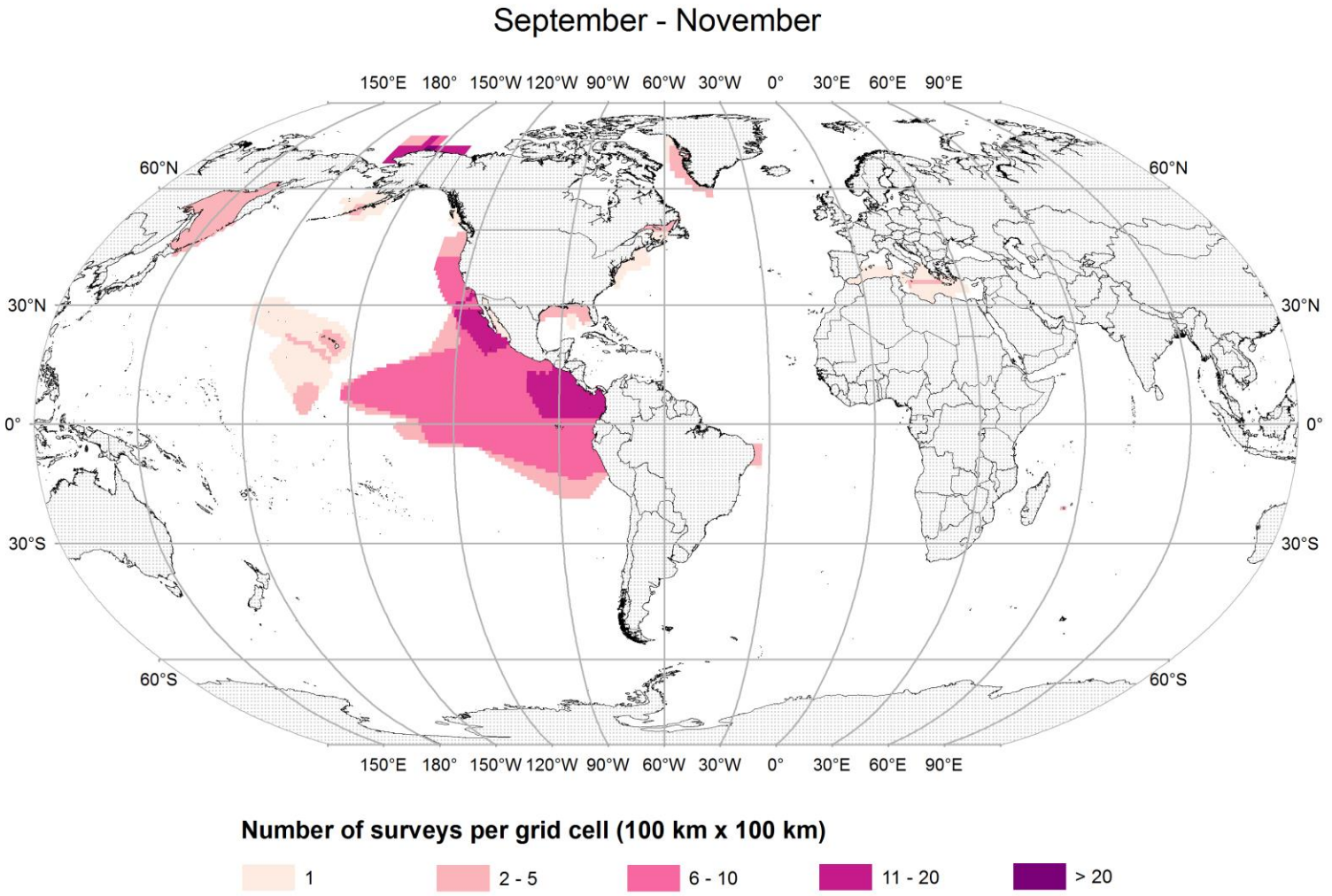
Appendix S6. Higher resolution version of Figure 2a: post-whaling era (1980-2012) seasonal line-transect survey effort (number of surveys per 100km x 100km grid cell) in December-February.



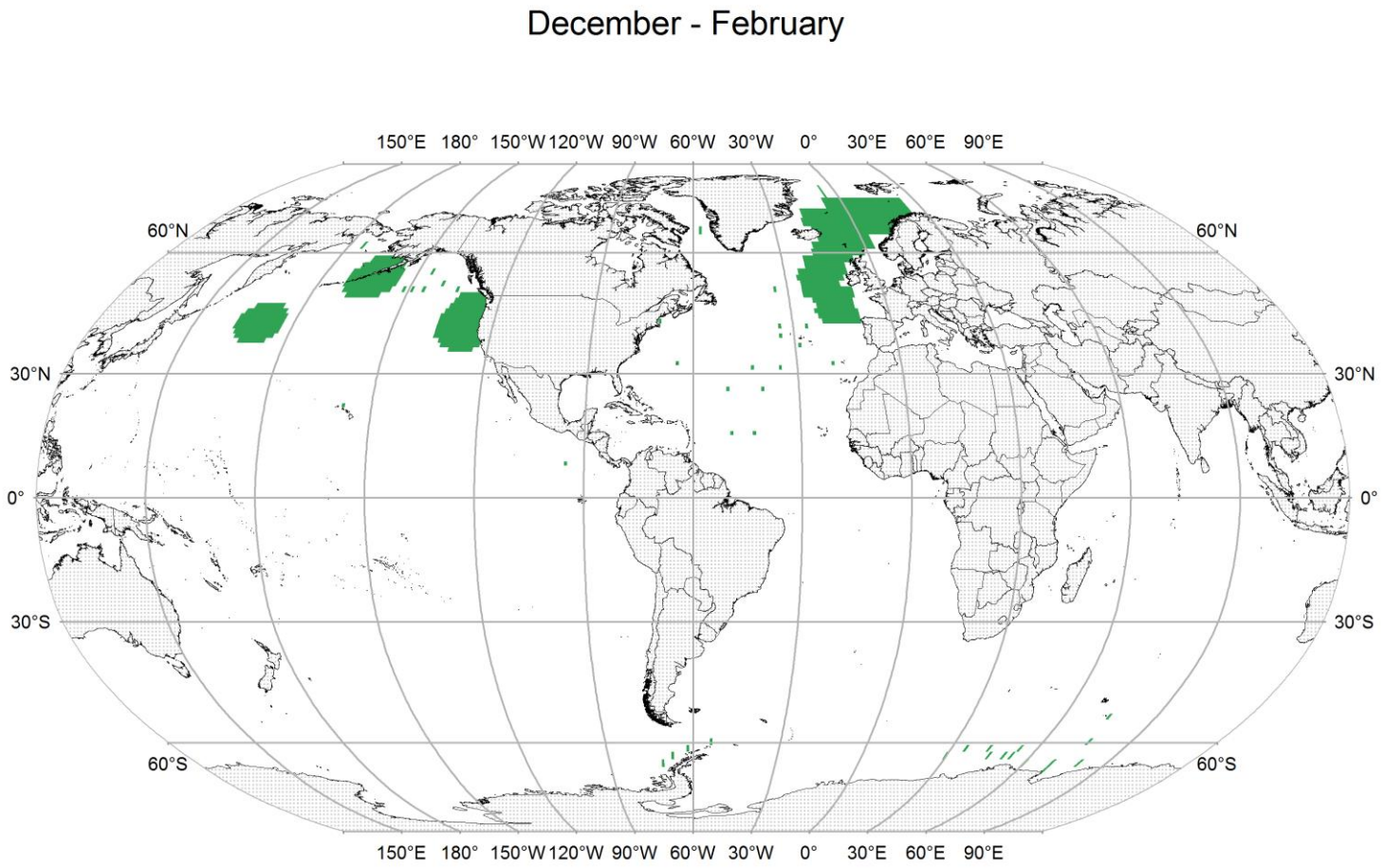
Appendix S7. Higher resolution version of Figure 2b: post-whaling era (1980-2012) seasonal line-transect survey effort (number of surveys per 100km x 100km grid cell) in March-May.



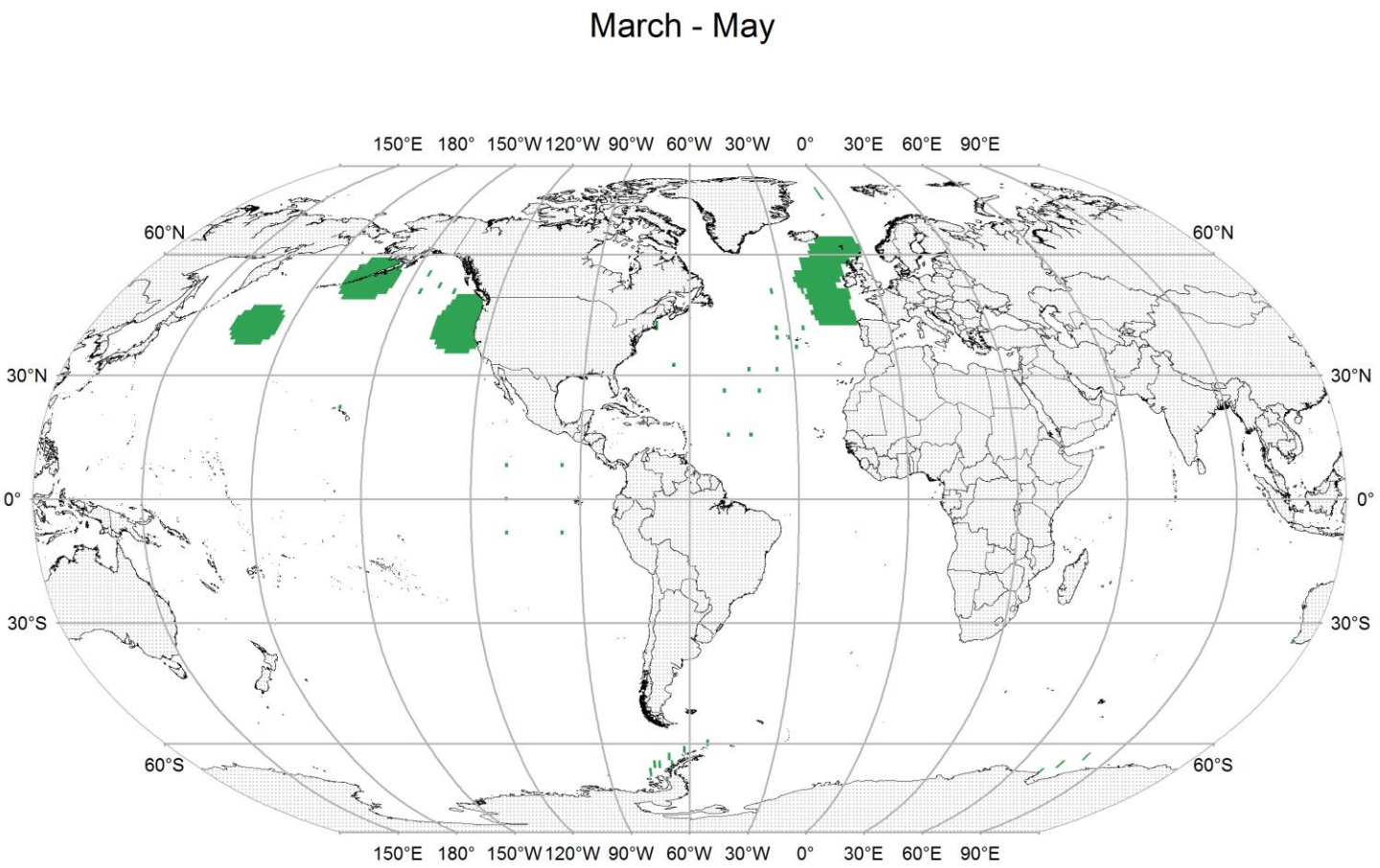
Appendix S8. Higher resolution version of Figure 2c: post-whaling era (1980-2012) seasonal line-transect survey effort (number of surveys per 100 km x 100 km grid cell) in June-August.



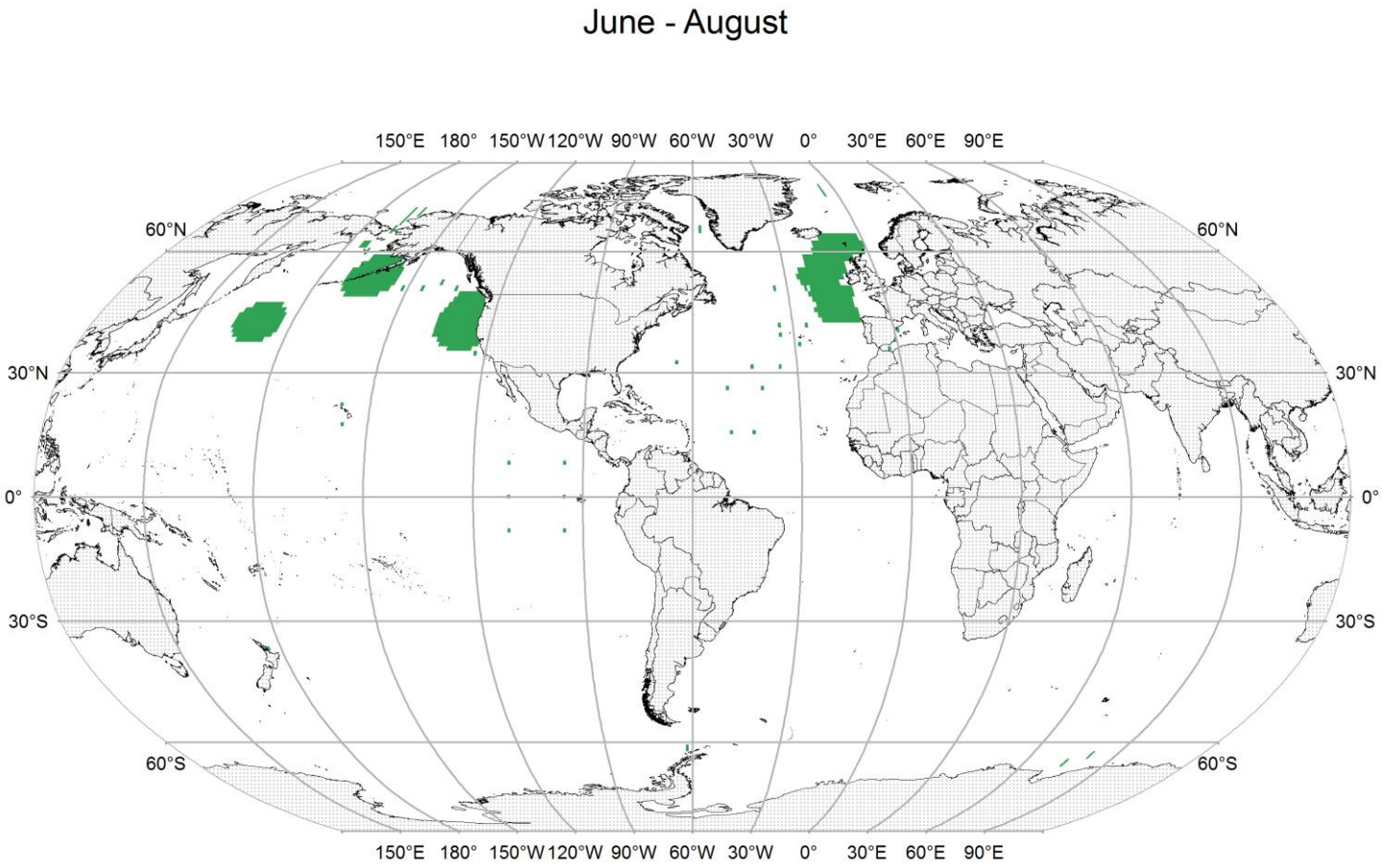
Appendix S9. Higher resolution version of Figure 2d: post-whaling era (1980-2012) seasonal line-transect survey effort (number of surveys per 100 km x 100 km grid cell) in September-November.



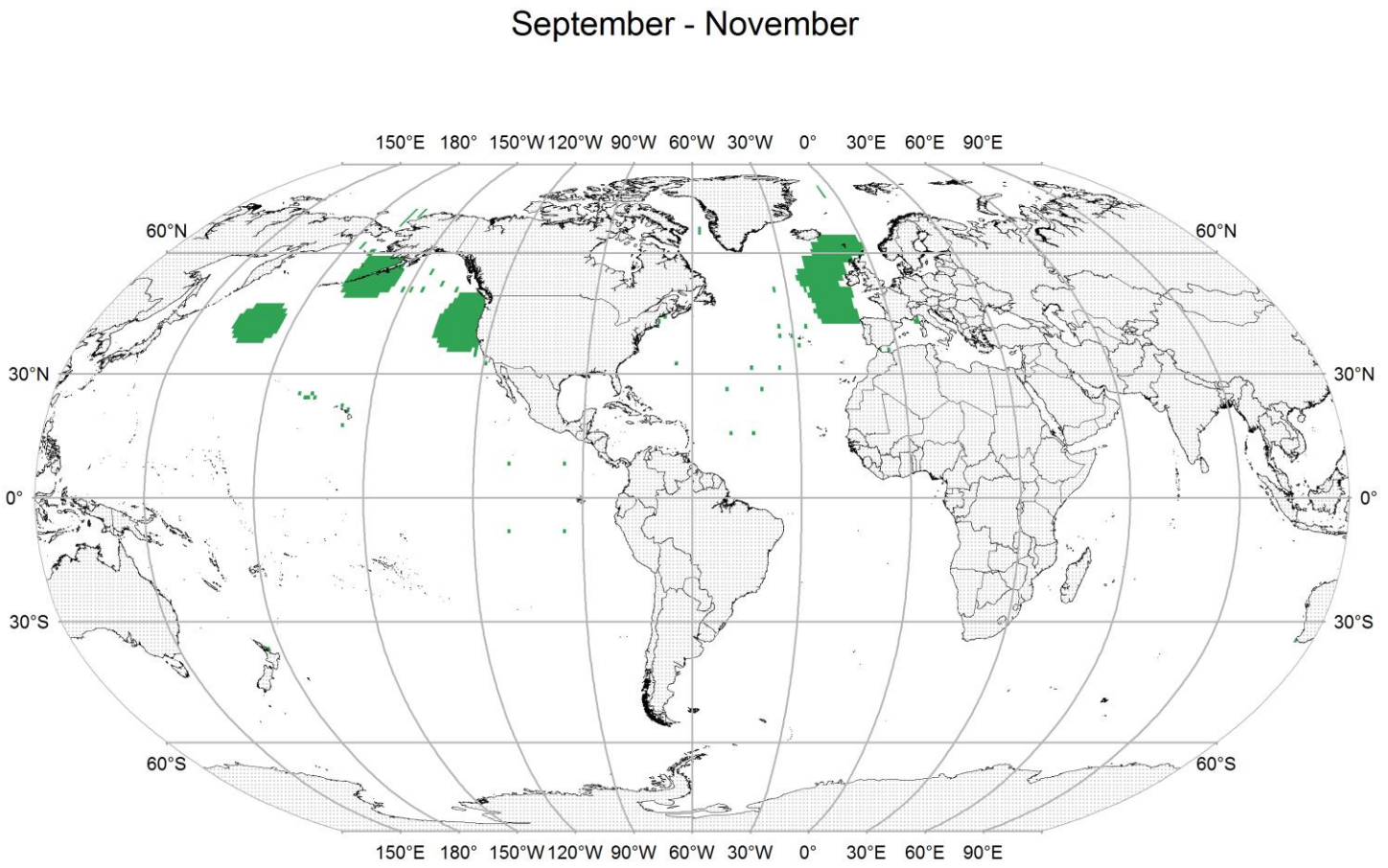
Appendix S10. Higher resolution version of Figure 4a: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in December-February.



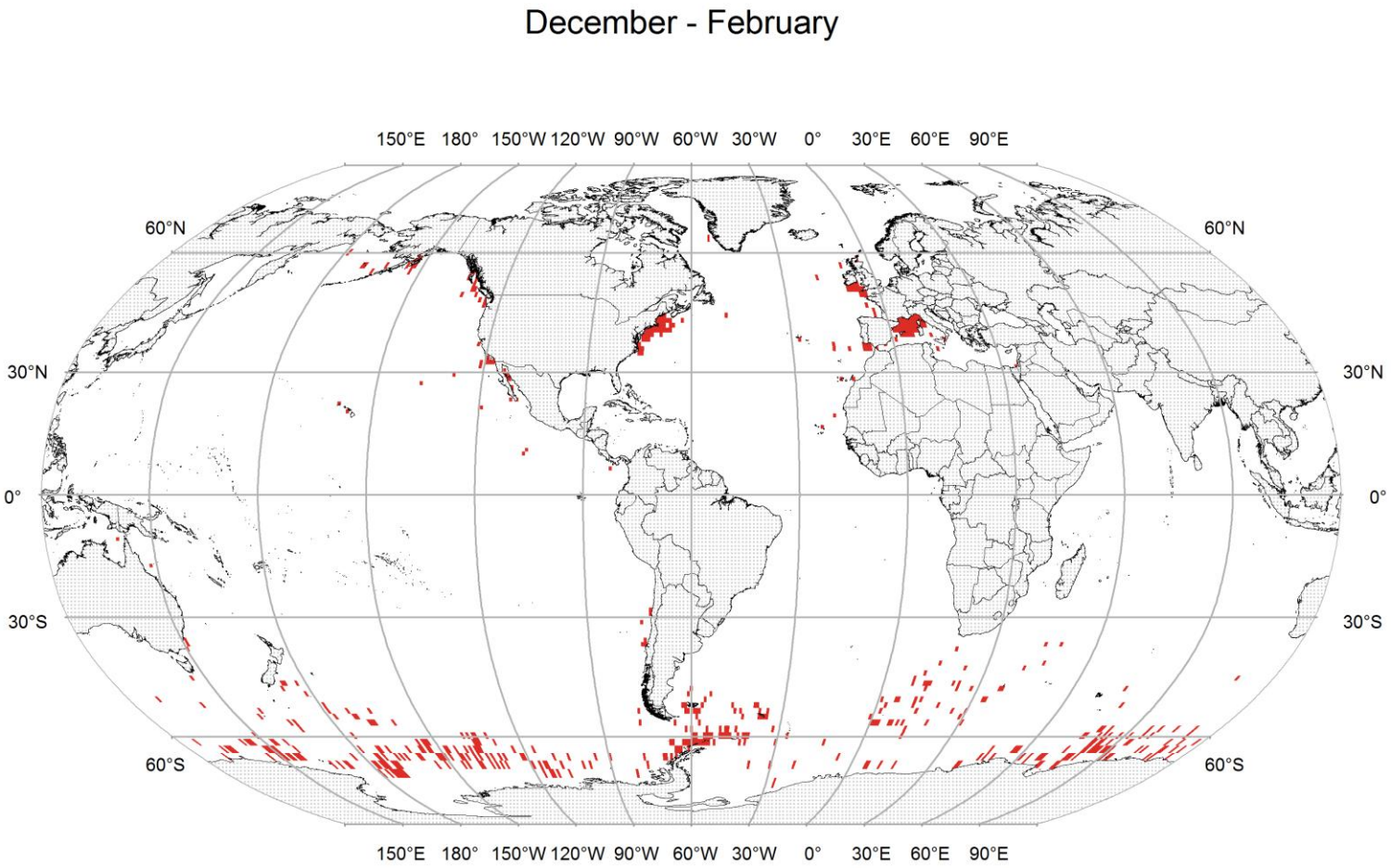
Appendix S11. Higher resolution version of Figure 4b: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in March-May.



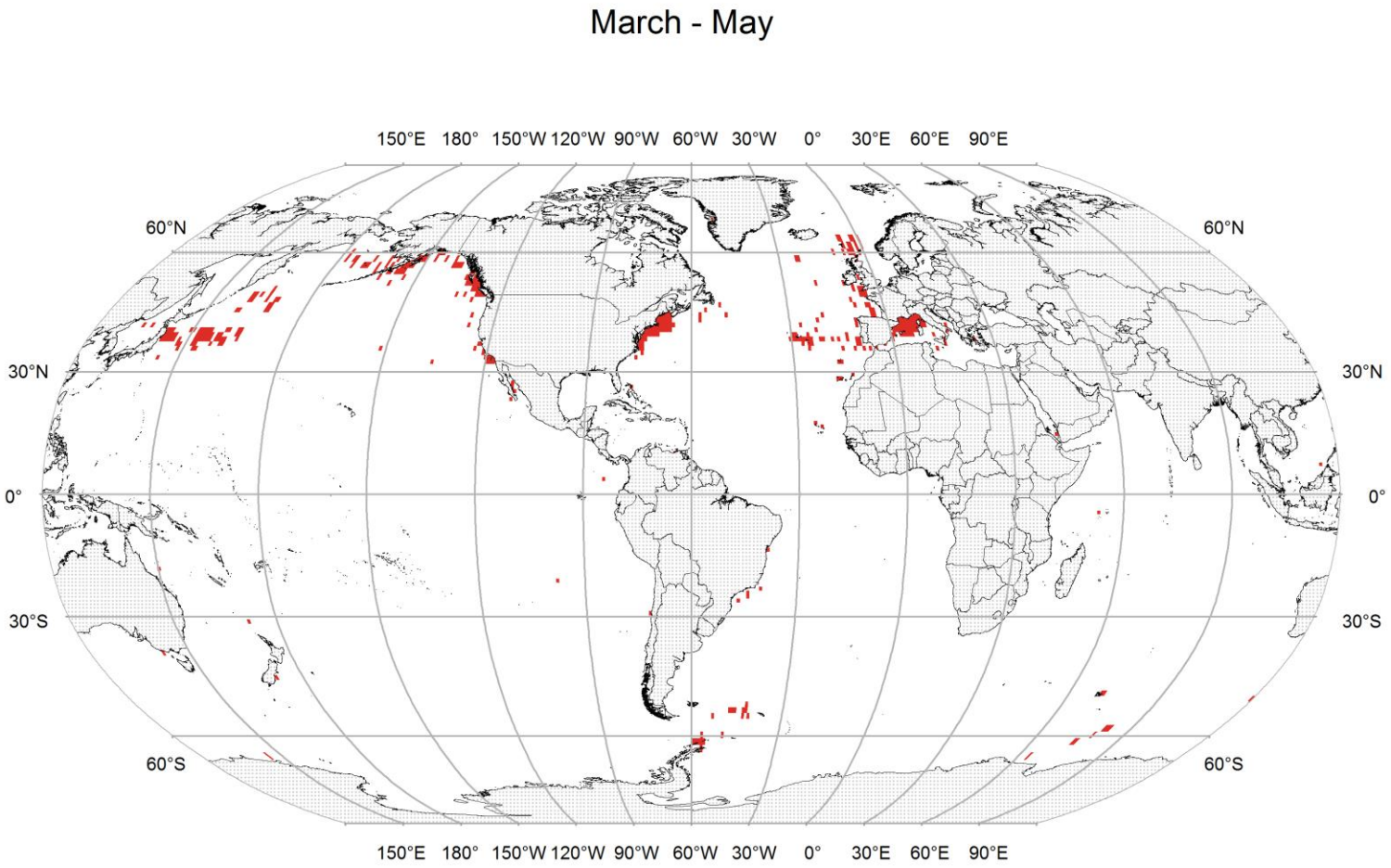
Appendix S12. Higher resolution version of Figure 4c: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in June-August.



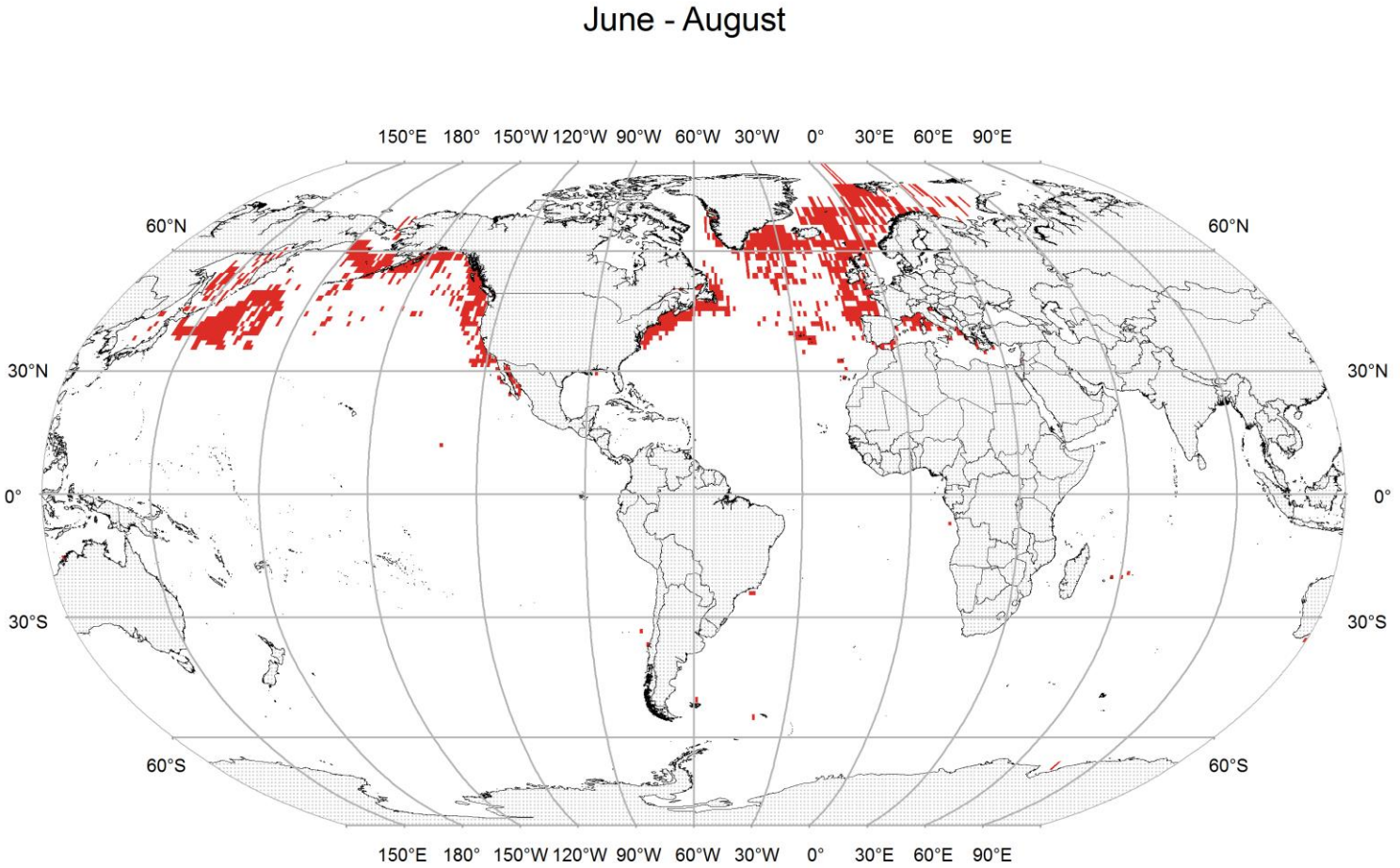
Appendix S13. Higher resolution version of Figure 4d: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal acoustic detections (green indicates at least one fin whale acoustic detection in that grid cell or in the area containing SOSUS hydrophones) in September-November.



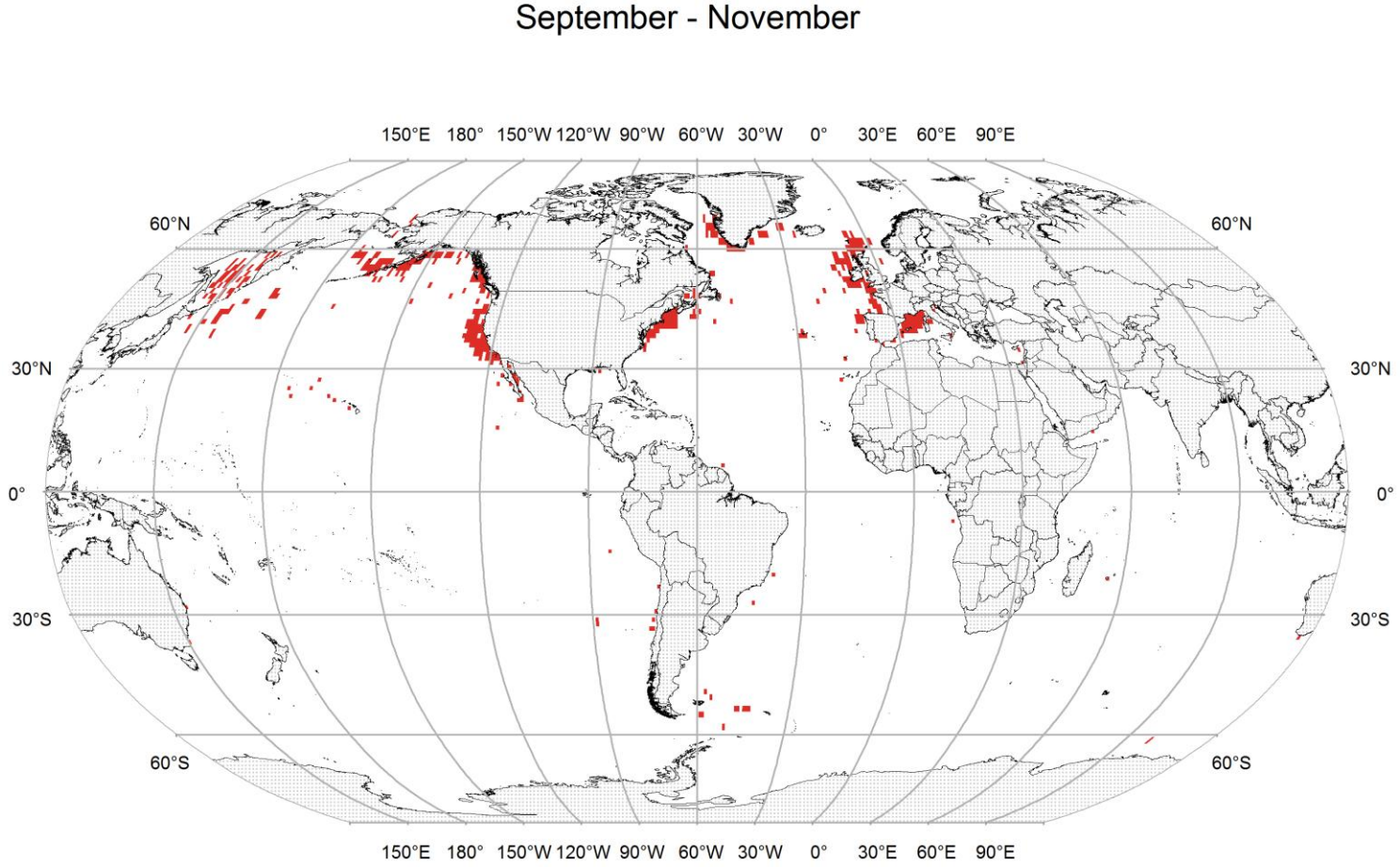
Appendix S14. Higher resolution version of Figure 5a: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in December-February.



Appendix S15. Higher resolution version of Figure 5b: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in March-May.



Appendix S16. Higher resolution version of Figure 5c: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in June-August.



Appendix S17. Higher resolution version of Figure 5d: post-whaling era (1980-2012) fin whale (*Balaenoptera physalus*) seasonal sightings (red indicates at least one fin whale sighting in that grid cell) in September-November.

Appendix S18. Studies in which fin whales (*Balaenoptera physalus*) would have been reported if they had been present. Units include kilometers (km), nautical miles (nm), days (d), and hours (h). Study methods include sightings surveys, acoustic surveys, opportunistic sightings (opp. sightings), specimens, interviews, literature reviews (review) and whaling records.

Author(s)	Year	Study Area	Study Type	Total Effort	Survey Dates	Latitude (approx.)
Northeast Atlantic:						
Notarbartolo di Sciara	1998	southern coast of Morocco	sightings survey	750 km	20 Jan.-14 Feb 1996	23°N
Hazevoet and Wenzel	2000	Cape Verde Islands	review, opp. sightings		Feb.- May 1995, 1996	15°N
Bamy et al.	2010	coastal Guinea, west Africa	review			9°N
Weir	2010	Gulf of Guinea to Dem. Rep. Congo	review			5°N-5°S
Mediterranean Sea:						
Dede et al.	2012	eastern Mediterranean Sea	sightings survey	860 nm	11-24 July 2008	35°N
Bearzi et al.	2009	northern Adriatic Sea	sightings surveys	114 d	2001 - 2006	45°N
Black Sea:						
Notarbartolo di Sciara	2002	Black Sea	review			44°N
Dede and Tonay	2010	western Black Sea	sightings survey	417 nm, 33 h	27 Oct.-2 Nov. 2007	42°N
Southeast Atlantic						
Budker and Roux	1968	Cape Lopez, Gabon, West Africa	whaling records		1949 - 1959	0.6°N
de Boer	2010	offshore Gabon, west Africa	sightings survey		7 Mar.-7 Aug. 2009	0.6°N
Northwest Atlantic:						
Diemer et al.	2011	fjords, ne Cumberland Sound, Canada	sightings survey	173 km, 20 h	29 July-9 Aug. 2008	65°N
Jefferson and Lynn	1994	Gulf of Mexico and Caribbean Sea	sightings survey	193 h	4 June-2 Aug. 1991	10°N-30°N
Yoshida et al.	2010	Eastern Caribbean	sightings survey	4210 km	17 Apr.-14 May 2004	12°N-20°N
Smultea et al.	2013	Caribbean, Venezula	sightings survey	10007 km	18 Apr.-3 June 2004	10°N-19°N
Smultea et al.	2013	Caribbean, Venezula	acoustic survey	7375 km	18 Apr.-3 June 2004	10°N-19°N
Whitt et al.	2011	Cuba, Caribbean	review			23°N
Weir et al.	2011	Montserrat, Caribbean	acoustic survey	73.3 h	Dec. 2007	17°N
Weir et al.	2011	Montserrat, Caribbean	sightings survey	168.4 h	Dec. 2007, May 2010	17°N
Jeremie et al.	2006	Martinique Island, Caribbean	sightings survey	1315 km	14 Mar.-Apr. 4 2003	14°N
Caldwell et al.	1971	St. Vincent Island, Antilles, Caribbean	sightings, specimens			13°N
Romero et al.	2001	Venezula	review, interviews			12°N

Appendix S18 (continued). Studies in which fin whales (*Balaenoptera physalus*) would have been reported if they had been present. Units include kilometers (km), nautical miles (nm), days (d), and hours (h). Study methods include sightings surveys, acoustic surveys, opportunistic sightings (opp. sightings), specimens, interviews, literature reviews (review) and whaling records.

Debrot et al.	1998	Leeward Dutch Antilles, Caribbean	review			12°N
Luksenburg	2011	Aruba, Caribbean	sightings survey	not reported	April 2010	12.5°N
Fraija et al.	2009	Colombia, Caribbean	sightings surveys	125 h, 37 km	February - May 2007	11°N
Zerbini et al.	1997	northern Brazil	review			5°N-5°S
Northwest Pacific:						
Anonmymous	2010	transit Guam-Wake Island-Oahu	sightings survey	6160 km, 13 d	19Apr.-May 4 2010	10°N-20°N
Ponnampalam	2012	South China, Sulu, Sulawesi Seas	sightings survey	2505 km, 127.7 h	20 June-8 Aug. 2009	1°N-8°N
Southwest Pacific:						
Lusseau and Slooten	2002	Fiordland coastline, New Zealand	opp. sightings	daily tours	1996 - 1999	45°S
Shimada and Pastene	1995	Solomon Islands	sightings survey	1041 nm	28 Nov.-11 Dec. 1993	5°S-12°S
Indian Ocean:						
Minton et al.	2010	coast, Oman, west Indian Ocean	sightings surveys	8840 km, 585 h	Jan. 2000 - Oct. 2003	17°N-25°N
Afsal et al.	2008	Indian EEZ and contiguous seas	sightings surveys	5254 h	Oct. 2003 - Feb. 2007	5°N-23°N
Small and Small	1991	Somali coast, Indian Ocean	opp. sightings	17313 nm, 2615 h	Aug. 1985 - May 1987	8°N-12°N
Ballance et al.	2001	Maldive Islands	sightings survey	1700 km, 155 h	April 1998	7°N-3°N
Ballance and Pitman	1998	western Indian Ocean	sightings survey	9784 km	March - July 1995	25°N-35°S
Clark et al.	2012	Maldive Islands	sightings survey	10915 km, 72 d	Jan.-March 2003, 2004	8°N-1°S
Anderson	2005	Maldive Islands	opp. sightings	535 d	Aug. 1990 - June 2002	8°N-1°S
Kasuya and Wada	1991	southern Indian Ocean	sightings surveys		Oct.- Mar. 1965-1985	0°-20°S
Eyre	1995	equatorial Indian Ocean	sightings survey	9165 nm, 507 h	27 May-19 July 1993	12°S
Kiszka et al.	2006	Comoros Arch., west Indian Ocean	opp. sightings	42 d, 117 h	July - October 2002	12°S
Kiszka et al.	2007	Mayotte Island, Comoros Archipelago	sightings surveys	284 h	July 2004 - August 2005	12°S

Appendix S18 References

Afsal VV, Yousuf KS, Anoop B, Kannan P, Ragagopalan M, Vivekanandan E (2008) A note on cetacean distribution in the Indian EEZ and contiguous seas during 2003-07. *Journal of Cetacean Research and Management* 10: 209-215.

Anderson RC (2005) Observations of cetaceans in the Maldives, 1990-2002. *Journal of Cetacean Research and Management* 7: 119-135.

Appendix S18 (continued). Studies in which fin whales (*Balaenoptera physalus*) would have been reported if they had been present. Units include kilometers (km), nautical miles (nm), days (d), and hours (h). Study methods include sightings surveys, acoustic surveys, opportunistic sightings (opp. sightings), specimens, interviews, literature reviews (review) and whaling records.

Anonymous (2010) Cruise Report: NOAA Ship *Oscar Elton Sette*, Cruise 10-04 (SE-80); Transit from Guam to Oahu via Wake Island. *Pacific Islands Fisheries Science Center Cruise Report* 14.

Ballance L, Anderson RC, Pitman RL, Stafford KM, Shaan A, Waheed Z, et al. (2001) Cetacean Sightings around the Republic of the Maldives, April 1998. *Journal of Cetacean Research and Management* 3: 213-218.

Ballance L, Pitman RL (1998) Cetaceans of the western tropical Indian Ocean. *Marine Mammal Science* 14: 429-459.

Bamy IL, Waerebeek K, Bah SS, Dia M, Kaba B, Keita N, et al. (2010) Species occurence of cetaceans in Guinea, including humpback whales with southern hemisphere seasonality. *Marine Biodiversity Records* 3: e48.

Bearzi G, Costa M, Politi E, Agazzi S, Pierantonio N, Tonini D (2009) Cetacean records and encounter rates in the northern Adriatic Sea during the years 1988-2007. *Annales Series Historia Naturalis* 19: 145-149.

Budker P, Roux C (1968) The 1959 Summer Whaling Season at Cape Lopez (Gabon). *Norsk Hvalfangst-Tidende* 6: 141-145.

Caldwell DK, Caldwell C, RathjenWF, Sullivan JR (1971) Cetaceans from the lesser Antillean island of St. Vincent. *Fishery Bulletin* 69: 303-312.

Clark J, Johnson CM, Johnson G, Payne R, Kerr I, Anderson RC, et al. (2012) Cetacean sightings and acoustic detections in the offshore waters of the Maldives during the northeast monsoon seasons of 2003 and 2004. *Journal of Cetacean Research and Management* 12: 227-234.

de Boer M (2010) Cetacean distribution and relative abundance in offshore Gabonese waters. *Journal of the Marine Biological Association of the United Kingdom* 90: 1613-1621.

Debrot A, De Meyer JA, Dezentje PJ (1998) Additional records and a review of the cetacean fauna of the Leeward Dutch Antilles. *Caribbean Journal of Science* 34: 204-210.

Dede A, Saad A, Fakhri M, Ozturk B (2012) Cetacean sightings in the Eastern Mediterranean Sea during the cruise in summer 2008. *Journal of the Black Sea/Mediterranean Environment* 18: 49-57.

Dede A, Tonay AM (2010) Cetacean sightings in the Black Sea in Autumn 2007. *Journal of Environmental Protection and Ecology* 11: 1491-1494.

Diemer DM, Conroy MJ, Ferguson SH, Hauser DD, Grgicak-Mannion A, Fisk AT (2011) Marine mammal and seabird summer distribution and abundance in the fjords of northeast Cumberland Sound of Baffin Island, Nunavut, Canada. *Polar Biology* 34: 41-48.

Eyre EJ (1995) Observations of Cetaceans in the Indian Ocean Whale Sanctuary, May-July 1993. *Report of the International Whaling Commissio*, 45: 419-426.

Fraija A, Florez-Gonzalez L, Jauregui A (2009) Cetacean occurance in the Santa Maria region, Colombian Caribbean, February-May 2007. *Latin American Journal of Aquatic Mammals* 7: 69-73.

Hazevoet CJ, Wenzel FW (2000) Whales and dolphins (Mammalia, Cetacea) of the Cape Verde Islands, with special reference to the humpback whale *Megaptera novaeangliae* (Borowski, 1781). *Contributions to Zoology* 69: 197.

Jefferson TA, Lynn SK (1994) Marine mammal sightings in the Caribbean Sea and Gulf of Mexico, summer 1991. *Caribbean Journal of Science* 30: 83-89.

Jeremie S, Gannier A, Bourreau S, Nicolas J (2006) Cetaceans of Martinique Island (Lesser Antilles): occurance and distribution obtained from a small boat dedicated survey. *IWC Scientific Committee Paper* SC/58/SM23.

Kasuya T, Wada S (1991) Distribution of large cetaceans in the Indian Ocean: data from Japanese sighting records, November - March. In: S. Leatherwood & G. P. Donovan (eds) *Cetaceans and Cetacean Research in the Indian Ocean Sanctuary: Marine Mammal Technical Report Number 3*, 139-160. United Nations Environment Programme: Oceans and Coastal Areas, Nairobi, Kenya.

Kiszka J, Breysse O, Vely M, Boinali K (2006) Marine mammals around the Comoros archipelago (Mozambique Channel): recent records and review of available information (SC/58/O6). *Report of the International Whaling Commission* SC/58/O6.

Kiszka J, Ersts P, Ridoux V (2007) Cetacean Diversity around the Mozambique Channel island of Mayotte (Comoros archipelago). *Journal of Cetacean Research and Management* 9: 105-110.

Luksenburg J (2011) Three new records of cetacean species for Aruba, Leeward Antilles, southern Caribbean. *Marine Biodiversity Records* 4: e4.

Lusseau D, Slooten E (2002) Cetacean sightings off the Fiordland coastline. *Science for Conservation (New Zealand Department of Conservation)* 187.

Appendix S18 (continued). Studies in which fin whales (*Balaenoptera physalus*) would have been reported if they had been present. Units include kilometers (km), nautical miles (nm), days (d), and hours (h). Study methods include sightings surveys, acoustic surveys, opportunistic sightings (opp. sightings), specimens, interviews, literature reviews (review) and whaling records.

Minton G, Collins T, Findlay KP, Baldwin R (2010) Cetacean distribution in the coastal waters of the Sultanate of Oman. *Journal of Cetacean Research and Management* 11: 301-313.

Notarbartolo di Sciara, G (2002) Section 3: Cetacean species occuring in the Mediterranean and Black Seas. In: G. Notarbartolo di Sciara (ed) Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies. *A report to the ACCOBAMS Secretariat,* Monaco, February 2002.

Notarbartolo di Sciara, G, Politi E, Bayed A, Beaubrun P, Knowlton A (1998) A Winter Cetacean Survey off Southern Morroco, with a Special Emphasis on Right Whales. *Report of the International Whaling Commission* 48: 547-550.

Ponnampalam LS (2012) Opportunistic observations on the distribution of cetaceans in the Malaysian South China, Sulu, and Sulawesi Seas and an updated checklist of marine mammals in Malaysia. *The Raffles Bulletin of Zoology* 60: 221-231.

Romero A, Agudo AI, Green SA, Notarbartolo di Sciara G (2001) Cetaceans of Venezuela: their distribution and conservation status. *NOAA Technical Report NMFS* 151.

Shimada H, Pastene L (1995) Report of a Sighting Survey off the Solomon Islands with Comments on Bryde's Whale Distribution. *Report of the International Whaling Commission* 45: 413-418.

Small JA, Small GJ (1991) Cetacean observations from the Somali Republic, September 1985 through May 1987. In: S. Leatherwood & G. P. Donovan (eds) *Cetaceans and Cetacean Research in the Indian Ocean Sanctuary: Marine Mammal Technical Report Number 3*, 179-210. United Nations Environment Programme: Oceans and Coastal Areas, Nairobi, Kenya.

Smultea M, Holst M, Koski WR, Roi S, Sayegh AJ, Fossati C, et al. (2013) Visual-acoustic survey of cetaceans during a seismic study in the southeast Caribbean Sea, April-June 2004. *Caribbean Journal of Science* 47: 271-283.

Weir CR (2010) A review of cetacean occurance in West African waters from Gulf of Guinea to Angola. *Mammal Review* 40: 2-39.

Weir CR, Calderan S, Unwin M, Paulatto M (2011) Cetacean encounters around the island of Monserrat (Carribean Sea) during 2007 and 2010, including new species state records. *Marine Biodiversity Records* 4: e42.

Whitt AD, Jefferson TA, Blanco M, Fertl D, Rees D (2011) A review of marine mammal records of Cuba. *Latin American Journal of Aquatic Mammals* 9: 65-122.

Yoshida H, Compton J, Tunnett S, Lovell T, Draper K, Franklin G, et al. (2010) Cetacean sightings in the eastern Caribbean and adjacent waters, spring 2004. *Aquatic Mammals* 36: 154-161.

Zerbini AN, Secchi E, Siciliano S, Simoes-Lopez PC (1997) A Review of the Occurance and Distribution of Whales of the Genus Balaenoptera along the Brazilian Coast. *Report of the International Whaling Commission* 47: 407-418.