



A Bibliography of the Long-Finned
Pilot Whale, *Globicephala melas*,
and the Short-Finned Pilot Whale,
Globicephala macrorhynchus,
in the North Atlantic Ocean

Compiled by Frederick W. Wenzel, John R. Nicolas,
Alan Abend, and Brett Hayward

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- 09-02 *The Northeast Data Poor Stocks Working Group Report, December 8-12, 2008 Meeting*, by Northeast Data Poor Stocks Working Group. January 2009.
- 09-03 *The 2008 Assessment of the Gulf of Maine Atlantic Cod (Gadus morhua) Stock*, by RK Mayo, G Shepherd, L O'Brien, LA Col, and M. Traver. February 2009.
- 09-04 *Mortality and serious injury determinations for baleen whale stocks along the United States eastern seaboard and adjacent Canadian maritimes, 2003-2007*, by AH Glass, TVN Cole, and M Garron. March 2009.
- 09-05 *North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2008 Results Summary*, by C Khan, TVN Cole, P Duley, AH Glass, M Niemeyer, and C Christman. March 2009.

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Table of Contents

ABSTRACT	iv
SPECIES BACKGROUND	1
Taxonomy	1
Description.....	1
BIBLIOGRAPHY	2
Index by Author	44
Index by Region.....	47
Index by Subject.....	47

ABSTRACT

This manuscript provides a brief description of the two species of pilot whales (long-finned pilot whales, *Globicephala melas* (previously known as *G. melaena*), and the short-finned pilot whale (*G. macrorhynchus*), found in the North Atlantic Ocean. It then lists scientific publications relating to the biology, behavior, conservation and management, most of which were published from 1939 to present. This document focuses primarily on published literature on the distribution and abundance of the two species throughout the North Atlantic Ocean. Literature on long-finned pilot whales and short-finned pilot whales from other geographic regions is also included, as readers may gain insight into the research methodologies and findings of other stocks and populations of these two species. Unpublished articles or popular books are generally excluded, unless these contain important information not available elsewhere.

SPECIES BACKGROUND

Taxonomy

The genus “*Globicephala*” was so named because of the globe shaped melon (head). While a number of specific species names for *Globicephala* have been proposed, van Bree (1971) demonstrated that only two species are recognizable osteologically: *G. macrorhynchus* Gray 1846 and *G. melaena* Traill, 1809. Most recently, Jones *et al.* (1986) proposed a revision of the species name for the long-finned pilot whale to its original form, *melas*. Research papers published prior to the 1990’s used *G. melaena*, and more recent papers used *G. melas* to describe long-finned pilot whales (Bernard and Reilly 1999). There are two species of pilot whales in the North Atlantic Ocean, the Atlantic or long-finned pilot whale, *G. melas*, and the short-finned pilot whale, *G. macrorhynchus*.

The long-finned pilot whale occurs in two widely disjunctive populations, one in the North Atlantic, the other in the Southern Hemisphere (between 35° and 60° South latitude (Sergeant 1962; Jefferson *et al.* 1993). Both populations have similar cranial features (True 1889), morphology (Sergeant 1962) and color patterns (Davies 1960), but since the two populations are completely isolated, and may show small color pattern differences, Davis (1960) considered them distinct subspecies, *G. m. edwardii*. The southern form had been described as a separate species, *G. leucosagmaphora*, (literally, white-saddle-bearing) by Rayner (1939).

Short-finned pilot whales (*G. macrorhynchus*) are found in all oceans; they are primarily distributed in warmer waters than where long-finned pilot whales are found (True 1889; Jefferson *et al.* 1993). In the North Pacific Ocean, two geographical forms of short-finned pilot whales are found off Japan, differing in external and cranial morphology (Rice 1998) and may represent separate species or subspecies. Their exact taxonomic status remains unresolved (see Scammon 1869; Norris and Prescott 1961; Kasuya *et al.* 1988; Wada, S. 1988.).

Description

Pilot whales are robust, with a thick tail stock. The melon (forehead) is exaggerated and bulbous and the beak is barely discernible or non-existent (Culik 2003). The dorsal fin is wide, broad based, and falcate (sickle-shaped). The dorsal fin is set well forward on short-finned pilot whales and set further back on long-finned pilot whales. The pectoral flippers are long, slender, and are also sickle-shaped. The long-finned pilot whale has extremely long pectoral fins reaching 18% to 27% of the total body length. The short-finned pilot whale has shorter pectoral fins (16% to 22% of the total body length); hence their common names were based on the length of the pectoral fins (True 1889; Sergeant 1962; Jefferson *et al.* 1993).

Pilot whales are predominantly dark grey, brown or black dorsally. In the western North Atlantic, short-finned pilot whales most often have a distinct post-dorsal fin saddle patch and post-orbital off-white blaze which extends posterior towards the forward insertion of the dorsal fin. Long-finned pilot whales have little or no post-dorsal fin saddle patch, and a pale or no visible post-orbital blaze pattern. A pale eye blaze is visible in about one fifth of all adult long-finned pilot whales, occurring most often in males (Bloch *et al.* 1993). However, sun angle, observer height over the water, and sea state often make these nuances difficult to observe. A grey mid-ventral line extends from the throat into an anchor-shaped chest patch and widens posterior (towards the tail) to a genital patch (Culik 2003). Sexual dimorphism exists, with longer flippers

and larger flukes in males (Bloch *et al.* 1993). Males are considerably larger than females in both species.

The pilot whale is highly gregarious, usually travelling in socially cohesive groups of 10–50 individuals, but are also encountered in large herds of several hundred and occasionally of over 1000 individuals (Bloch 1998; Zachariassen 1993). Based on photo-identification and genetic work, long-finned pilot whales appear to live in relatively stable pods like those of killer whales (*Orcinus orca*), and not in the fluid groups, characteristic of many smaller dolphins species (Canadas and Sagarminaga 2000; Jefferson *et al.* 1993). In addition, the pods generally contain individuals with close matrilineal associations (Amos *et al.* 1991; 1993; Culik 2003).

BIBLIOGRAPHY

Assembled here are references, with either abstracts taken directly from the paper or summaries written by us that provide background material for our understanding of the geographic range, distribution, and life history of these two species. There may be two or more papers with similar title, authors and summary. This has occurred because, for example, several articles are directly related to an individual's PhD dissertation or Master of Science (M.Sc.) research thesis and both the thesis and articles are referenced, or some "preliminary results" papers have more complete results/updates years later. This is not an exhaustive listing, yet encompasses a diverse scope of citations from multiple sources.

Abend, A.G. 1993. Long-finned pilot whale distribution and diet as determined from stable carbon and nitrogen isotope tracers. [M.Sc. thesis]. University of Massachusetts, Amherst, MA; 96 p.

Summary: This thesis explored four objectives: (1) Compile existing sighting and stranding data sets to generate a distribution map; (2) Present available known diet history; (3) Test new methodology of diet analysis using stable isotope tracers; and (4) Use stable isotope tracers to determine the trophic level of the whales and compare the results between study areas to predict potential movement between areas.

Abend, A.G.; Smith, T.D. 1995. Differences in ratios of stable isotopes of nitrogen in long-finned pilot whales (*Globicephala melas*), in the western and eastern North Atlantic. *Int. Council. Explor. Sea J. Mar. Sci.* 52(5):837-841.

Abstract: Naturally occurring nitrogen stable isotopes found in tissues have been shown to differ among animals feeding on various prey species and at different trophic levels. The ratio of ^{15}N to ^{14}N , expressed relative to atmospheric nitrogen, is compared for four types of tissues collected from long-finned pilot whales from three locations in the North Atlantic. Significant differences in ratios from skin, muscle, and blubber between animals from the eastern and western Atlantic suggest the whales are not feeding at the same trophic level. That is, there are more predator-prey relationships separating pilot whales and their primary production in the western Atlantic Ocean than in other areas. Differences in the isotope ratios for blubber, a lower turnover rate tissue, between whales from Cape Cod and the Mid-Atlantic Bight suggest that whales from these areas were feeding in different areas over the longer term. Different patterns of variability in

nitrogen isotope ratios from pilot whale teeth among the three regions suggest potentially more complex, longer term movement patterns.

Abend, A.G.; Smith, T.D. 1997. Differences in ratios of stable isotope ratios of carbon and nitrogen between long-finned pilot whales (*Globicephala melas*), and their primary prey in the western North Atlantic. *Int. Coun. Explor. Sea J. Mar. Sci.* 54(3):500-503.

Abstract: Carbon ($^{13}\text{C}/^{12}\text{C}$) and nitrogen ($^{15}\text{N}/^{14}\text{N}$) stable isotope ratios were measured in skin and muscle samples from free-ranging long-finned pilot whales stranded or caught in fishing gear in two locations in the western North Atlantic. Samples of the principal pilot whale prey species, long-finned squid and a secondarily important species, Atlantic mackerel, were collected for stable isotope analysis from three areas in the western North Atlantic. The differences between carbon ratios among prey species and whale tissues suggest that mackerel comprise a significant proportion of the diet of pilot whales.

Abend, A.G.; Smith, T.D. 1999. Review of distribution of the long-finned pilot whale (*Globicephala melas*) in the North Atlantic and Mediterranean. NOAA/NMFS Tech. Memo. NMFS-NE 117; 22 p.

Abstract: The spatial and seasonal distribution of the long-finned pilot whale (*Globicephala melas*) in the North Atlantic is summarized based on published and some unpublished data. The data presented separately for 12 countries and within each country by type of data: 1) evidential (i.e., sightings strandings, harvests, and bycatches); and 2) inferential (i.e., oceanographic process, prey occurrences). The locations of sightings are presented in distribution maps for each country. The locations of several sighting surveys and other field activities are summarized, seasonal differences are shown and possible seasonal movement patterns are suggested. The Atlantic-wide distribution is then summarized, based on these individual country summaries.

Aguilar, A.; Jover, L.; Borrell, A. 1993. Heterogeneities in organochlorine profiles of Faroese long-finned pilot whales: indication of segregation between pods? *Rep. Int. Whal. Comm. (Special Issue)* 14:359-367.

Summary: Blubber samples were analyzed for the presence of organochlorines to determine differences in pollutant profiles from 114 female long-finned pilot whales belonging to five schools captured in the Faroe Islands during 1987. Although the heterogeneity observed in the pollutant profile of pods does not necessarily correspond to the heterogeneous genetic structure of the population, it suggests the existence of some segregation, geographical, seasonal or behavioral, between two of the pilot whale schools studied and the remainder.

Amos, B.; Barrett, J.; Dover, G.A. 1991. Breeding system and social structure in the Faroese pilot whale as revealed by DNA fingerprinting. *Rep. Int. Whal. Comm. (Special Issue)* 13:255-68.

Summary: Authors found that for 88% of the examined fetuses, all accompanying adult males within these pods could be excluded as potential fathers; this suggests a high level of gene flow between pods.

Amos, B.; Barrett, J.A.; Bancroft, D.R.; Majures, T.M.O.; Bloch, D.; Desportes, G.; Dover, G.A. 1993. A review of molecular evidence relating to social organization and breeding system in the long-finned pilot whale. Rep. Int. Whal. Comm. (Special Issue) 14:219-231.

Summary: Based on a detailed study of two pods of long-finned pilot whales from the Faroese drive fishery, there is new evidence that mating appears to occur reciprocally between pods and there is no evidence of strong reproductive dominance. Pilot whales exhibit a high degree of cohesive social structure. The findings are a result of analysis of DNA fingerprinting, microsatellite polymorphisms and protein polymorphisms.

Amos, B.; Schlotterer, C.; Tautz, D. 1993. Social structure of pilot whales revealed by analytical profiling. Science 260:670-672.

Summary: Long-finned pilot whales swim in large, extremely cohesive groups. Molecular typing revealed that pod members form a single extended family. Mature males neither disperse from, nor mate within, their natal pods. Such behavior could be explained in terms of inclusive fitness benefits gained by adult males helping the large number of female relatives with which they swim.

Andersen, L.W. 1988. Electrophoretic differentiation among local populations of pilot whales, *Globicephala melaena*, at the Faroe Islands. Can. J. Zool. 66:1884-1892.

Abstract: Enzyme variation in and between nine schools of long-finned pilot whales, *Globicephala melas*, caught in the Faroe Islands, were examined by starch gel electrophoresis. Twenty-seven enzymes were investigated, representing 41 loci, of which three were polymorphic. The polymorphic enzymes were analyzed in either liver or muscle tissue from 628 specimens. No heterogeneity within the schools was observed, while significant differences in allele frequencies between schools were detected by multi-locus G-test. This result indicates some degree of reproductive isolation.

Andersen, L.W.; Desportes, G.; Friedrich, U. 1992. Sex identification of long-finned pilot whale fetuses off the Faroe Islands. Mar. Mammal Sci. 8(2):184-7.

Summary: This paper discusses three methods used to identify the sex of small pilot whale fetuses, and the reliability of these methods for sex determination.

Andersen, L.W. 1993. Further studies on the population structure of long-finned pilot whales, *Globicephala melaena*, off the Faroe Islands. Rep. Int. Whal. Comm. (Special Issue) 14:219-231.

Abstract: A genetic investigation of 31 schools of *Globicephala melas* off the Faroe Islands was performed using isozyme electrophoresis to test the hypothesis of one or more stocks in the northeastern Atlantic. Two hypotheses were suggested. One hypothesis was that two stocks exist, one that is present year-round and one that comes inshore seasonally. However, after testing this hypothesis, no trend was detected. The second hypothesis to explain population structure, based on the observed heterogeneity found in the species, was that it could be generated by a regular pattern of fission and fusion of schools, combined with the migration of mature males between schools and a strong maternal family structure within schools, possibly consisting of several family lineages.

Andersen, L.W.; Siegismund, H.R. 1994. Genetic evidence for migration of males between schools of long-finned pilot whales, *Globicephala melas*. Can. J. Zool. 105:1-7.

Abstract: The genetic variation at three polymorphic allozyme loci was investigated in a population sample of approximately 650 long-finned pilot whale (*Globicephala melas*) caught in the Faroe Islands. The sample consisted of pregnant females, non-pregnant females and males. The genetic variation was analyzed with a selection component analysis. Using two of the loci, it is concluded, that the fathers of the fetuses differed geno-typically from the males found in the schools, indicating that males migrate between schools to mate.

Anonymous. 1990. Report of the Scientific Committee. Small cetaceans, pilot whales. (*Globicephala melas*). Rep. Int. Whal. Comm. 40:73-79.

Summary: The 1987 International Whaling Commission (IWC) Committee meeting report on the life history and status of pilot whales. Abundance data are not sufficient enough to make estimates for the entire North Atlantic, but are made for specific areas within the North Atlantic.

Anonymous. 1992. Report of the study group on long-finned pilot whales. Int. Counc. Explor. Sea C.M. 1992N:3; 24 p.

Summary: Report of an International Council for the Exploration of the Sea (ICES) meeting held 3-4 December 1991, Montreal. The questions addressed by the study group were: (a) What are the stocks and where are they, (b) How large are the stocks, (c) What are the trends in stock size? (d) Describe interactions with other species.

Anonymous. 1993. Report of the study group on long-finned pilot whales. Int. Counc. Explor. Sea C.M. 1993N:5; 29 p.

Summary: Report of an ICES meeting held 30 August through 3 September, 1993. The conclusion of the study group were: (a) conduct an evaluation of the status of long-finned pilot whales in the North Atlantic (i.e., population size and trends, population dynamics), including the importance of behavioral factors and accounting for multispecies interactions, (b) identify key information gaps and critical long term information needs.

Auger-Methe, M.; Whitehead, H. 2007. The use of natural markings in studies of long-finned pilot whales (*Globicephala melas*). Mar. Mammal Sci. 23(1):77-93.

Abstract: Photo-identification using natural markings has been used for pilot whale (*Globicephala melas*) studies. However, none of these studies investigated the reliability of the marks used. To identify which mark types are reliable and which could improve the method, fifteen mark types, and their distribution within the population, were described. The rates of gain and loss of each mark type were calculated and the variability in visibility was investigated. Although the mark types associated with the current photo-identification method, the notch and the protruding piece, appear to be permanent, they allowed us to identify only 33% of our sample. The prevalence of all but two mark types is independent of the identify-ability of a photograph. One of these is already used in the current photo-identification method. This independence indicates that the proportion of the population that is currently identifiable does not differ from the rest of the population in its susceptibility to factors causing marks, such as predation, and thus

appears to be representative of the whole population. Using saddle patches in combination with the current photo-identification method would double the percentage of the identifiable individuals. However, due to limitations of matching software, the current method is easier to use.

Baird, R.W.; Stacey, P.J. 1989. Sightings, strandings and incidental catches of short-finned pilot whales, *Globicephala macrorhynchus*, off the British Columbia coast. Rep. Int. Whal. Comm. (Special Issue) 14:475-479.

Summary: This short paper lists the sightings, strandings and incidental catch records of short-finned pilot whales, *G. macrorhynchus*, within 320km (200 miles) of the British Columbia coast.

Baird, R.W.; Borsani, J.F.; Hanson, M.B.; Tyack, P.L. 2002. Diving and night time behavior of long-finned pilot whales in the Ligurian Sea. Mar. Ecol. Prog. Ser. 237:301-305.

Abstract: Pilot whales *Globicephala* spp. has long been thought to be deep divers, yet little information is available on dive depths. During August 1999 we obtained detailed dive data from suction-cup-attached time-depth recorder/VHF radio tags deployed on 5 long-finned pilot whales *G. melas*. Pilot whales were tagged for short periods (average 5 h ind.⁻¹) in deep (>2000 m) waters of the Ligurian Sea, off the NW coast of Italy. During the day all 5 whales spent their time in the top 16 m of the water column, and visible surface activities consisted primarily of rest and social behaviors. Tags remained attached after dark on 2 whales and shortly after sunset both whales made several deep dives (max. 360 and 648 m). Velocity on these deep dives was greater than during shallow dives either during the day or at night, suggesting that these deep dives function primarily for foraging. Our results confirm the supposition that long-finned pilot whales can dive deep, particularly within 2 h after sunset, which is the time that vertically migrating prey become more readily available as they move closer to the surface.

Baraff, L.S.; Asmutis, R.A. 1998. Long-term association of an individual long-finned pilot whale and Atlantic white-sided dolphins. Mar. Mammal Sci. 14(1):155-161.

Summary: An individually identified long-finned pilot whale (*Globicephala melas*) associated with Atlantic white-sided dolphins (*Lagenorhynchus acutus*) over six consecutive years.

Baron, S.C.; Martinez, A.; Garrison, L.P.; Edward, K. 2008. Differences in acoustic signals from Delphinids in the western North Atlantic and northern Gulf of Mexico. Mar. Mammal Sci. 24(1):42-56.

Abstract: Whistle characteristics were quantitatively compared between both geographically separated and neighboring populations of Atlantic spotted dolphins (*Stenella frontalis*), bottlenose dolphins (*Tursiops truncatus*), and pilot whales (*Globicephala* spp.) in U.S. waters to evaluate if intra-specific acoustic differences exist between groups. We compared nine whistle characteristics between continental shelf and offshore Atlantic spotted dolphins in the western North Atlantic and between northern Gulf of Mexico and western North Atlantic bottlenose dolphins and pilot whales using discriminant analysis. Offshore Atlantic spotted dolphin whistles were significantly different (Hotelling's T^2 , $P= 0.0003$) from continental shelf whistles in high frequency,

bandwidth, duration, number of steps, and number of inflection points. Atlantic bottlenose dolphin whistles were significantly different (Hotelling's T^2 , $P < 0.0001$) from those in the Gulf of Mexico in duration, number of steps, and number of inflection points. There was no significant difference between pilot whale whistles in the two basins. The whistle differences indicate acoustic divergence between groups in different areas that may arise from geographic isolation or habitat separation between neighboring but genetically distinct populations of dolphins. This study supports the premise that acoustic differences can be a tool to evaluate the ecological separation between marine mammal groups in field studies.

Baum, C.; Simon, F.; Meyer, W.; Fleischer, L.G.; Siebers, D.; Kacza, J.; Seeger, J. 2003. Surface properties of the skin of the pilot whale, *Globicephala melas*. *Biofouling* 19(1):181-186.

Abstract: On the skin surface of delphinids small biofoulers are challenged to high shear water flow and liquid vapor interfaces of air-bubbles during jumping. This state of self-cleaning is supported by the even, nano-rough gel-coated epidermal surface of the skin. In the present study we focused on the topographic evolution of gel formation and the chemical composition of the gel smoothing the skin surface of the pilot whale, *Globicephala melas*. We employed photoelectron spectroscopy (XPS) in combination with cryo-scanning electron microscopy (CSM), and transmission electron microscopy (TEM). In the superficial layer of the epidermis, stratum corneum, intercellular material was shown by electron optical methods to assemble from smaller into larger covalently cross-linked aggregates during the transit of the corneocytes towards the skin surface. Employing XPS measurements, the surface of the skin and the intercellular gel included in approximately the same amount polar groups (especially, free amines and amides) and non-polar groups corresponding to the presence of lipid droplets dispersed within the jelly material. It was concluded from the results obtained that the gel-coat of the skin surface is a chemically heterogeneous skin product. The advantages of chemically heterogeneous patches contributing to the ablation of traces of the biofouling process are discussed.

Beatson, E.L.; O'Shea, S.; Ogle, M. 2007. First report on the stomach contents of long-finned pilot whales, *Globicephala melas*, stranded in New Zealand. *N. Z. J. Zool.* 34:51-56.

Summary: Stomach contents of five long-finned pilot whale, *Globicephala melas*, are reported from stranded individuals on Farewell Spit, Golden Bay, South Island, New Zealand in December 2005 revealed a diet comprised exclusively of cephalopods (2-33 lower cephalopod beaks per stomach). Two genera of cephalopod from two orders; arrow squid, *Nototodarus* spp. (Teuthoidea: Ommastrephidae), and common octopus, *Pinnoctopus cordiformis* (Octopoda: Octopodidae) were represented. A further five pilot whale stomachs were examined and found to be empty.

Bernard, H.J.; Reilly, S.B. 1999. Pilot whales, *Globicephala* lesson, 1828. In: Ridgway, S.H. and Harrison, R. (eds.). *Handbook of Marine Mammals*, Vol. 6:245-279.

Summary: This chapter in the *Handbook of Marine Mammals* provides a good overview of what is currently known about both species of pilot whales.

Bjoerke, H. 2001. Predators of the squid *Gonatus fabricii* (Lichtenstein) in the Norwegian Sea. Fish. Res. 52(1-2):113-120.

Abstract: *Gonatus fabricii* is the most abundant squid of the Arctic and sub-Arctic waters of the North Atlantic and, during the summer months, young specimens can be found in the upper 60 m over large areas of the Norwegian Sea. In the summer of 1994, the biomass of young *G. fabricii* in this area was calculated to be at least 1.5 million tons. When the young squids reach a mantle length (ML) of 50–60 mm, they disappear from the surface and can be found at depths greater than 400 m. The life span of both sexes probably does not exceed 2 years, and the largest specimen ever recorded was a female of 385 mm ML. The biomass production of this species represents a considerable food resource and their consumption by known predators such as sperm whales (*Physeter macrocephalus*), northern bottlenose whales (*Hyperoodon ampullatus*), long-finned pilot whales (*Globicephala melaena*) and hooded seals (*Cystophora cristata*) is discussed.

Bloch, D.; Desportes, G.; Hoydal, K.; Jean, P. 1989. Pilot whaling in the Faroe Islands, July 1986-July 1988. North Atl. Stud. 2:36-44.

Summary: This paper describes the preliminary findings from the 1986-1988 long-finned pilot whale hunts in the Faroe Islands.

Bloch, D.; Hoydal, K.; Joensen, J.S.; Zachariassen, P. 1989. The Faroese catch of long-finned pilot whale. Bias shown in the 280 year time series. North Atl. Stud. 2:45-46.

Summary: This short note provides insights to potential bias in the 280 year time series of the Faroe Islands pilot whale hunt.

Bloch, D. 1992. Studies on the long-finned pilot whale in the Faroe Islands, 1976-1986. Fróðskaparrit 38-39:35-61.

Summary: Research findings from ten years of harvesting pilot whales in the Faroe Islands including; life history, feeding ecology, ecological energetic, pollutant loads, parasites and population genetics.

Bloch, D.; Desportes, G.; Mouritsen, R.; Skaaning, S.; Stefansson, E. 1993. An introduction to studies on the ecology and status of the long-finned pilot whale (*Globicephala melas*) off the Faroe Islands, 1986-1988. Rep. Int. Whal. Comm. (Special Issue) 14:1-32.

Summary: During this three year study, observers examined 3,470 pilot whales to look at the status of the exploited population life history, diet, ecological energetic, pollutant loads, parasites and population genetics.

Bloch, D.; Lastein, L. 1993. Morphometric segregation of long-finned pilot whales in the eastern and western North Atlantic. Ophelia 38(1):55-68.

Abstract: Discriminant analysis performed on morphometric measurements of pilot whale showed significant differences between the samples obtained in the Faroe Islands and Newfoundland. Regardless of total body length, pilot whales in Newfoundland showed longer skulls (Males: $F = 56.22$; $p < 0.001$. Females: $F = 167.00$; $p < 0.001$) and shorter torsos (Males: $F = 84.15$; $p < 0.001$. Females: $F = 70.56$; $p < 0.001$) than Faroese pilot whales, also regardless of total body length ($F = 13.40$; $p < 0.001$). It is suggested that these differences may be caused by the isolation resulting from the physical barrier

created by the front between the North Atlantic-Irminger Current and the East Greenland-Labrador Current. The front moves from south-west to northeast-east and turns north following the mid-Atlantic Ridge, separating the northern North Atlantic in a western and an eastern gyre. This results in a segregation of the long-finned pilot whales occurring in the eastern and western parts of the North Atlantic.

Bloch, D.; Lockyer, C.; Zachariassen, M. 1993. Age and growth parameters of the long-finned pilot whale off the Faroe Islands. Rep. Int. Whal. Comm. (Special Issue) 14:163-207.

Summary: The age/length/weight and growth parameters are determined by reviewing the teeth (age), total weight, total length from over 3,000 pilot whale carcasses from the Faroe Islands.

Bloch, D.; Zachariassen, M.; Zachariassen, P. 1993. Some external characteristics of the long-finned pilot whale off Faroe Islands and a comparison with the short-finned pilot whale. Rep. Int. Whal. Comm. (Special Issue) 14:117-135.

Summary: This paper examined the morphological characteristics and color patterns of the long-finned pilot whales taken between July 1986 and July 1988 off the Faroe Islands. Color patterns, blubber thickness, occurrence of saddle patch and/or blaze, flipper length, fluke length and dorsal fin height were collected and compared among both species of pilot whales.

Bloch, D. 1994. Pilot whales in the North Atlantic: Age, growth and social structure in Faroese grinds of the long-finned pilot whale, *Globicephala melas*. [PhD. Dissertation] Lund University, Sweden. (Available from Lund University, Lund, Sweden).

Bloch, D.; Lastein, L. 1995. Modelling the school structure of pilot whales in the Faroe Islands, 1832-1994. In: Blix, A.S., Walløe, L. and Ulltang, U. (eds.). Whales, seals, fish and man: 499-508. Proceedings of the International Symposium on the Biology of Marine Mammals in the Northeast Atlantic, Tromsø, Norway, 29 November- 1 December, 1994. p. 489. Developments in Marine Biology. Vol. 4, 1995.

Abstract: Background catch data of the long-finned pilot whale (*Globicephala melas*) in the Faroe Islands have provided hunting statistics covering a long time period. Data includes the number of whales landed, and biological information, such as their weight valuation in skinn (1 skinn = 72 kg). Methods: from 1709 to 1994, skinn values of 87,008 whales are available from 609 of 1,715 totally landed schools. Skinn and sex have been determined for 10,102 whales, sexual status for 3,020 whales. The attainment of sexual maturity is estimated at 9.4 skinn plus or minus 0.01 (males; N = 629), and 5.4 skinn plus or minus 0.00 (females; N = 1,127) and an average male proportion of 29% (females 71%) was found. These data were used to model the sex and maturity distribution through time. Results and conclusions: years with high number of schools were related with many whales, but connected with a low annual average whale size. In periods with a high number of whales and abundant food, the schools consisted mainly of immature whales and proportionally more males. Local differences appeared in the average annual whale size corresponding with the environmental rhythmic variations. A lower annual whale size was found in the southern district. Finally, peak periods seem to appear at the same time over the entire North Atlantic.

Bloch, D.; Zachariassen, M.; Zachariassen, P. 1998. Is the stock definition of the long-finned pilot whale, *Globicephala melas*, possible with morphological characters? Int. Counc. Explor. Sea (ICES) C.M. Bergen, Norway, 6 Oct. 1988.

Summary: Three parameters were considered for this stock identification study: color patterns, morphological characteristics of flippers or flukes, and dorsal fin length. Only dorsal fin length was found to produce a highly significant difference among different schools.

Bloch, D.; Jørgensen, M.P.H.; Stefansson, E.; Mikkelsen, M.; Ofstad, L.H.; Dietz, R.; Andersen, L.W. 2003. Short-term movements of long-finned pilot whales, *Globicephala melas*, around the Faroe Islands. *Wildlife Biol.* 9(1):47-58.

Abstract: On 15 July 2000, a pod of about 80 long-finned pilot whales *Globicephala melas* was driven to the coast at Sandavágur, the Faroe Islands (62.055°N, 7.157°W) for the purpose of tagging selected whales with satellite-linked radio transmitters. A transmitter was attached to the anterior flank of the dorsal fin of four beached whales. After the tagging, all four whales were reunited with their pod and the entire pod was driven to sea. The positions of three of the four whales were tracked (one for a period of 47 days) and the results show that the whales separated after a few days and eventually went in different directions. After 10 days, two of the whales were observed together in a pod, and after 19 days two of the whales were located at positions determined to be within 2.3 km of each other. The whales showed a strong affinity for the deep water off the continental shelf. The sex and relatedness of the four, tagged whales were determined from skin biopsies.

The tagged whales comprised one adult female with one juvenile in puberty, possibly her male offspring, and two adult males, one of which could be the offspring or the sibling of the female. The swimming speed of the whales was estimated at 0.2-14.5 km/hour, and they travelled average distances of 70-111 km/24 hours with a maximum of 200 km in 24 hours. Considering the mobility of the whales, it seems likely that the catches that occur at the Faroe Islands are recruited from a larger area in the North Atlantic than previously presumed. This suggests that the whales are taken from a larger population than that estimated from coastal areas around the Faroe Islands, hence increasing the probability that the harvest is sustainable.

Borrell, A.; Aguilar, A. 1993. DDT and PCB pollution in blubber and muscle of long-finned pilot whales from the Faroe Islands. *Rep. Int. Whal. Comm. (Special Issue)* 14:351-358.

Summary: Blubber and muscle tissues were collected and compared from 183 individual pilot whales and analyzed for organochlorine pollutants.

Borrell, A.; Bloch, D.; Desportes, G. 1995. Age trends and reproductive transfer of organochlorine compounds in long-finned pilot whales from the Faroe Islands. *Environ. Pollut.* 88(3):283-292.

Abstract: Total DDT and PCB concentrations were determined in blubber of 130 long-finned pilot whales, observed between age and organochlorine concentrations or the ratio of tDDT (total DDT)/PCB; in contrast, concentrations and ratios in mature females declined with age, which is attributed to reproductive transfer to their offspring during gestation and lactation. Relative abundance of DDE relative to tDDT increased in

males and young females and decreased in mature females. Organochlorine transfer to offspring during lactation was found to represent about 60-100% of the mother's body load, while that occurring during gestation was estimated to be much lower, in the range 4-10% of mother's body load. Transfer rates tended to decrease with mother's age and were, consequently, much higher in primiparous females than in those that had already given *Globicephala melas* (100 females and 30 males) from the Faroe Islands (northern north-east Atlantic). In males and immature females no relation was observed between age and organochlorine concentrations or the ratio of tDDT (total DDT)/PCB; in contrast, concentrations and ratios in mature females declined with age, which is attributed to reproductive transfer to their offspring during gestation and lactation. Relative abundance of DDE relative to tDDT increased in males and young females and decreased in mature females. Organochlorine transfer to offspring during lactation was found to represent about 60-100% of the mother's body load, while that occurring during gestation was estimated to be much lower, in the range 4-10% of mother's body load. Transfer rates tended to decrease with mother's age and were, consequently, much higher in primiparous females than in those that had already given birth. Transplacental rates were found to be consistent with the ratio between mother's body weight and neonatal body weight.

Bossart, G.D.; Walsh, M.T.; Odell, D.K.; Lynch, J.D.; Beusse, D.O.; Friday, R.; Young, W.G. 1991. Histopathologic findings of a mass stranding of pilot whales (*Globicephala macrorhynchus*). In: Marine Mammal strandings in the United States, Proceedings of the Second Marine Mammal Stranding Workshop, Miami, Fl. Dec. 3-5, 1987. Reynolds, J.E. and D.K. Odell (eds.). NOAA Tech. Rep. NMFS 98.

Abstract: Thirty short-finned pilot whales (*Globicephala macrorhynchus*) stranded on the Gulf coast of Florida in 1986. Gross and microscopic necropsies were performed on 10 whales. This report describes the histopathologic findings on these whales. A wide diversity of lesions was present not only within individual whales, but within the stranding group as a whole. The severity of these lesions also had a wide range. Pathologic changes included multiorgan inflammatory and degenerative lesions as well as adrenocortical and lymphoid changes consistent with prolonged stress and possible secondary immunologic suppression. The histopathologic findings were often indicative of chronic progressive disease processes suggesting the existence of disease some time prior to stranding.

Brown, S.G. 1961. Observations of pilot whales in the North Atlantic Ocean. *Nor. Hvalfangstid.* 50(6):225-254.

Summary: Observations of the oceanic range of long-finned pilot whales made from weather ships, merchant vessels and other ships from the central North Atlantic Ocean. These data suggest their occurrence throughout the year in the oceanic waters between 45° and 50° North latitude and probably in all longitudes from the Bay of Biscay (Europe) to Newfoundland.

Brown, S.G.; Jones, S.J.; Boyde, A. 1971. Sightings of cetaceans during two trans-Atlantic yacht races. *J. Cons. Int. Explor. Mer.* 31(1):106-120.

Summary: Sightings of cetaceans were logged during two trans-Atlantic yacht races from Bermuda to Germany during July 1966 and 1968. Pilot whales were continuously sighted during the passage, suggesting continuous distribution across the North Atlantic.

Brown, S.G. 1975. Relation between stranding, mortality and population abundance of Cetacea in the eastern Atlantic Ocean. *J. Fish. Res. Board Can.* 32(7):1095-1099.

Summary: The most complete and continuous series of stranding records for the British coasts, comprising 1,616 strandings, from 1913 to 1972. The harbor porpoise (*Phocoena phocoena*) was the most numerous (667 strandings, 41%), with 17 other species representing the remaining 59%, with long-finned pilot whale, comprising 20% of the British stranding events. The ratio of Irish sightings to strandings is at least 120:1; the ratio of sightings at weather ship stations to strandings of long-finned pilot whales (*Globicephala melaena*) is at least 150:1.

Buckland, S.T.; Cattanach, K.L.; Gunnlaussón, T.; Sigurjonsson, J. 1993. Abundance and distribution of long-finned pilot whales in the North Atlantic, estimated from NASS 1987 and NASS-1989. In: Donovan, G.P.; Lockyer, C. H.; Martin, A.R. (eds.). *Biology of Northern Hemisphere Pilot Whales. Rep. Int. Whal. Comm. (Special Issue) 14:* 33-49.

Summary: A population estimate for long-finned pilot whales in the north-eastern Atlantic was calculated as a result of two North Atlantic Sighting Surveys, (NASS 1987, 1989). This paper analyzed pilot whale survey data collected by three Icelandic vessels and one Faroese vessel in 1987 and four Icelandic, one Faroese and one Spanish vessel in 1989. The paper discusses potential biases in the abundance estimates, and the problems of estimating pilot whale abundance from sightings data.

Caldwell, D.K.; Erdman, D.S. 1963. The pilot whale in the West Indies. *J. Mamm.* 44(1):113-115.

Summary: The paper describes what is known about the occurrence and distribution of short finned pilot whales in the West Indies.

Caldwell, D.K.; Rathjen, W.F.; Caldwell, M.C. 1970. Pilot whales mass stranded at Nevis, West Indies. *Quart. J. Fl. Acad. Sci.* 33(4):241-243.

Summary: Paper describes the first record of a mass stranding event of 16 short finned pilot whales on Nevis, West Indies, Caribbean Sea.

Caldwell, D.K.; Caldwell, M.C. 1975. Dolphin and small whale fisheries of the Caribbean and West Indies: occurrence, history, and catch statistics - with special reference to the Lesser Antillean Island of St. Vincent. *J. Fish. Res. Board Can.* 32(7):1105-1110.

Abstract: Humpback (*Megaptera novaeangliae*) whaling, and fishing for smaller cetaceans in the West Indies and Caribbean is on the decline, mainly due to economic factors. These factors are summarized. Catch statistics are tabulated for pilot (*Globicephala melaena*), killer (*Orcinus orca*), false killer (*Pseudorca crassidens*), and sperm whales (*Physeter catodon*), along with landed wt. for mixed catches of dolphins. The pilot whale fishery of St. Vincent has taken 2912 blackfish (*Globicephala*

macrorhynchus) in the period 1962-74 (mean 224 per annum). Catches occur in all months, but are lowest in Dec and Jan. 10 other *spp.* of smaller cetaceans known to be taken in the waters of St. Vincent is listed.

Canadas, A.; Sagarminaga, R. 2000. The northeastern Alboran Sea, an important breeding and feeding ground for the long-finned pilot whale (*Globicephala melas*) in the Mediterranean Sea. *Mar. Mammal Sci.*, 16(3):513–529.

Abstract: Little is known about the long-finned pilot whale's population size, structure, distribution, and dynamics in the Western Mediterranean basin. The research region covered since 1992 in southeast Spain, at the edge of the Alboran Sea, is considered an important oceanographic transition zone between the Mediterranean and the Atlantic Ocean. The research ship *Toftevaag* carried out surveys covering a total of 10,173 nmi (18,840 km) from April to September each year, 1992-1997, all years pooled. Effort for ten-by-ten-mile quadrants was stratified by depth and sea state to ascertain encounter rates. Tracking was used together with photo-identification of animals to analyze home range of groups. Behavior was recorded ad libitum, and underwater video taping was used to analyze specific behavior patterns. One hundred and nine sightings of pilot whales were made. The average group size was 41.4 plus or minus 58.4, ranging from 1 to 350. The average depth at encounters was 848.7 plus or minus 281.2 m ranging from 300 to 1,800 m. Comparison of results for encounter rate and group size with those for other Mediterranean regions, together with site fidelity shown by photo-identification and observations of reproductive behavior, reflect the importance of the Alboran Sea to this species in the Mediterranean.

Canadas, A.; Sagarminaga, R.; García-Tiscar, S. 2002. Cetacean distribution related with depth and slope in the Mediterranean waters off southern Spain. *Deep-Sea Res. I, Oceanogr. Res. Pap.* 49(11):2053-2073.

Abstract: The northeastern section of the Alboran Sea is currently under consideration as a Special Area for Conservation under the European Union's Habitat Directive. Within this framework, the present study focuses on the distribution of cetaceans in this area and is part of the Spanish Ministry of the Environment's "Program for the Identification of Areas of Special Interest for the Conservation of Cetaceans in the Spanish Mediterranean". Shipboard visual surveys were conducted in 1992 and from 1995 to 2001 in the north-eastern Alboran Sea, covering 14,409 km. A total of 1,134 sightings of cetaceans were made. From the data collected, the distribution of seven species of odontocete was examined with respect to two physiographic variables, water depth and slope. Analyses of χ^2 and fitting of GLMs demonstrated significant differences in distribution for all species, mainly with respect to depth. Kruskal–Wallis tests, factor analysis and discriminate function analysis showed that the species could be classified in two major groups, shallow-waters (short-beaked common dolphin and bottlenose dolphin) and deep-waters (striped dolphin, Risso's dolphin, long-finned pilot whale, sperm whale and beaked whale), respectively. Preferred habitats in terms of water depth were areas deeper than 600 m for the deep-water group, and the shallower ranges from shore to 400 m for the other. The distribution of cetaceans was further matched with that of their most common prey in order to establish which habitats could be considered important for their feeding. The resulting analysis highlighted two areas in the region as

important habitats for the conservation of the most vulnerable species in the Mediterranean, the bottlenose and the common dolphin.

Caurant, F.; Amiard-Triquet, C.; Amiard, J.C. 1993. Factors influencing the accumulation of metals in pilot whales (*Globicephala melas*) off the Faroe Islands. Rep. Int. Whal. Comm. (Special Issue) 14:369-390.

Summary: Arsenic, copper, selenium, zinc, cadmium and mercury were analyzed from the tissues of 131 individual pilot whales (*Globicephala melas*) off the Faroe Islands. Factors including prey, age, and reproductive status were looked at in order to determine influencing factors for the accumulation of these metals.

Caurant, F.; Amiard, J.C.; Amiard-Triquet, C.; Sauriau, P.G. 1994. Ecological and biological factors controlling the concentrations of trace elements (As, Cd, Cu, Hg, Se, Zn) in delphinids *Globicephala melas* from the North Atlantic Ocean. Mar. Ecol. Prog. Ser. 103:207–219.

Abstract: Trace elements (As, Cd, Cu, Hg, Se and Zn) were determined in liver and kidney of pilot whales *Globicephala melas* Traill, 1809 collected from 7 schools caught at different seasons around the Faroe Islands. These and other biological data at our disposal enabled us to confirm and to define more accurately the relations shown previously between age, sex and trace element concentrations in marine mammals. The most striking features were: (1) the elevated levels of Cd and Hg in pilot whales compared to other marine mammals and to minimum adverse-effect levels established for humans; (2) the bio-cumulative behaviour of Cd and Hg; (3) the high correlations between Hg and Se, predominantly influenced by age; and (4) the high correlations between Cd and Zn, the levels of which appear to be mainly dependent on the school to which the specimens belong. This last may be tentatively attributed to the fact that the schools sampled correspond to different sub-populations with different genetic characteristics. The apparent metal tolerance of pilot whales and the health consequences to consumers of marine mammal's meat are discussed.

Cetacean and Turtle Assessment Program (CeTAP). 1982. A characterization of marine mammals and turtles in the Mid and North Atlantic areas of the United States outer continental shelf, Final report. NOAA Contract No. AA551-CT8-48. Washington D.C. Bureau of Land Management; 538 p.

Summary: The Cetacean and Turtle Assessment Program (CeTAP) study encompassed 81,154 square nautical survey miles and was conducted between 1979 and 1982. The objective of the intense aerial and shipboard survey was to describe the distribution and abundance, and generate population estimates of marine mammal species on the U.S. outer continental shelf between Cape Hatteras, North Carolina and Nova Scotia, Canada.

Church, T.N.; Mooers, C.N.K.; Voorhis, A.D. 1984. Exchange processes over a Mid-Atlantic shelf break canyon. Estuarine Coastal Shelf Sci., 19(4):393-411.

Summary: A synoptic oceanographic study was conducted in August 1978 at the Middle Atlantic shelf break along the shelf-slope front and over the Wilmington Canyon. Two distinct mixing regimes appear to provide some of the common means for water exchange across the shelf-slope front. This high primary productivity at the front seems

linked to the cold pool and its nutrient supplies and in our opinion may be an important habitat for odontocetes, especially pilot whales.

Ciano, J.N.; Jørgensen, R. 2000. Observations on an interaction between a humpback whale (*Megaptera novaeangliae*) and pilot whales (*Globicephala melas*). *Mar. Mammal Sci.* 16(1):245-248.

Summary: A short note on the behavior and interactions between a group of pilot whales and a humpback whale off the coast of Norway. The event was one of high speed (the vessel traveled at a speed of 6 knots to keep up with the event), and high intensity.

Culik, B. 2003. *Globicephala melas*, Traill 1809. Review on Small Cetaceans: Distribution, Behaviour, Migration and Threats. [Online]. Compiled for the Convention on Migratory Species (CMS). Available from: http://www.cms.int/publications/culik_report.htm.

Summary: An overview of what is currently known about pilot whale distribution, behaviour, migration and threats.

Dam, M.; Bloch, D. 2000. Screening of mercury and persistent organochlorine pollutants in long-finned pilot whale (*Globicephala melas*) in the Faroe Islands. *Mar. Pollut. Bull.* 40(12):1090-1099.

Abstract: Results of mercury and organochlorine analyses in pooled muscle and blubber samples representing in all 417 long-finned pilot whales (*Globicephala melas*) sampled in 1997 in the Faroe Islands are presented. The 28 pooled muscle samples from (in all) 9 pods were analyzed for total mercury and the same number of pooled blubber samples were analyzed for PCB (IUPAC CBs no. 28, 52, 99, 101, 105, 118, 128, 138, 153, 170, 180, 183 and 187), *p,p'*-DDT and metabolites and *o,p'*-DDT and metabolites, *cis* (α) and *trans* (γ)-chlordane, *cis*- and *trans*-nonachlor, oxychlordane, mirex, hexachlorobenzene, β -HCH and toxaphene (Parlars no. 26 (T2), 32, 50 (T12), 62 (T20) and 69).

Davies, J.L. 1960. The southern form of pilot whale. *J. Mamm.* 41(1):29-34.

Summary: Davies compared the North Atlantic and southern hemisphere pilot whales and found similarities, but since the two populations are completely isolated, and showed small color pattern differences, he called the southern hemisphere pilot whale a distinct subspecies, *G. m. edwardii*.

de Stephanis, R.; García-Tíscar, S.; Verborgh, P.; Esteban-Pavo, R.; Pérez, S.; Minvielle-Sebastia, L.; Guinet, C. 2008. Diet of the social groups of long-finned pilot whales (*Globicephala melas*) in the Strait of Gibraltar. *Mar. Biol.* 154:603–612.

Abstract: The Strait of Gibraltar is inhabited throughout the year by a group of pilot whales (*Globicephala melas*), but their spatial distribution varies between summer and autumn. In this paper, we have used carbon ($^{13}\text{C}/^{12}\text{C}$) and nitrogen ($^{15}\text{N}/^{14}\text{N}$) stable isotope signatures to investigate the differences in diet amongst seasons, sex and stable social units. Skin samples were collected from 56 individually photo-identified pilot whales during autumn 2005 and summer 2006. These individuals were genetically sexed and their isotopic signature determined. The levels of inter-individual association both within and between stable social units were compared to Euclidean distances between individual isotopes signatures. No differences in either d^{15}N or d^{13}C were found

according to the sex of individuals, but significant seasonal differences were found in d15N, although not in the d13C values. This suggests that pilot whales are resident year round in the Strait, a finding supported by independent photo-identification. The variation in d15N could reflect a shift in pilot whale diet through the year, with pilot whales feeding at a higher trophic level in autumn compared to summer. This could also represent a change in the diet of pilot whale prey species. The d13C values were significantly different amongst the four stable social unit's sampled and individual d13C values were significantly related to the level of inter-individual association, while no relationship was found for d15N. These results suggest that within the same general area (i.e., the Strait of Gibraltar), there is some level of specialization in habitat or prey choice between pilot whales social units.

Desportes, G. 1989. Pilot whale in the Faroe Islands: Presentation and preliminary results. North Atl. Stud. 2:47-54.

Summary: Preliminary results from the 1986-1988 pilot whale hunt in the Faroes, which looked at the status of the exploited population with aspects of its life history, including feeding, pollutant loads, parasites and population genetics.

Desportes, G.; Bloch, D.; Andersen, A.W.; Mouritsen, R. 1993. The international research program on the ecology and status of the long-finned pilot whale off the Faroe Islands. Copenhagen, Denmark: Int. Counc. Explor. Sea (ICES) Study Group on Pilot Whales; 21 p.

Summary: This report summarizes the International Council for the Exploration of the Sea, (ICES), research program which was studying the ecological status of the long-finned pilot whale off the Faroe Islands.

Desportes, G.; Saboureau, M.; Lacroix, A. 1993. Reproductive maturity and seasonality of male long-finned pilot whales, off the Faroe Islands. Rep. Int. Whal. Comm. (Special Issue) 14:233-62.

Summary: This paper reports on the reproductive seasonality and activity based on data collected on 1,148 male pilot whales collected over a three year period.

Desportes, G.; Mouritsen, R. 1993. Preliminary results on the diet of long-finned pilot whales off the Faroe Islands. Rep. Int. Whal. Comm. (Special Issue) 14:305-324.

Summary: The diet of long-finned pilot whales is described based on 857 stomachs collected in the Faroes drive fishery. All months of the year are covered.

Desportes, G.; Andersen, L.W.; Aspholm, P.E.; Bloch, D.; Mouritsen, R. 1994. A note about a male-only pilot whale school observed in the Faroe Islands. Fróðskaparrit 40 (1992):31-37.

Summary: A male-only school of long finned pilot whales was observed in the drive fishery of the Faroe Islands.

Desportes, G.; Andersen, L.W.; Bloch, D. 1994. Variation in foetal and postnatal sex ratios in long-finned pilot whales. Ophelia 39(3):183-196.

Abstract: Variation in foetal and postnatal sex ratios was examined jointly within the 1986-1988 Faroese international research programs on the ecology and status of the long-finned pilot whale (*Globicephala melas*). Data were obtained from 58 schools of whales

landed in the Faroe Islands from 1958 to 1992. The sample included 505 embryos and foetuses. Variation in foetal sex ratios was analyzed according to gestational age, mother's age and years. Foetal and postnatal sex ratios from pilot whales off the Faroe Islands were compared with those obtained off Newfoundland by Sergeant (1962).

The overall foetal sex ratio was biased significantly towards more females than males. The proportion of male foetuses declined as the size of foetuses increased. Females older than 25 years of age in comparison to younger females bore more female than male foetuses. From birth, through the first three years of life, selection acted mainly against females and parity was observed again in the age group 3 and maintained until the age group 10. Annual variation may occur. For similar season, at a 30 year interval, foetal sex ratio differed significantly between the Faroese and Newfoundland (46.9% and 58.8%) respectively, more male fetuses.

The relative higher mortality of male than female foetuses suggest, that a significant overall foetal mortality occurs, which has to be taken into account when estimating fecundity.

Doksæter, L.; Olsen, E.; Nøttestad, L.; Fernö, A. 2008. Distribution and feeding ecology of dolphins along the Mid-Atlantic Ridge between Iceland and the Azores. Deep Sea Research Part II: Topical Studies in Oceanography. 55(1-2):243-253.

Abstract: During Leg 1 of the MAR-ECO expedition on the R.V. G.O. Sars in June 2004, four main species of dolphins were observed along the Mid-Atlantic Ridge from Iceland to the Azores: pilot whale (*Globicephala melas*) (n=326), short-beaked common dolphin (*Delphinus delphis*) (n=273), white-sided dolphin (*Lagenorhynchus acutus*) (n=103), and striped dolphin (*Stenella coeruleoalba*) (n=86). Pilot whales and white-sided dolphins were found in cold (5–16 °C) and less-saline (34.6–35.8‰) water masses in the northern part of the study area, whereas common and striped dolphins inhabited warmer (12–22 °C) and more-saline (34.8–36.7‰) waters in the south. Dolphins tended to aggregate in areas of steep slopes, but actual bottom depth appeared to be less important. Based on spatial correlations between dolphin occurrence and candidate prey organisms recorded acoustically and by midwater trawling, mesopelagic fishes and squids were assumed to be important prey items, with *Benthoosema glaciale* probably being the most important prey for pilot whales and white-sided dolphins, while *Lampanyctus macdonaldi*, *Stomias boa ferox* and *Chauliodus sloani* were probably of particular importance for common dolphins. Cephalopods, especially *Gonatus sp.* and *Teuthowenia megalops* were the most likely prey species of pilot whales and striped dolphins, respectively. The difference in physical habitat north and south of the Sub-polar Frontal Zone seemed to have important effects on prey distribution, in turn influencing dolphin distribution.

Donovan, G.P. 1991. A review of IWC stock boundaries. Rep. Int. Whal. Comm. (Special Issue) 13:39-68.

Summary: This document reviewed the current stock boundaries used by the International Whaling Commission (IWC). The review is intended to provide the background to the IWC decision to fund work on the use of biochemical techniques to examine stock identity as a priority in its Comprehensive Assessment Program.

Donovan, G.P.; Lockyer, C. H.; Martin, A.R., eds. 1993. Biology of the Northern Hemisphere Pilot Whales. Rep. Int. Whal. Comm. (Special Issue) 14, 479 p.

Summary: This volume in IWC's Special Series arose from discussions in the sub-committee on small cetaceans of the IWC's Scientific Committee. This *Special Issue* 14, contains 23 papers relevant to aspects of life history, population structure, chemical analysis of tissues and pilot whale fishery interactions.

Duignan, P.J.; House, C.; Geraci, J. R.; Early, G.; Copland, H.G.; Walsh, M.T.; Bossart, G.D.; Cray, C.; Sadove, S.; St. Aubin, D.J.; Moore, M.J. 1995. Morbillivirus infection in two species of pilot whale (*Globicephala* sp.) from the western Atlantic. Mar. Mammal Sci. 11(2):150-162.

Abstract: We report evidence of enzootic morbillivirus infection among long-finned, *Globicephala melas*, and short-finned, *G. macrorhynchus*, pilot whales in the western Atlantic. A retrospective serologic survey, using five morbilliviruses, was carried out on 99 *G. melas* from 14 stranding events between 1982 and 1993 and from 25 *G. macrorhynchus* stranded in 5 events between 1986 and 1994. A blood sample was also obtained from an adult *G. melas* by-caught in the western North Atlantic. Tissues were collected from 24 *G. melas* and 15 *G. macrorhynchus* for histology and immunoperoxidase staining. Neutralizing antibody titers were found in 92 (92%) of 100 *G. melas* and 16 (64%) of 25 *G. macrorhynchus*, and titers were highest against cetacean morbilliviruses. Seroprevalence was similar between age classes and sexes. The earliest evidence of infection was in a *G. melas* that stranded in 1982. Stable antibody titers were observed in pilot whales under rehabilitation for up to eight months. Clinical disease consistent with morbillivirus pneumonia was detected in a *G. melas* calf. Immunoperoxidase staining confirmed that viral antigen was present in the lesions. The authors propose that enzootic infection in pilot whales is facilitated by population size, social structure, and migration patterns. Furthermore, through mixing with other odontocetes, pilot whales could act as vectors through the Atlantic. Clinical morbillivirus infection may precipitate mass strandings of highly social odontocetes.

Evans, P.G.H. 1980. Cetaceans in British waters. Mamm. Rev. 10(1):1-52.

Summary: This paper provides marine mammal sighting and stranding records from 1958 to 1978 including pilot whales from the British waters.

Fairfield, C.P.; Waring, G.T.; Sano, M.H. 1993. Pilot whales incidentally taken during the distant water fleet Atlantic mackerel fishery in the mid-Atlantic Bight, 1984-1988. Rep. Int. Whal. Comm. (Special Issue) 14:107-116.

Summary: Pilot whales have been reported as incidental takes in the U.S. North Atlantic Distant Water Fleet mackerel fishery since 1977. The number of takes was anomalously high during 1988. This document investigates potential causes for the high rate of fishery interactions which were concentrated from Baltimore Canyon north to Welker Canyon.

Fehring, W.K.; Wells, R.S. 1976. A series of strandings by a single herd of pilot whales on the west coast of Florida. J. Mamm. 57(1):191-194.

Summary: Between 19 August and 25 August, 1971, there occurred on the lower west coast of Florida a series of attempted strandings by a single herd of short-finned pilot

whales, *Globicephala macrorhynchus*. In each case the whales were prevented from beaching by human observers.

Foote, A.D. 2008. Mortality rate acceleration and post-reproductive lifespan in matrilineal whale species. *Biol. Lett.* 4(2):189-191.

Abstract: The strength of selection to increase the span of a life stage is dependent upon individuals at that stage being able to contribute towards individual fitness and the probability of their surviving to that stage. Complete reproductive cessation and a long post-reproductive female lifespan as found in humans are also found in killer whale (*Orcinus orca*) and short-finned pilot whale (*Globicephala macrorhynchus*), but not in the long-finned pilot whale (*Globicephala melanaea*). Each species forms kin-based, stable matrilineal groups and exhibits kin-directed behaviours that could increase inclusive fitness. Here, the initial mortality rate and mortality rate-doubling time of females of these three closely related whale species are compared. The initial mortality rate shows little variation among pilot whale species; however mortality rate accelerates almost twice as fast in the long-finned pilot whale as it does in killer whale and short-finned pilot whale. Selection for a long post-reproductive female lifespan in matrilineal whales may therefore be determined by the proportion of females surviving past the point of reproductive cessation.

Fullard, K.J.; Early, G.; Heide-Jørgensen, M.P.; Bloch, D.; Rosing-Asvid, A.; Amos, W. 2000. Population structure of long-finned pilot whales in the North Atlantic: a correlation with sea surface temperature? *Mol. Ecol.* 9(7):949-958.

Abstract: The long-finned pilot whale, *Globicephala melas*, is a social, pelagic odontocete distributed widely in the cold temperate waters of the North Atlantic. Despite genetic, morphometric, physiological and observational studies, it remains unclear whether any population substructure exists. We have used eight highly polymorphic microsatellite loci to analyze samples from four disparate sampling sites: USA East Coast (Cape Cod), West Greenland, the Faeroe Islands and the UK. Our results indicate that substructure does exist, and is particularly pronounced between West Greenland and other sites. The magnitudes of the various pair wise comparisons do not support a simple isolation-by-distance model. Instead, the patterns of genetic differentiation suggest that population isolation occurs between areas of the ocean which differ in sea surface temperature. Such a mechanism is supported by the observation that temperature is a primary factor determining the relative distributions of two short-finned pilot whale (*G. macrorhynchus*) populations off the Pacific coast of Japan.

Gannon, D.P.; Read, A.J.; Craddock, J.E.; Firstrup, K.M.; Nicolas, J. R. 1997. Feeding ecology of long-finned pilot whales, *Globicephala melas*, in the western North Atlantic. *Mar. Ecol. Prog. Ser.* 148:1-10.

Abstract: Stomach contents from 30 long-finned pilot whales *Globicephala melas* captured incidentally in the Distant Water Fleet (DWF) mackerel fishery off the northeastern United States were examined. Several methods of assessing prey importance were used in order to construct a true representation of the pilot whale diet. Separate analyses of trace (free, durable body parts from well-digested prey) and non-trace (relatively intact prey) food materials were conducted to address biases caused by

differential rates of digestion and passage. Squids dominated the diet and long-finned squid, *Loligo pealei* was the most important prey, but we noted large yearly fluctuations in prey importance. Metric multidimensional scaling analyses of trace and non-trace stomach contents of individual whales suggest that many animals were caught while feeding opportunistically near fishing operations, resulting in a bias of non-trace (intact) stomach contents. The diversity of prey in this study was greater than previous reports of the food habits of western North Atlantic long-finned pilot whales.

Gannon, D.P.; Read, A.J.; Craddock, J.E.; Mead, J.G. 1997. Stomach contents of long-finned pilot whales (*Globicephala melas*) stranded on the US mid-Atlantic coast. *Mar. Mamm. Sci.* 13(3):405-413.

Abstract: Ten prey taxa were recorded from the stomach contents of eight long-finned pilot whales (*Globicephala melas*) independently stranded along the U.S. mid-Atlantic coast. Relative importance of prey species was determined by methods that incorporate prey frequencies of occurrence, proportions of numerical abundance, and proportions of reconstructed mass. Separate analyses of trace (free, durable body parts representing well-digested prey items) and non-trace (relatively intact prey specimens) food material were conducted in order to address biases caused by differential rates of digestion and passage through the gastrointestinal tract. Different measures of prey importance yielded varying results, but the long-finned squid (*Loligo pealei*) was the most important prey species regardless of how prey importance was defined. Fishes were relatively unimportant in the diet. Our results indicate that the diets of western North Atlantic long-finned pilot whales differ substantially from what has been previously reported in the literature and that results from food-habits studies that utilize different techniques may not be comparable.

Garrison, L.P. 2007. Interactions between marine mammals and pelagic longline fishing gear in the U.S. Atlantic Ocean between 1992 and 2004. *Fish. Bull.* 105(3):408-417.

Abstract: The U.S. East Coast pelagic longline fishery has a history of interactions with marine mammals, where animals are hooked and entangled in longline gear. Pilot whales (*Globicephala spp.*) and Risso's dolphin (*Grampus griseus*) are the primary species that interact with longline gear. Logistic regression was used to assess the environmental and gear characteristics that influence interaction rates. Pilot whale interactions were correlated with warm water temperatures, proximity to the shelf break, mainline lengths greater than 20 nautical miles, and damage to swordfish catch. The incidental bycatch of marine mammals is likely associated with depredation of the commercial catch and is increased by the overlap between marine mammal and target species habitats. Altering gear characteristics and fishery practices may mitigate incidental bycatch and reduce economic losses due to depredation.

Geraci, J. R.; St. Aubin, D.J. 1977. Mass stranding of long-finned of pilot whales, *Globicephala melaena*, on Sable Island, Nova Scotia. *J. Fish. Res. Board Can.* 34:2196-2199.

Summary: On December 23, 1976, a herd of over 130 long-finned pilot whales, (*Globicephala melaena*) became stranded on Sable Island, Nova Scotia. Data on sex, length, and maximum girth, as well as skin and blubber samples for hydrocarbon analysis were collected from 116 carcasses.

Gonzalez, A.F.; Lopez, A.; Valeiras, X. 2000. First recorded mass stranding of short-finned pilot whales (*Globicephala macrorhynchus* Gray, 1846) in the northeastern Atlantic. *Mar. Mamm. Sci.* 16(3):640-646.

Abstract: The short-finned pilot whale is distributed in the tropical and warm temperate waters of the Atlantic, Pacific, and Indian Oceans. To date, there has been no evidence of the presence of short-finned pilot whales off the northwestern coast of the Iberian Peninsula (Galicia), as indicated by the complete absence of sightings or strandings in this area among the 1,200 strandings of marine mammals recorded for the period 1990-1999 (Gonzalez, unpublished data). The long-finned pilot whale, *Globicephala melas*, is a common cetacean in Galician waters; thirty-three strandings have been reported since 1990 (Gonzalez, unpublished data). The authors describe the first recorded mass stranding of short-finned pilot whales in the northeastern Atlantic. Observation and rescue of the surviving animals are described, and hypotheses of the possible causes of the mass stranding are discussed.

Goodall, R.N.P.; Macnie, S.V. 1998. Sightings of pilot whales off South America, South of 30°S: A review of data to 1988. *Rep. Int. Whal. Comm.* 48:565-579. SC/49/027

Summary: A collection of opportunistic sightings, strandings and historical records from the South Pacific, South Atlantic, Sub-Antarctic and Antarctic-Southern Ocean of the two species of pilot whales in order to look at distribution and species overlap.

Gowans, S.; Whitehead, H. M. 1995. Distribution and habitat partitioning by small odontocetes in the Gully, a submarine canyon on the Scotian Shelf. *Can. J. Zool.* 73: 1599-1608.

Summary: The authors examined the summer distribution of three species of small odontocetes in the highly productive waters in and near the Gully, a submarine canyon on the edge of the Scotian Shelf. Atlantic white-sided dolphins and common dolphins were not randomly distributed with respect to depth, sea-floor relief, month of sighting, or sea surface temperature. Long-finned pilot whales were not randomly distributed with respect to month or sea-surface temperature. Pilot whales ranged widely over the study area preferring areas with fairly flat relief and were more common later in the summer, when the waters were warmer. It appears that white-sided dolphins and common dolphins partition the Gully temporally but not geographically.

Hain, J.H.W.; Leatherwood, S. 1982. Two sightings of white pilot whales, *Globicephala melaena*, and summarized records of anomalously white cetaceans. *J. Mamm.*, 63(2):338-343.

Summary: Observation records of anomalously white cetaceans including pilot whales.

Hain, J.H.W.; Hyman, M.; Winn, H.E. 1985. The role of cetaceans in the shelf edge region of the northeastern United States. *Mar. Fish. Rev.* 47(1):13-17.

Summary: This study examines the role of cetaceans on the shelf break region of the northeastern United States between the 91 and 2,000 meter contours from Cape Hatteras N.C. to the eastern tip of Georges Bank. This paper summarizes aspects of the findings from the CeTAP report. Pilot whales are not identified to species.

Hashmi, D.D.K. 1990. Habitat selection of cetaceans in the Strait of Gibraltar. Presentation at the Fourth Annual Conf. of the European Cetacean Society, Palma de Mallorca, Spain.

Summary: The long-finned pilot whale expressed the least tolerance for habitat selection and was almost exclusively found on the African continental slope in waters between 700-900m.

Hay, K. 1982. Aerial line-transect estimates of abundance of humpback, fin, and long-finned pilot whales in the Newfoundland-Labrador area. Rep. Int. Whal. Comm. 32:475-86.

Summary: This paper provides early population estimates for long-finned pilot whales off Newfoundland-Labrador, Canada.

Heide-Jørgensen, M.P.; Bloch, D.; Stefansson, E.; Mikkelsen, B.; Ofstad, L.H.; Dietz, R. 2002. Diving behaviour of long-finned pilot whales *Globicephala melas* around the Faroe Islands. Wild. Biol. 8(4):307-313.

Abstract: Three long-finned pilot whales *Globicephala melas* were equipped with satellite-linked time-depth recorders on the Faroe Islands on 15 July 2000. The purpose was to study the diving behaviour and habitat use of free-ranging pilot whales in the northeast Atlantic. Summarized data on the diving behaviour of the whales were collected for up to 129 6-hour periods. The maximum depth of dives was 828 m and the mean number of dives below 12 m was 12.2/hour (SD = 8.2). On average, the whales spent 60% of their time above 7 m depth. All three whales had significantly longer surface times when they were outside the continental shelf than when they were on the shelf. The mean vertical speeds ranged from 0.9 m/second for dives to 150 m to 2.3 m/second for dives to 600 m. No dives below 12 m lasted longer than 18 minutes, and more than 60% of dives lasted less than three minutes. The mean number of dives that lasted less than one minute was significantly higher in offshore areas than on the continental slope for all three whales. Compared to other odontocetes of similar size, long-finned pilot whales apparently either have a lower dive capacity or utilize a niche in the water column that requires less diving activity.

Heide-Jørgensen, M.P.; Bunch, C. 1991. Occurrence and hunting of pilot whales in Greenland. J. Cons. Int. Explor. Mer., Study Group on Pilot Whales. 3-5 Dec., 1991.

Summary: This paper provides background information of the sightings, occurrence and hunting of pilot whales in waters off Greenland.

Heimlich-Boran, J.R. 1993. Social organization of the short-finned pilot whale, *Globicephala macrorhynchus*, with special reference to the comparative social ecology of delphinids. [PhD Dissertation] University of Cambridge, Dept of Zoology, Cambridge, England.

Heimlich-Boran, J.R.; Heimlich-Boran, S.L. 1990. Occurrence and group structure of short-finned pilot whales *Globicephala macrorhynchus* off the western coast of Tenerife, Canary Islands. European Research on Cetaceans. 4th. Annu. Conf. of the European Cetacean Society, Palma de Mallorca (Spain), 2-4 Mar 1990.

Abstract: This is a preliminary report of a 2-year study of a free-ranging group of short-finned pilot whales off the western coast of Tenerife in the Canary Island archipelago. This paper reports on the initial findings of occurrence and group structure which will

form the basis for an on-going study of the behavioural ecology of this species. Although these results are preliminary, they suggest that short-finned pilot whales off Tenerife exist in somewhat stable subgroups. At this point, the degree of mixing between groups appears to be high, superficially more similar to the semi-fluid groups observed in bottle-nosed dolphins than to highly stable killer whale groups. The large number of new animals observed indicates a very large population of pilot whales in the region or a fluid and more open population with a cycling of temporary membership. It will be critical to identify the distribution range of specific groups.

Hernandez-García, V.; Martín, V. 1994. Stomach contents of two short-finned pilot whale (*Globicephala macrorhynchus* Gray, 1846) (Cetacea, Delphinidae) off the Canary Islands: A preliminary note. International Council for the Exploration of the Sea (ICES) CM-1994/N:16 Denmark

Abstract: Two short-finned pilot whales (*Globicephala macrorhynchus*) were found, one stranded on Lanzarote and the other floating dead off the southwest of Tenerife. On analysis of the stomach contents, the diet composition was ascertained and the role of the cephalopod species in the same which is the object of this paper. In both animals, the stomach contents were made up entirely of cephalopods. Thus, the stomach of the short-finned pilot whale stranded in Lanzarote had only 7 upper and 5 lower cephalopod beaks. One of the lower beaks belonged to a large *Todarodes sagittatus*. From the whale found off Tenerife the stomach contents were recorded as consisting in three squid specimens, arm crowns, lenses and free beaks (318 upper and 313 lower). The specimens were identified as *Todarodes sagittatus*, and 17 free lower beaks were also identified as pertaining to this species. The most important families by number were Cranchiidae (66.7%), Cycloteuthidae (8.8%) and Ommastrephidae (6.3%); though probably by weight there is a different order of importance, due to the fact that a large proportion of the cephalopods were identified as Cranchia and juveniles of Megalocranchia.

Hooker, S.K.; Baird, R.W. 2003. Diving and range behavior of odontocetes: a methodological review and critique. Mamm. Rev. 31(1):81-105.

Summary: A review of what is currently known on the dive-depth-behavior of 13 odontocete species; including both species of pilot whales.

Hoydal, K.; Lastein, L. 1993. Analysis of Faroese catches of pilot whales (1709-1992) in relation to environmental variations. Rep. Int. Whal. Comm. (Special Issue) 14:89-106.

Summary: This paper reviewed information on the long-finned pilot whale (*Globicephala melas*) in the waters around the Faroes. A long term time series of catches of pilot whales (1709-1992) was examined for possible relationships between landings of whales, environmental variables and availability of prey species.

International Council for the Exploration of the Sea (ICES), 1993. Report of the Study Group on long-finned pilot whales, Copenhagen, 30 August-3 September. Copenhagen, Denmark; ICES C.M. 1993/N:5.

Summary: This International Council for the Exploration of the Sea, (ICES), report summarizes current findings regarding several parameters of the biology and life history of the long-finned pilot whale from the eastern and western North Atlantic.

International Council for the Exploration of the Sea (ICES), 1996. Report of the Study Group on Long-Finned Pilot Whales, Cambridge, United Kingdom. 22-26 April. Copenhagen, Denmark; ICES C.M. 1996/A:6.

Summary: This International Council for the Exploration of the Sea (ICES) report on the recent findings regarding the biology and life history of the long-finned pilot whale from the North Atlantic.

Irvine, A.B.; Scott, M.D.; Wells, R.S.; Mead, J.G. 1979. Stranding of the pilot whale, *Globicephala macrorhynchus*, in Florida and South Carolina. Fish. Bull. 77 (2):511-513.

Summary: This paper describes the mass stranding of 175-200 pilot whales along the shores of South Carolina, Georgia and Florida from the 6th – 13th Feb. 1977.

Jefferson, T.A.; Leatherwood, S.; Webber, M. A. 1993. Marine Mammals of the World. Food and Agriculture Organization of the United Nations, FAO. Rome, 320 p; 587 figs.

Abstract: This is a worldwide guide for the identification of marine mammals and those cetaceans, seals, and sirenians also found in freshwater. The 119 species include a variety of taxa: baleen whales, toothed whales, dolphins, porpoises, seals, sea lions, sirenians, marine otters, and the polar bear. There is an introduction with notes on marine mammal distribution in regard to oceanography and marine mammal identification, a glossary of technical terms, illustrated keys to species, illustrated family keys for skulls, species sheets, and a table of species by major marine fishing areas. Every species sheet includes scientific and official FAO names, diagnostic features, notes on similar species, size, distribution, biology, habitat, behaviour, exploitation, and IUCN (World Conservation Union, formerly International Union for the Conservation of Nature and Natural Resources) status. The work is fully indexed and includes a list of reference and sources for further reading.

Kasuya, T. 1975. Past occurrences of *Globicephala melaena* in the western North Pacific. Sci. Rep. Whales Res. Inst. Tokyo 27:95-110.

Abstract: Six skulls of *G. melaena* excavated at the northern Sea of Japan indicate that the species was present in the western North Pacific at least until about the 10th century. However, the absence of the species in the collection from recent fauna and in modern Japanese whaling statistics suggests that the species might have been extinct from the North Pacific or that a small population is surviving in some area of western North Pacific which has not yet been studied by biologist.

Kasuya, T.; Marsh, H. 1984. Life history and reproductive biology of the short-finned pilot whale, *Globicephala macrorhynchus*, off the Pacific coast of Japan. Rep. Int. Whal. Comm. (Special Issue) 6:259-310.

Summary: Life history and reproductive biology were analyzed from 373 female and 170 male short-finned pilot whales obtained from directed drive fisheries from the coast of Japan.

Kasuya, T.; Miyashita, T.; Kasamatsu, F. 1988. Segregation of two forms of short-finned pilot whale off the Pacific coast of Japan. *Sci. Rep. Whales Res. Inst. Tokyo* 39:77-90.

Summary: Two forms of short-finned pilot whales are known off the Pacific coast of Japan. The northern form, having larger body size, distinct saddle, and rounded contour of the head, inhabits coastal waters between 35°-40°N latitude. The southern form, having smaller body size, indistinct saddle and square shape contour of the adult male head, is seen across a wide range of coastal waters south of the Kuroshio front and south of 39°N with some degree of possible density gap within their range.

Kasuya, T.; Sergeant, D.E.; Tanaka, K. 1988. Re-examination of life history parameters of long-finned pilot whales in Newfoundland waters. *Sci. Rep. Whales Res. Inst. Tokyo*. 39:103-119.

Summary: Age dependent life history parameters of the long-finned pilot whale were analyzed using recent technique of aging which allowed accurate age estimate for old individuals. Teeth were retained from a 1954 drive fishery off Newfoundland. In both sexes mean growth ceases between 21 and 25 years when natural mortality increases. Males live to age 36 or about 10 years less than females.

Kenney, R.D.; Winn, H.E. 1986. Cetacean high use habitats of the northeast United States continental shelf. *Fish. Bull.* 84(2):345-357.

Summary: Results of the Cetacean and Turtle Assessment Program (CeTAP) have demonstrated that specific areas of the continental shelf waters off the northeast coast of the United States exhibited high-density utilization by several cetacean species. This document concluded habitat use by cetaceans on the continental is highest in the spring and summer and lowest in fall and winter. Pilot whale sightings are only confirmed to Genus.

Kenney, R.D.; Winn, H.E. 1987. Cetacean biomass densities near submarine canyons compared to adjacent shelf/slope areas, *Continental Shelf Res.* 7(2):107-114.

Abstract: Estimated cetacean biomass densities in areas of the northeastern United States continental shelf edge encompassing major submarine canyons were compared to neighboring shelf/slope areas. It was hypothesized that biomass densities would prove to be higher in the canyon areas: however, the analysis demonstrated significantly lower total cetacean biomass in the canyon areas. The canyons are apparently not more important as cetacean habitat than the shelf break region. Both long-finned and short-finned pilot whales are among the more common shelf edge marine mammal species.

Layne, J.N. 1965. Observations on marine mammals in Florida waters. *Bull. Florida State Museum, Biological Ser.*, 9(4):131-181.

Summary: Data were presented on the distribution, measurements and weights, ecology, and other aspects of the biology of twelve species of cetaceans (including short-finned pilot whale), one pinniped, and the manatee in Florida waters. Most records are for the period 1953 through 1963 although some earlier years were included.

Leatherwood, S.; McDonald, D.; Prematunga, W.P.; Girton, P.; Ilangakoon, A.; McBearty, D. 1991. Records of the 'blackfish' (killer, false killer, pilot, pygmy killer and melon-headed whales) in the Indian Ocean, 1772-1986. In: Cetaceans and Cetacean Research in the Indian Ocean Sanctuary, Marine Mammal Technical Report No. 3, S. Leatherwood, S.; G.P. Donovan, (eds.) United Nations Environment Programme, Nairobi, Kenya; 287 p.

Summary: Whaling, sighting and stranding records of the 'blackfish' (killer, false killer, pilot, pygmy killer and melon-headed whales) in the Indian Ocean, from 1772-1986.

Lindstroem, G.; Wingfors, H.; Dam, M.; Bavel, B.V. 1999. Identification of 19 Polybrominated Diphenyl Ethers (PBDEs) in long-finned pilot whale (*Globicephala melas*) from the Atlantic. Arch. Environ. Contam. Toxicol. 36(3):0355-0363.

Abstract: Nineteen tetra- to hexabrominated diphenyl ethers were identified at ppb concentration in the blubber of pilot whales caught off the coast of the Faroe Islands in 1994 and 1996. Higher total concentrations were found in the pooled samples of young males (3,160 ng/g lipid) and females (3,038 ng/g lipid) compared to adult females (843 ng/g and 1,048 ng/g lipid) and males (1,610 ng/g lipids). The predominant isomers in all samples were 2,2,4,4-TeBDE (PBDE 47) and 2,2,4,4,5-PeBDE (PBDE 99) accounting for some 70% of the sum of the 19 isomers.

Lockyer, C. 1993. A report on patterns of deposition of dentine and cement in teeth of pilot whales, genus *Globicephala*. Rep. Int. Whal. Comm. (Special Issue) 14:137-61.

Summary: This paper reports on two aspects of pilot whale tooth structure: (1) deposition rate of dentinal and cemental laminae, and (2) patterns and possible significance of mineralization anomalies. Teeth are from live captured short-finned pilot whales (North Pacific) and long finned pilot whales from the Faroe Islands drive fishery (northeast Atlantic).

Lockyer, C. 1993. Seasonal changes in body fat condition of Northeast Atlantic pilot whales, and their biological significance. Rep. Int. Whal. Comm. (Special Issue) 14:325-50.

Summary: Length, girth and blubber thickness were collected from 693 whales. Body weights were obtained for 232 fetuses and 622 long-finned pilot whales of both sexes at all times of the year.

Lockyer, C. 2007. All creatures great and smaller: a study in cetacean life history energetics. J. Mar. Biol. Assoc. U.K. 87(4):1035-1045.

Abstract: Reviews of some specific studies of cetacean life history energetics over the past 20–30 years that include one of the largest species, the baleen fin whale, *Balaenoptera physalus*, the medium-sized odontocete long-finned pilot whale, *Globicephala melas*, and one of the smallest marine odontocetes, the harbour porpoise, *Phocoena phocoena*. Attention is drawn to the decrease in longevity with size and the differences in biological parameters that reflect this and affect life history strategy and energy utilization. Data from the past whaling industry in Iceland for fin whales, the Faroese 'grindedrap' for pilot whales, and by-catches as well as some live captive studies for harbour porpoise have been used. The studies demonstrate how information can be gathered to compile energy budgets for individuals, relying on carcass measurement and analysis, dietary investigations, biochemical analyses of tissues, and general life history

studies including reproduction; as well as from monitoring living animals. The individual examples presented show how food energy storage in the form of fat can be variously important in insulation in the smallest species to controlling reproductive efficiency in large migratory species. The paper concludes by noting that an understanding of energy use in the individual can be an important input in multi-species ecosystem modeling.

Macleod, K.; Simmonds, M.P.; Murray, E. 2003. Summer distribution and relative abundance of cetacean populations off Northwest Scotland. *J. Mar. Biol. Assoc. U.K.* 83(5):1187-1192.

Abstract: Line transects surveys were conducted in July/August 1998 to investigate the distribution and abundance of cetaceans off north-west Scotland. Over 2156.5 km of survey effort, 304 sightings were recorded of which 184 were identified to species. Nine species were identified: Atlantic white-sided dolphin *Lagenorhynchus acutus*, fin whale *Balaenoptera physalus*, sei whale *Balaenoptera borealis*, long-finned pilot whale *Globicephala melas*, sperm whale *Physeter macrocephalus*, common dolphin *Delphinus delphis*, harbour porpoise *Phocoena phocoena*, white beaked dolphin *Lagenorhynchus albirostris* and Risso's dolphin *Grampus griseus*. The Atlantic white-sided dolphin was the most relatively abundant species. The relative abundance of large whales and dolphins was greatest in the Faroe–Shetland Channel. The continental slopes of this area are undergoing development by oil industries and concerns have been raised about the potential impacts of these activities on cetaceans. These waters are used year-round by cetaceans and provide feeding and breeding grounds and are a migration route for large whales.

Madin, K. 2008. Pilot whales – the “cheetahs of the deep sea.” *Oceanus* 46(3):36-38.

Summary: Researchers reveal first glimpse of pilot whales high speed, deep diving hunt for squid via data collected from suction cup time depth recorder tags.

Martin, A.R.; Reynolds, P.; Richardson, M. G. 1987. Aspects of the biology of pilot whales *Globicephala melaena* in recent mass strandings on the British coast. *J. Zool. (Lond.)* 211:11-23.

Summary: Authors looked at the biology of pilot whales obtained from five mass stranding events along the British coast between 1982 and 1985. Sex, length, sexual maturity determined an “excess” of mature females in these pilot whale schools.

Martin, A.R.; Rothery, P. 1993. Reproductive parameters of female long-finned pilot whales (*Globicephala melas*) around the Faroe Islands. *Rep. Int. Whal. Comm. (Special Issue)* 14:263-304.

Summary: Nearly 2000 female long finned pilot whales, from the Faroes Island catch were examined, measured and sampled between July 1986 and June 1988. Females of this stock ovulate for the first time at an average age of 8 yrs and average length of 375 cm. Gestation last about 12 months; the calf is born at a mean length of 177 cm and a mass of 74 kg.

Mate, B.R. 1989. Satellite-monitored radio tracking as a method for studying cetacean movements and behaviour. *Rep. Int. Whal. Comm.* 39:389-391. (SC/40/O 42).

Abstract: In summer 1987, a pilot whale (*Globicephala melas*) tagged with an Argos satellite-monitored radio tag was tracked for 95 days in the western North Atlantic. The

whale was located 479 times by satellite during movements of at least 7,588 km and sighted from an aircraft several times in the company of other pilot whales. Duration of dive data was collected on 187,866 dives. Transmitter temperature information was also sent and indicated that virtually all deep dives occurred at night, when the whale was likely feeding on squid. Surface resting occurred most often immediately after sunrise on a four to seven day cycle. Future movement and dive information in conjunction with oceanographic data will be important in identifying the critical habitats of whales and understanding their behaviour.

Mate, B.R.; Lagerquist, B.A.; Winsor, M.; Geraci, J.; Prescott, J.H. 2005. Movements and dive habits of a satellite-monitored long finned pilot whale (*Globicephala melas*) in the Northwest Atlantic. *Mar. Mammal Sci.*, 21(1):136-144.

Summary: On 29 June 1987, three juvenile long finned pilot whales were released 160 km southeast of Cape Cod, MA with satellite telemetry tags which provided movements and dive behavior.

McFee, W.E. 1990. An analysis of mass strandings of the long-finned pilot whale, *Globicephala melaena* on Cape Cod. [M.Sc. thesis]. Northeastern University, Boston, MA; 85 p. (Available from Northeastern University Library, Boston, Ma.)

Summary: This thesis reviews mass stranding events of long finned pilot whales on Cape Cod from 1620 – 1990, and discusses possible causes.

McFee, W.E. 1991. Common names applied to the long-finned pilot whale, *Globicephala melas*. *Can. Field Nat.* 105(4):564-566.

Summary: The author provides a list of historical pilot whale mass stranding events occurring on Cape Cod, Massachusetts. His research found four common names used "locally" to describe pilot whales in these waters.

Mead, J.G.; Brownell, R.L. 2005. Order Cetacea. *Mammalian Species of the World*: 723-743.

Summary: This document provides background information on the taxonomic and systematic relationships for the different species of pilot whales.

Mercer, M.C. 1967. Wintering of pilot whales *Globicephala melaena* in Newfoundland inshore water. *S.J. Fish. Res. Board. Can.* 24:2481-2484.

Summary: This document discusses the regular occurrence of inshore wintering of long-finned pilot whales as it relates to an abundant food source, short-finned squid (*Illex illecebrosus*).

Mercer, M.C. 1975. Modified Leslie-DeLury population models of the long-finned pilot whale (*Globicephala melaena*) and annual production of the short-finned squid (*Illex illecebrosus*) based upon their interactions at Newfoundland. *J. Fish. Res. Bd. Can.* 32(7):1145-54.

Summary: This document presents a population model for long-finned pilot whale as it relates to an abundant food source short-finned squid (*Illex illecebrosus*) in the waters off Newfoundland.

Mintzer, V. J.; Gannon, D.P.; Barros, N.B.; Read, A.J. 2008. Stomach contents of mass-stranded short-finned pilot whales (*Globicephala macrorhynchus*) from North Carolina. *Mar. Mammal Sci.*, 24(2):290-302.

Abstract: We examined the stomach contents of 27 short-finned pilot whales (*Globicephala macrorhynchus*) were identified from a mass stranding on 15 January 2005 in North Carolina. Eleven whales had prey parts in their fore stomachs. Authors used frequency of occurrence and numerical abundance to assess the relative importance of prey. *Brachioteuthis riisei* (numerical abundance 28%), an oceanic species, was the most important cephalopod prey, but *Taonius pavo* (12%) and *Histioteuthis reversa* (9%) also represented a substantial part of the diet. A large number of otoliths belonging to the fish *Scopelogadus beanii* were present (25%). These results differ from reports of the stomach contents of short-finned pilot whales from the Pacific coast in which neritic species dominate the diet. Our findings also suggest that there is a considerable difference between the diets of short- and long-finned pilot whales (*Globicephala melas*) in the western North Atlantic. The latter feed predominantly on the long-finned squid (*Loligo pealei*) whereas the former feed on deep-water species. Their results indicate these whales fed primarily off the continental shelf prior to stranding.

Miyashita, T.; Kasuya, T.; Mori, K. 1990. An examination of the feasibility of using photo-identification techniques for a short-finned pilot whale stock off Japan. *Rep. Int. Whal. Comm.* (Special Issue) 12:425-428.

Summary: The authors discuss the feasibility and use of photo-identification techniques to identify and examine short-finned pilot whale populations in the North Pacific. Several important techniques are discussed.

Muir, D.C.G.; Wagemann, R.; Grift, N.P.; Norstrom, R. J.; Simon, M.; Lien, J. 1988. Organochlorine chemical and heavy metal contaminants in white-beaked dolphins (*Lagenorhynchus albirostris*) and pilot whales (*Globicephala melaena*) from the coast of Newfoundland, Canada. *Arch. Environ. Contam. Toxicol.* 17:613-629.

Abstract: Polychlorinated biphenyls (EPCB), DDT isomers (EDDT), chlordanes (ECHLOR), toxaphene, chlorobenzenes and hexachlorocyclohexane isomers and seven elements (As, Cd, Cu, Hg, Pb, Se, Zn) were determined in tissues of 41 stranded pilot whales (*Globicephala melaena*) and 27 ice-entrapped white-beaked dolphins (*Lagenorhynchus albirostris*) from Newfoundland, Canada. Cadmium, Hg, As and Se were significantly higher in pilot whale kidney and liver than in dolphin tissues. Mercury in liver and blubber, and Cd in kidney, of pilot whales were positively correlated with age. Cadmium levels in both species were much higher than reported for other cetaceans from Canadian east coast waters. Lead concentrations in dolphin kidney and muscles were 5 times higher than in pilot whales. Levels of EPCB (sum of 49 congeners) in blubber samples ranged from 31 to 61 mg/kg (lipid wt) in female and male dolphins, respectively, and from 5.6 to 12 mg/kg in female and male pilot whales. XDDT and toxaphene were present at similar levels to EPCB while mean XCHLOR (sum of seven components) ranged from 1.6 to 17 mg/kg in blubber of pilot whales and dolphins, respectively. The presence of high levels of toxaphene in the blubber of both species was unexpected and may be due to increased use of this pesticide during the 1970's. Higher levels of all organochlorine chemicals in blubber, as well as Pb in kidney and muscle, of

dolphins than in pilot whales may reflect greater exposure to contaminants because of over-wintering and feeding in Gulf of St. Lawrence waters.

Mullin, K.D.; Fulling, G.L. 2003. Abundance of cetaceans in the southern U.S. North Atlantic Ocean during summer of 1998. *Fish. Bull.* 101(3):603-613.

Summary: The U.S. Marine Mammal Protection Act requires an assessment of marine mammal abundance in U.S. waters. This requirement had not met for a large portion of the North Atlantic Ocean (U.S. waters south of Maryland), a ship based line transect survey was conducted between Maryland and central Florida. Results included several sightings of short-finned pilot whales.

Mullin, K.D.; Fulling, G.L. 2004. Abundance of cetaceans in the oceanic Gulf of Mexico, 1996-2001. *Mar. Mamm. Sci.* 20(4):787-807.

Abstract: The Gulf of Mexico is a subtropical marginal sea of the western North Atlantic Ocean with a diverse cetacean community. Ship-based, line-transect abundance surveys were conducted in oceanic waters (>200 m deep) of the northern Gulf within U. S. waters (380,432 km²) during spring from 1996 to 1997 and from 1999 to 2001. Data from these five surveys were pooled and minimum abundance estimates were based on 12,162 km of effort and 512 sightings of at least 19 species. The most commonly sighted species (number of groups) were pantropical spotted dolphin, *Stenella attenuata* (164); sperm whale, *Physeter macrocephalus* (67); dwarf/pygmy sperm whale, *Kogia sima/breviceps* (58); Risso's dolphin, *Grampus griseus* (38); and bottlenose dolphin, *Tursiops truncatus* (24). The most abundant species (number of individuals; coefficient of variation) were *S. attenuata* (91,321; 0.16); Clymene dolphin, *S. clymene* (17,355; 0.65); spinner dolphin, *S. longirostris* (11,971; 0.71); and striped dolphin, *S. coeruleoalba* (6,505; 0.43). The only large whales sighted were *P. macrocephalus* (1,349; 0.23) and Bryde's whale, *Balaenoptera edeni* (40; 0.61). Abundances for other species or genera ranged from 95 to 2,388 animals. Cetaceans were sighted throughout the oceanic northern Gulf and, whereas many species were widely distributed, some had more regional distributions.

Mullin, K.D.; Hoggard, W.; Hansen, L.J. 2004. Abundance and seasonal occurrence of cetaceans in outer continental shelf and slope waters of the north-central and northwestern Gulf of Mexico. *Gulf Mex. Sci.* 2004(1):62-73.

Summary: Eight aerial line-transect surveys of the outer continental shelf and continental slope waters were conducted seasonally from summer 1992 through the spring of 1994 in the north-central and northwestern Gulf of Mexico to study the seasonal occurrence and spatial distribution of cetaceans and to estimate their abundances. Short-finned pilot whale sightings were summarized.

North Atlantic Marine Mammal Commission (NAMMCO). 1997. North Atlantic Marine Mammal Commission Annual Report 1996. Tromso, Norway. The long-finned pilot whale.

Summary: The paper provides information on the current knowledge of the distribution, stock definition, ecology, abundance trends, management and threats of this species in the eastern North Atlantic Ocean.

Nawojchik, R.; St. Aubin, D.J.; Johnson, A. 2003. Movements and dive behavior of two stranded rehabilitated pilot whales, *Globicephala melas*, in the Northwest Atlantic. *Mar. Mammal Sci.*, 19(1):232-239.

Summary: This paper described the post-release behavior of two juvenile long-finned pilot whales following their rehabilitation. Their movements and dive behavior were monitored for four months with the aid of satellite-linked time-depth recorders.

Nelson, D.; Lien, J. 1996. The status of the long-finned pilot whale *Globicephala melas* in Canada. *Can. Field Nat.*, 110(3):511-524.

Summary: The long-finned pilot regularly migrates to Canadian inshore waters following spawning squid. Drive fisheries from 1947-1971 seriously depleted the *G. melas* population off Newfoundland. There are few reliable recent population estimates for *G. melas* but even optimistic recovery forecasts based on drive fisheries in Newfoundland would produce a present population substantially lower than pre-whaling numbers.

Nielsen, J.B.; Nielsen, F.; Joergensen, P.J.; Grandjean, P. 2000. Toxic metals and selenium in blood from pilot whales (*Globicephala melas*) and sperm whales (*Physeter catodon*). *Mar. Pollut. Bull.* 40:348–351.

Abstract: Mercury, lead, cadmium and selenium were measured in blood from pilot whales (*Globicephala melas*) caught at the Faroe Islands and in blood from four sperm whales (*Physeter catodon*) stranded in Denmark. The median whole-blood concentration of mercury in pilot whales was 229 µg/l with a positive correlation to the corresponding selenium concentrations. Blood concentrations of mercury and cadmium up to 2421 and 31 100 µg/l, respectively, were found in the sperm whales. Cadmium concentration averaged 500-1000 times higher in stranded sperm whales than in the pilot whales. The mercury and cadmium concentrations dramatically exceed levels which are associated with severe toxicity in several other mammal species.

Nores, C.; Perez, C. 1988. Overlapping range between *Globicephala macrorhynchus* and *Globicephala melaena* in the northeastern Atlantic. *Mammalia* 52(1):51-55.

Summary: Ten pilot whales were definitely identified off the coast of Asturias (northern Spain) from 1982 – 1986; seven of these belonged to the species *Globicephala macrorhynchus*. These observations seem to confirm the possibility that the limit of the geographical range of this species is in the Bay of Biscay, although its relative frequency with respect to *Globicephala melaena* is much less in these waters. Towards the south, the boreal species descends along the African coast to Mauritania, favored by the Saharan upwelling, whereas the tropical species travels north through warmer pelagic waters.

Norris, K.S.; Prescott, J.H. 1961. Observations on Pacific cetaceans in Californian and Mexican waters. University of California Publications in Zoology 63:291-402.

Summary: This document provides background information on the taxonomic and systematic relationships for the different species of pilot whales of the Pacific Ocean.

Oremus, M. 2008. Genetic and demographic investigation of population structure and social system in four delphinid species. 2008. [PhD Dissertation] Univ. of Auckland, New Zealand.

Abstract: Population structure, genetic diversity and social system were investigated in four species of dolphins, thought to present contrasting habitat preferences and social organization: spinner dolphins, rough-toothed dolphins, long-finned and short-finned pilot whales. The molecular ecology of the mass strandings of long-finned pilot whales around New Zealand was investigated to test the hypothesis that individuals stranding together are part of an extended matrilineal group. Analyses of mtDNA sequences indicate that more than one haplotype was found in five of the seven mass strandings investigated ($n = 275$), demonstrating that groups are sometimes composed of unrelated maternal lineages. This was further supported by analyses of relatedness within and between strandings based on microsatellites (14 loci). These analyses discount kinship as the only factor causing large mass strandings in long-finned pilot whales. Parentage analyses confirmed some aspects of previous studies in the North Atlantic, suggesting a social system with at least some level of male and female philopatry to the maternal group, and infrequent paternities within the group. In a detailed study of a large mass stranding (Stewart Island 2003, $n = 122$), there was no correlation between position of the whales on the beach and genetic relatedness (based on 20 microsatellite loci), discounting the assumption that kinship bonds are maintained during these traumatic events. This was further supported by the striking separation of stranded mothers and dependant calves. This disruption of kinship bonds could help explain the behavioural distress of stranded individuals and the tendency of many whales to re-strand even after being re-floated. University of Auckland, Auckland, NZ. Available from:

<http://researchspace.auckland.ac.nz/bitstream/2292/2621/6/01front.pdf>

Ottensmeyer, C.A. 2002. Social structure of long-finned pilot whales from photo-identification techniques (*Globicephala melas*). [M.Sc.] Dalhousie University, Halifax, Nova Scotia, Canada. (Available from the Dalhousie University library, Halifax, Nova Scotia.

Summary: Social structure as determined from the long-term photo-identification studies of long-finned pilot whales from the waters of Nova Scotia, Canada.

Ottensmeyer, C.A.; Whitehead, H. 2003. Behavioral evidence for social units in long-finned pilot whales. *Can. J. Zool.* 81(8):1327-1338.

Abstract: In general, mammal species show geographic or social dispersal by one or both sexes. Long-term behavioral observations and genetic evidence have confirmed that fish-eating resident killer whales, *Orcinus orca*, are a rare exception. Female and male offspring travel with their mothers for their whole lives: this is called natal group philopatry. It is suspected that pilot whales, *Globicephala* spp., also follow this social pattern, but longitudinal data on the social structure of live long-finned pilot whales, *Globicephala melas*, are rare. The authors observed *G. melas* during July and August of 1998–2000 off northern Nova Scotia, Canada. Estimated group sizes ranged from 2 to 135 (mean=20, SD=17, median=15, $n=249$). A total of 322 individuals were identified on the basis of distinctive marks on the dorsal fin, with estimated mark rates of 0.336 (proportion) (SE=0.041) and 0.352 (mean of estimates) (SE=0.036). Permutation testing rejected the null hypothesis of random association between individuals ($p < 0.0005$). The best-fit model of the standardized lagged association rate suggests short-term associations

of individuals over hours to days and long-term associations with a subset of those individuals over years. When scaled according to mark rate, sets of long-term associate's average approximately 11–12 individuals, a much lower estimate than that presented previously from drive-fishery data from the Faroe Islands. Genetic sampling of behaviorally studied individuals is recommended.

Overholtz, W.J.; Waring, G.T. 1991. Diet composition of pilot whales *Globicephala sp.* and common dolphins *Delphinus delphis* in the Mid-Atlantic Bight during spring 1989. Fish. Bull. 89:723-728.

Summary: Data were collected by U.S. observers on foreign vessels in the offshore Atlantic mackerel trawl fishery. Stomachs were collected from 5 pilot whales and 4 common dolphins incidentally caught in March/April 1989 in the Mid-Atlantic Bight region. The authors looked at the similarities and differences in the diet composition between these two species.

Payne, P.M.; Heinemann, D.W. 1993. The distribution of pilot whales (*Globicephala sp.*) in shelf and shelf-edge waters of the northeastern United States, 1987-1998. In: Donovan, G.P.; Lockyer, C. H.; Martin, A.R., (eds.). Biology of the Northern Hemisphere Pilot Whales. Rep. Int. Whal. Comm. (Special Issue) 14:51-58.

Abstract: The spatial and temporal distribution of pilot whales (*Globicephala spp.*) in shelf/shelf-edge and slope waters of the northeastern U.S. is described from 1,033 sightings collected during standardized aerial and shipboard surveys (1978-88). Two species of pilot whales (long-finned pilot whales, *Globicephala melas*, and the short-finned pilot whale, *Globicephala macrorhynchus*), occur in this study area. The long-finned pilot whale is the most widespread and abundant. Seasonal distribution of *G. melas*, coincide most closely with the abundance of long-finned squid (*Loligo pealei*) and Atlantic mackerel (*Scomber scombrus*). During late winter and spring the distribution of pilot whales generally follows the shelf-edge/slope region between the 100m and 2,000m contours. This corresponds to a general movement northward and onto the shelf from deeper slope waters. During late summer and fall the pilot whale sighting distribution is more widespread throughout the shelf.

Two distinct clusters of pilot whales sightings occur in shelf-edge/slope waters of the northeastern U.S. May-December. A northward cluster (likely *G. melas*) is centered north of 40°N (in the Great South Channel-Georges Bank regions). The second cluster of pilot whale sightings occurs in the Mid-Atlantic (south of 38 30N) at this time, and is considered *G. macrorhynchus*.

Pfeiffer, D.C.; Wang, A.; Nicolas, J.; Pfeiffer, C.J. 2001. Lingual ultrastructure of the long-finned pilot whale (*Globicephala melas*). Anat. Histol. Embryol. 30, 359-365.

Summary: This paper describes the microscopic studies and description of the pilot whale tongue.

Praca, E.; Gannier, A. 2008. Ecological niches of three teuthophageous odontocetes in the northwestern Mediterranean Sea. Ocean Sci., 4(1):49-59.

Abstract: In the northwestern Mediterranean Sea, sperm whales, pilot whales and Risso's dolphins prey exclusively or preferentially on cephalopods. In order to evaluate their

competition, the authors modeled their habitat suitability with the Ecological Niche Factor Analysis (ENFA) and compared their ecological niches using a discriminant analysis. Long term (1995-2005) small boat data set, with visual and acoustic (sperm whale) detections were used. Pilot whale has the most oceanic habitat (2500 m mean depth) mainly located in the central Ligurian Sea and Provencal basin. Therefore, potential competition for food between these species may be reduced by the differentiation of their habitats.

Prieto, R.; Fernandes, M. 2007. Revision of the occurrence of the long-finned pilot whale *Globicephala melas* (Traill, 1809), in the Azores Arquipélago. *Life Mar. Sci.* 24: 65-69.

Abstract: Although the expected distribution of the long-finned pilot whale in the Atlantic includes the Azores, overlapping with the known northern distribution of the short-finned pilot whale, the only documental references to the species in the archipelago are based on a single specimen captured in 1894. Moreover, a clear distinction between the two species of pilot-whales based on osteological grounds was only possible after 1971 and before that a great uncertainty existed about the phylogeny of the Genus. The long-finned pilot whale, thus, has never been confirmed by sightings at sea in the region and the extent of its occurrence to the South in the central North Atlantic has been, up to now, an open issue. Here we present evidence of the occurrence of the long-finned pilot whale in the Azores, based on two sightings made in different years.

Rack, R.S. 1952. Blackfish hunting off St. Vincent. (In: Fisheries in the Caribbean. Report of the Fisheries Conference, Caribbean Commission, Central Secretariat. Kent House, Trinidad. March 24-28, 1952), p. 80-83.

Summary: This paper describes the methods, materials and results of the blackfish hunt (short-finned pilot whales) in the waters surrounding St. Vincent in the early 1950s.

Raga, J.A.; Balbuena, J.A. 1993. Parasites of the long-finned pilot whale, *Globicephala melas* (Traill, 1809), in European waters. *Rep. Int. Whal. Comm. (Special Issue)* 14:391-406.

Summary: Long-finned pilot whales from three European regions (Faroe Island, Spanish western Mediterranean waters and French Atlantic [Bay of Biscay]) were surveyed for ecto- and endo-parasites in order to provide information on the taxonomy, biology, host relationships and pathogenicity of the parasites and epizootics of the pilot whale in the Eastern North Atlantic.

Rayner, G.W. 1939. *Globicephala leucosagmorpha*, a new species of the genus *Globicephala*. *Annals and Magazine of Natural History (Series 2)*. 4:543-544.

Summary: The pilot whale found in the So. Hemisphere is described as a new, separate species, *G. leucosagmaphora*.

Rendell, L.E.; Gordon, J.C.D. 1999. Vocal response of long-finned pilot whales (*Globicephala melas*) to military sonar in the Ligurian Sea. *Mar. Mamm. Sci.* 15(1):198-204.

Summary: A marine mammal acoustic study reports military sonar signals were heard most frequently in the northern part of the Ligurian Sea (Mediterranean Sea). Loud sonar signals could be heard during an extended encounter with long-finned pilot whales. The

paper describes vocal response from an encounter between pilot whales and an Italian Naval vessel sonar signals on 5 September 1994.

Rendell, L.E.; Matthews, J.N.; Gill, A.; Gordon, J.C.D.; Macdonald, D.W. 1999. Quantitative analysis of tonal calls from five odontocete species, examining inter-specific and intra-specific variation. *J. Zool. (Lond.)* 249(4):403-410.

Summary: Whistle vocalizations of five odontocete cetaceans, the false killer whale *P. crassidens*, short-finned pilot whale *G. macrorhynchus*, long-finned pilot whale *G. melas*, white-beaked dolphin *L. albirostris* and Risso's dolphin *G. griseus*, were analyzed and summarized quantitatively.

Rice, D.W. 1998. *Marine Mammals of the World: Systematics and Distribution*. The Society for Marine Mammalogy Special Publication 4:1-231.

Summary: This document provides background information on the taxonomic, systematic and distribution relationships for the different species of pilot whales.

Scammon, C.M. 1869. On the cetaceans of the western coast of North America. *Proc. Acad. Nat. Sci. Philadelphia*. 22:13-63

Summary: This document provides background information on the taxonomic and systematic relationships for the different species of pilot whales of the Pacific Ocean.

Schmiegelow, J.M.M.; Filho, A.M.P. 1989. First record of the short-finned pilot whale *Globicephala macrorhynchus* Gray 1846, for the southwestern Atlantic. *Mar. Mamm. Sci.* 5(4):387-391.

Summary: Strandings of short-finned pilot whale *Globicephala macrorhynchus*, in Brazil are summarized.

Sergeant, D.E. 1962. The biology of pilot or pothead whales *Globicephala melaena* in Newfoundland waters. *J. Fish. Res. Board Can.* 19:1-84.

Summary: One of the best early research papers on the biology of western North Atlantic long-finned pilot whales.

Sergeant, D.E. 1962. On the external characters of the blackfish or pilot whale (Genus *Globicephala*). *J. Mamm.* 43(3):395-413.

Abstract: The coloration and morphology of the North Atlantic pilot whale *Globicephala melaena melaena* are described and comparisons made with the sub species *G. m. edwardii*, occurring in the southern oceans, the tropical Atlantic *G. macrorhynchus* and the north Pacific *G. scammoni*. The North Atlantic pilot whale may show small differences in color pattern from the southern subspecies but no differences have been detected in morphometry. The other two species have dark ventral markings of approximately the same for as *G. melaena*. The flipper of *G. melaena* grows more rapidly in length than the body throughout all but earliest postnatal life, while the flipper of *G. macrorhynchus* is isometric. The latter species thus has a short flipper at all except young ages. *G. scammoni* appears to be intermediate in this feature. *G. melaena* shows positive allometry of the flipper and dorsal fin in foetal and most of postnatal life but

negative allometry between birth and weaning. The functional significance of this feature found also in the fin whale.

Shane, S.H.; McSweeney, D. 1990. Using photo-identification to study pilot whale social organization. Rep. Int. Whal. Comm. (Special Issue) 12:259-263.

Summary: Photo-identification of uniquely marked individuals was the primary research tool used in the studies of short-finned pilot whale social organization at Santa Catalina Island, California and the Big Island of Hawaii.

Siemann, L. 1992. Pilot whale research using small tissue samples. *Oceanus*, 35(3):71-73.

Summary: This paper focuses on the use of pilot whale genetic samples used in determining the DNA sequences of the D-loop. This is a rapidly evolving mtDNA region, used to determine relationships between pilot whale populations in the North Atlantic.

Siemann, L. 1994. Mitochondrial DNA sequence variation in North Atlantic pilot whales, *Globicephala melas*. [PhD. Dissertation] Massachusetts Institute of Technology, Woods Hole Oceanographic Institution, Woods Hole, Ma. USA. (Available from the Marine Biological Laboratory Library, Woods Hole, Ma.)

Sigurjonsson, J.; Vikingsson, G.; Lockyer, C. 1993. Two mass strandings of pilot whales *Globicephala melas* on the coast of Iceland. Rep. Int. Whal. Comm (Special Issue) 14:407-423.

Summary: This paper describes two mass stranding of pilot whales on the coast of Iceland occurring in 1982 and 1986. Food habits, age, length, sexual maturity and reproduction are discussed.

Stacey, P.J.; Baird, R.W. 1993. Status of the short-finned pilot whale, *Globicephala macrorhynchus*, in Canada. Can. Field Nat. 107(4):481-489.

Summary: This paper presents distributional information and population status on short-finned pilot whales from North Pacific Canadian waters.

Sweeny, M.M.; Price, J.M.; Jones, G.S.; French, T.W.; Early, G.A.; Moore, M.J. 2005. Spondylitic changes in long-finned pilot whales (*Globicephala melas*) stranded on Cape Cod, Massachusetts, USA, between 1982 and 2000. J. Wildl. Dis. 41(4):717-727.

Abstract: The primary bone pathology diagnoses recognized in cetacea are osteomyelitis and spondylosis deformans. In this study, the authors determined the prevalence, type, and severity of vertebral pathology in 52 pilot whales, a mass stranding species that stranded on Cape Cod, Massachusetts, between 1982 and 2000. Eleven whales (21%) had hyperostosis and ossification of tendon insertion points on and between vertebrae, chevron bones, and costovertebral joints, with multiple fused blocks of vertebrae. These lesions are typical of a group of interrelated diseases described in humans as spondyloarthropathies, specifically ankylosing spondylitis, which has not been fully described in cetacea. In severe cases, ankylosing spondylitis in humans can inhibit mobility. If the lesions described here negatively affect the overall health of the whale, these lesions may be a contributing factor in stranding of this highly sociable species.

Taruski, A.G. 1976. Whistles of the pilot whale (*Globicephala* spp.) variations in whistling related to behavioral/environmental broadcast of underwater sound and geographic location. [PhD Dissertation University of Rhode Island, Narragansett, R.I.] (Available from the University of Rhode Island Library, Narragansett, R.I.)

Taruski, A.G. 1976. The whistle repertoire of the North Atlantic pilot whale (*Globicephala melaena*) and its relationship to behavior and the environment. In Behavior of Marine Animals: Current perspectives in Research. Vol. 3: Cetaceans. Winn, H.E. & B.L. Olla (eds.). Plenum Press, NY. pps. 345-368.

Summary: After reviewing over 1500 pilot whale whistle sonograms there were no clear mutually exclusive whistle types. Paper describes pilot whale whistle types, associated behavior and group size.

Tilbury, K.L.; Adams, N.G.; Krone, C.A.; Meador, J.P.; Early, G.; Varanasi, U. 1999. Organochlorines in stranded pilot whales (*Globicephala melaena*) from the coast of Massachusetts. Arch. Environ. Contam. Toxicol. 37:125-134.

Abstract: Pilot whales strand periodically along the U.S. coast, and these strandings offer an opportunity for the collection of tissues for biomonitoring of contaminant exposure in cetaceans, as well as for specimen archiving. Concentrations of organochlorine (OC) contaminants (*e.g.*, PCB congeners, pesticides, DDTs) were measured in tissue samples from pilot whales that stranded in 1986 and 1990 along the Massachusetts coast. Adult and fetal samples of blubber, liver, brain, and kidney were collected, as well as ovaries from mature female whales. Many of the OCs found in maternal tissues was detected in corresponding fetal tissues indicating maternal transfer of OCs to the fetus. The concentrations of individual OCs in tissues varied considerably among the animals. Statistically significant differences were found between females and males for the concentrations of certain analytes (*e.g.*, SPCBs, *p,p*8-DDE) and these differences may be partially due to contaminants being transferred by the female whales during gestation and lactation. The concentrations of OCs in different tissues were similar when based on total lipid weight, except for the brain, which contained the lowest lipid-normalized OC concentrations. The low concentrations in brain may be related to the disparate lipid compositions in this tissue as well as the presence of the blood-brain barrier. The availability of data on these archived and biomonitoring samples provide a baseline for future retrospective studies.

True, F.W. 1889. A review of the family Delphinidae. Bull. U.S. Nat. Mus., 36:1-191.

Summary: This is one of the oldest published papers which describes the biology and morphology of the members of the family Delphinidae, including pilot whales.

Uhen, M.D.; Fordyce, R.E.; Barnes, L.G. 2008. Odontoceti. In C. M. Janis, K.M. Scott, and L. L. Jacobs (eds.), Evolution of Tertiary Mammals of North America II: 566-606.

Summary: This document provides background information on the taxonomic, systematic and distribution relationships for the different species of pilot whales.

Valsecchi, E.; Amos, B. 1996. Microsatellite markers for the study of cetacean populations. *Mol. Ecol.* 5(1):151-156.

Abstract: Microsatellites are one of the most important classes of nuclear genetic markers and offer many advantages for the study of marine mammals. The isolation and characterization of 12 cetacean microsatellites were tested across 30 different cetacean species. For around half the species tested, five or more polymorphic loci were identified. Since many species were represented by only one or two specimens, this figure is likely to underestimate the usefulness of these markers. No relationship was found between microsatellite repeat length and proportion of species which gave polymorphic products.

van Bree, P.J.H. 1971. On *Globicephala seiboldi* Gray 1846, and other species of pilot whales. (Notes on cetacean, Delphinoidea III). *Beaufortia* 19:79-87.

Summary: This paper provides both historical and systematic information on the (species) name changes found in the Genus *Globicephala*.

van Bree, P.J.H.; Best, P.B.; Ross, G.J.B. 1978. Occurrence of the two species of pilot whales on the coast of South Africa. *Mammalia*. 42:323-328.

Abstract: The history of a skull of a Pilot whale from South Africa present in the Museum d'Histoire Naturelle at Bordeaux, France, is discussed in detail. This skull almost certainly is the holotype of *Globicephala melaena edwardii*. Occurrence of long-finned pilot whales, *Globicephala melaena*, and short-finned pilot whales, *G. macrorhynchus*, on the coast of South Africa are enumerated and the local distribution of the two species is discussed.

Wada, S. 1988. Genetic differentiation between two forms of short-finned pilot whales off the Pacific coast of Japan. *Sci. Rep. Whales Res. Inst., Tokyo* 39:91-101.

Summary: Two forms of short-finned pilot whales are known to exist off the Pacific coast of Japan. The northern form has larger body size, distinct saddle, and rounded contour of the head than the southern form. The northern form inhabits the coastal waters between 35-°40°N latitude of Japan. Genetic variation and differences are presented.

Walsh, M.T.; Beusse, D.O.; Young, W.G.; Lynch, J.D.; Asper, E.D.; Odell, D.K. 1991. Medical findings of a mass stranding of pilot whales (*Globicephala macrorhynchus*) in Florida. In: *Marine Mammal strandings in the United States, Proceedings of the Second Marine Mammal Stranding Workshop, Miami, Fl. Dec. 3-5, 1987.* Reynolds, J.E. and D.K. Odell (eds). NOAA Tech. Rep. NMFS 98.

Abstract: A pod of at least thirty-three short-finned pilot whales (*Globicephala macrorhynchus*) stranded on Marco Island on the southwest coast of Florida on 23 July 1986. Because the animals were already being returned to the Gulf of Mexico by another response group at the time we arrived, our initial examination was limited to blood work on either live individuals and post-mortems on six of eight dead individuals. The remainder of the live individuals, some of which were marked for future identification with plastic tags and by notching dorsal fins, headed north in the Gulf after regrouping at the mouth of the Marco River. On 9 August 1986 the apparent remnants of the pod were found stranded near Key West, Fl. On this date, 10 of 17 animals found were dead. Surviving animals were transported to Sea World of Florida from Key West and were

sampled for complete blood counts and serum chemistries before therapy began. All of the individuals sampled from the incidents on 24 July and 9 August showed physical, clinical pathological or histological evidence of illness. None of the individuals survived longer than two weeks. Physical abnormalities noted in the live whales included increased respiratory rate, difficult breathing, and elevated heart rate. Clinical pathologic abnormalities included elevated hemoglobin levels and elevated plasma fibrinogen, leucopenia, leukocyte left shift, hyperglycemia, elevated serum creatinine, elevated serum bilirubin, decreased alkaline phosphatase, elevated lactic dehydrogenase, elevated liver enzymes, hypocalcemia and hypophosphatemia.

These findings suggest that the majority of whales sampled in this mass stranding were clinically ill. Stranded individuals should be examined for illness by common diagnostic procedures such as blood counts, serum chemistries and necropsy to determine the extent of illness in stranded whales.

Waring, G.T.; Gerrior, P.T.; Payne, P.M.; Parry, B.L.; Nicolas, J. R. 1990. Incidental takes of marine mammals in foreign fishery activities off the northeast United States, 1977-1988. Fish. Bull. 88:347-360.

Abstract: Fishery observers aboard foreign commercial fishing vessels collected information on the incidental catch of marine mammals in the Exclusive Economic Zone (EEZ) off the northeastern United States since March 1977. Observer coverage on foreign vessels was 25-35% during 1977-82 and increased to 58%, 86%, 95%, 98%, 100%, and 100%, respectively, in 1983-88. During 1981-88, observers have covered most joint venture fishing operations. During 1977-88, observers reported 538 marine mammals captured incidental to direct and joint-venture fishing activities. Eight cetacean species and three unidentified baleen whales were caught, principally in the fisheries for Atlantic mackerel *Scomber scombrus*, and squid *Illex illecebrosus* and *Loligo pealei*. Pilot whales *Globicephala* spp. (297/538) and common dolphins *Delphinus delphis* (203/538) comprised 93% of the catch. Chi-square tests indicate that significant differences in diel rates of capture occurred between the two species. The number of *Globicephala* spp. captured at night (2000-0400 h) in the Atlantic mackerel fishery was significantly less ($\chi^2 = 8.28$, $P < 0.03$) than the number caught during day (0800-1600 h) or dawn/dusk (1600-2000 h, 0400-0800 h). The number of *D. delphis* captured during daylight in the *Loligo* squid fishery was significantly less ($\chi^2 = 44.48$, $P < 0.001$) than the number caught at night or dawn/dusk. A minke whale *B. acutorostrata* (released alive), and individuals of two endangered species, a humpback whale *Megaptera novaeangliae* (released alive) and a right whale *Eubalaena glacialis*, were also captured incidental to fishing activity. During December 1986 February 1988, observers collected whole, dead, non-endangered mammals for detailed shore side examination. Trawl contents at the time of capture and subsequent analysis of mammal stomach contents suggest that *L. pealei* is a major component of the mid-shelf and shelf-edge diet of common dolphins and pilot whales. Further, pilot whales, considered principally as teuthophagous, were observed to selectively feed on mackerel while on the Continental Shelf.

Waring, G.T.; Josephson, E.; Fairfield-Walsh, C.P.; Maze-Foley, K. (eds.), 2007. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments – 2007. NOAA Tech. Memo. NMFS-NE 205.

Summary: The Marine Mammal Protection Act requires that an annual stock assessment report for each stock of marine mammal that occurs in waters under USA jurisdiction, be prepared by the National Marine Fisheries Service and the US Fish and Wildlife Service in regional Scientific Review Groups. The Scientific Review Groups are a broad representation marine mammal and fisheries scientists and members of the commercial fishing industry mandated to review the marine mammal stock assessment and provide advice to the NOAA Assistant Administrator of Fisheries. The reports are available on the Federal Register for public review before final publication.

Weilgart, L.S.; Whitehead, H. 1990. Vocalizations of the North Atlantic pilot whale (*Globicephala melas*) as related to behavioral contexts. Behav. Ecol. Sociobiol. 26:399-402.

Abstract: Vocalizations of free-ranging North Atlantic pilot whales were studied in different behavioral contexts to gain insight into the function and biological significance of different sound types. Simple whistles (with no frequency inflections) were heard more frequently when whales were "milling," a restful behavior type. During "surface active" behavior, energetic, often coordinated activity probably representing feeding, many sound types, especially complex whistles (with more frequency inflections) and pulsed sounds, occurred with greater frequency than when this behavior was absent. Greater numbers of most whistle types were produced when whales were spread over a larger area and when more subgroups were present. Thus, in pilot whales, there is a significant relationship between their sounds and their behavior, with vocalizations possibly serving to maintain contact and coordinate movements of the herd.

Weir, C.; Pollock, C.; Cronin, C.; Taylor, S. 2001. Cetaceans of the Atlantic Frontier, north and west of Scotland. Continent. Shelf Res. 21(8-10):1047-1071.

Abstract: Surveys carried out to the north and west of Scotland have recorded 15 species of cetacean between 1979 and 1998. These were fin whale (*Balaenoptera physalus*), sei whale (*B. borealis*), minke whale (*B. acutorostrata*), humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*), killer whale (*Orcinus orca*), long-finned pilot whale (*Globicephala melas*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), white-beaked dolphin (*L. albirostris*), Risso's dolphin (*Grampus griseus*), bottlenose dolphin (*Tursiops truncatus*), common dolphin (*Delphinus delphis*) and harbour porpoise (*Phocoena phocoena*). Atlantic white-sided dolphin was the most abundant species in the region with a total of 6317 animals recorded. Harbour porpoise was the most frequently sighted cetacean species. The geographical distribution of sightings indicate that cetacean species have varying ecological requirements, with species such as sperm whale, pilot whale and white-sided dolphin favoring deep water off the continental shelf edge, while minke whale, white-beaked dolphin and harbour porpoise were apparently limited to the continental shelf. The diversity of species recorded in the region suggests that the Atlantic Frontier is an important habitat for cetaceans.

Weir, C. R. 2008. Short-finned pilot whales (*Globicephala macrorhynchus*) respond to an air gun ramp-up procedure off Gabon. *Aq. Mammal.* 34(3):349-354.

Abstract: The ramp-up is a standard procedure within the offshore geophysical industry for mitigating the potential impacts of seismic air gun sound on marine mammals. However, the efficiency of the ramp-up as a mitigating procedure is poorly documented. In March 2008, a pod of 15 short-finned pilot whales (*Globicephala macrorhynchus*) was monitored before, throughout, and following a 30-min ramp-up procedure during a 2-D seismic survey off Gabon. No change in behaviour was apparent during the initial period of the ramp-up. However, 10 min into the ramp-up procedure (at air-gun volume of 940 cu3), the nearest whale subgroup turned sharply away from the air-guns. Subsequent behaviour included milling, tail slapping, and a 180° change of course to travel in the opposite direction from the seismic vessel. The observation described here suggests that pilot whales did initially demonstrate an avoidance response to the ramp-up. However, the movement away from the source was limited in time and space. Recommendations are made for further research into the efficiency of the ramp-up procedure for marine mammal mitigation.

Weisbrod, A.V.; Shea, D.; Moore, M.J.; Stegeman, J.J. 2001. Species, tissue and gender-related organochlorine bioaccumulation in white-sided dolphins, pilot whales and their common prey in the Northwest Atlantic. *Mar. Environ. Res.* 51:29-50.

Abstract: Organochlorine concentrations were measured in white-sided dolphins, pilot whales, and their prey from the Gulf of Maine and used to identify species, tissue, and gender differences, and trophic transfer trends, in bioaccumulation. Polychlorinated biphenyl concentrations ([PCB]) in dolphin blubber (13.7.1 mg/g fresh wt.) were twice those in pilot whales, but pesticide concentrations (20.13 mg/g fresh) were similar between species. 4,40-DDE, trans-non-achlor, C16(153) and C16(138) concentrations were highest. Skin tissues had more recalcitrant Organochlorines than the internal organs. Male dolphins bio-accumulated higher concentrations of nonmetabolizable PCBs and hexachlorocyclohexane (HCH) isomers, whereas pilot whales had no gender-related differences in bioaccumulation. Pilot whales, mackerel, and herring had proportionately higher concentrations of DDTs, whereas [PCB] were higher in dolphins and squid. Although these odontocetes feed at the same trophic level and store a similar suite of contaminants, dolphins bio-accumulated higher and potentially hazardous 4,40-DDE and PCB concentrations from food in their more geographically restricted range.

Weller, D.W.; Würsig, B.; Whitehead, H.; Norris, J.C.; Lynn, S.K.; Davis, R.W.; Clauss, N.; Brown, P. 1996. Observations of an interaction between sperm whales and short-finned pilot whales in the Gulf of Mexico. *Mar. Mamm. Sci.*, 12(4):588-594.

Summary: On 24 August 1994 an unusual interaction between short-finned pilot whales (*Globicephala macrorhynchus*) and sperm whales (*Physeter macrocephalus*) was observed during a study of acoustic and surface behavior of sperm whales in the north central Gulf of Mexico (28°43.20'N, 88°44.13'W). Authors report here on the defensive reactions of sperm whales to the presence of pilot whales.

Werth, A. 2000. A kinematic study of suction feeding and associated behavior in the long-finned pilot whale, *Globicephala melas* (Traill). Mar. Mamm. Sci. 16(2):299–314.

Abstract: Analysis of videotaped feeding sequences provides novel documentation of suction feeding in captive juvenile long-finned pilot whales (*Globicephala melas*). Swimming and stationary whales were videotaped while feeding at the surface, mid-water, and bottom. The ingestion sequence includes a preparatory phase with partial gape followed by jaw opening and rapid hyoid depression to suck in prey at a mean distance of 14 cm (duration 90 msec), although prey were taken from much greater distances. Depression and retraction of the large, piston-like tongue generate negative intraoral pressures for prey capture and ingestion. Food was normally ingested without grasping by teeth yet was manipulated with lingual, hyoid, and mandibular movement for realignment; suction was then used to transport prey into the oropharynx. Whales frequently rolled or inverted before taking prey, presumably to avoid grasping and repositioning. Preys were sucked off the bottom or sides of the pool without direct contact; lateral suction was used to ingest items from the sides of the mouth.

Whitehead, H. 1998. Cultural selection and genetic diversity in matrilineal whales. Science 282:1708-1711.

Abstract: Low diversities of mitochondrial DNA (mtDNA) have recently been found in four species of matrilineal whale. No satisfactory explanation for this apparent anomaly has been previously suggested. Culture seems to be an important part of the lives of matrilineal whales. The selection of matrilineal transmitted cultural traits, upon which neutral mtDNA alleles “hitchhike,” has the potential to strongly reduce genetic variation in whale species. Thus, in contrast to other nonhuman mammals, culture may be an important evolutionary force for the matrilineal whales.

Whitehead, H.; Ottensmeyer, C.A. 2003. Behavioural evidence for social units in long-finned pilot whales. Can. J. Zool. 81(8):1327-1338.

Abstract: In general, mammal species show geographic or social dispersal by one or both sexes. Long-term behavioural observations and genetic evidence have confirmed that fish-eating *resident* killer whales, *Orcinus orca*, are a rare exception. Female and male offspring travel with their mothers for their whole lives: this is natal group philopatry. It is suspected that pilot whales, *Globicephala* spp., also follow this social pattern, but longitudinal data on the social structure of live long-finned pilot whales, *Globicephala melas*, are rare. We observed *G. melas* through July and August of 1998–2000 off northern Nova Scotia, Canada. Estimated group sizes ranged from 2 to 135 (mean = 20, SD = 17, median = 15, $n = 249$). We distinguished 322 individuals on the basis of distinctive marks on the dorsal fin, with estimated mark rates of 0.336 (proportion) (SE = 0.041) and 0.352 (mean of estimates) (SE = 0.036). Permutation testing rejected the null hypothesis of random association between individuals ($p < 0.0005$). The best fit model of the standardized lagged association rate suggests short-term associations of individuals over hours to days and long-term associations with a subset of those individuals over years. When scaled according to mark rate, sets of long-term associate’s average approximately 11–12 individuals, a much lower estimate than that presented previously from drive-fishery data from the Faroe Islands. Genetic sampling of behaviorally studied individuals is recommended.

Zabow, G.; Butterworth, D.S. 1995. Possible implications of cohesive social structure for the dynamics and sustainable yields of cetacean populations - some exploratory calculations. Rep. Int. Whal. Comm. 45:391-396.

Abstract: An exploratory numerical investigation of the effects of exploitation on cetacean populations is undertaken to determine likely differences in dynamics between populations exhibiting cohesive social structures and ones in which such grouping either does not occur or is not pertinent given the exploitation pattern. A model with groups, each of which is age-structured, is developed, in which small groups of younger animals split from their parent groups once these exceed a certain size. Per capita growth rates are assumed to be less for these smaller groups, under the hypothesis (based on analogy with large land-based mammals) that such groups are less successful in protecting their young from predators. This effect, coupled to an exploitation pattern which removes only the larger group, does not lead to a lesser sustainable yield than could be taken from an “equivalent” homogeneous population, but the differences only a few percent for the set of parameter values investigated. The length distributions of animals captured also differ little. An interesting feature of the group’s model is an approach to equilibrium levels under exploitation marked by long lasting oscillations of not inconsiderable amplitude and duration. While a more exhaustive evaluation of the hypothesis investigated here could be undertaken, the development and analysis of alternative ideas of how group structure might impact population dynamics would seem to have a higher priority.

Zachariassen, P. 1993. Pilot whale catches in Faroe Islands 1709-1992. Rep. Int. Whal. Comm. (Special Issue) 14:69-88.

Summary: This paper provides statistical analysis of pilot whale catches in the Faroe Islands for the period 1709-1992. A total of 1,629 schools were taken involving 240,721 pilot whales, resulting in yearly averages of 5.74 schools and 848 pilot whales.

Index by Author

Abend, A.G.	2, 3
Adams, N.G.	37
Aguilar, A.	3, 10
Amiard, J.C.	14
Amiard-Triquet, C.	14
Amos, B.	3, 4, 38
Amos, W.	19
Andersen, A.W.	16
Andersen, L.W.	4, 5, 10, 16
Anonymous.	5
Asmutis, R.A.	6
Asper, E.D.	38
Aspholm, P.E.	16
Auger-Methe, M.	5
Baird, R.W.	6, 23, 36
Balbuena, J.A.	34
Bancroft, D.R.	4
Baraff, L.S.	6
Barnes, L.G.	37
Baron, S.C.	6
Barrett, J.	3, 4
Barros, N.B.	29
Baum, C.	7
Bavel, B.V.	26
Beatson, E.L.	7
Bernard, H.J.	7
Best, P.B.	38
Beusse, D.O.	11, 38
Bjoerke, H.	8
Bloch, D.	4, 8, 9, 10, 15, 16, 19, 22
Borrell, A.	3, 10
Borsani, J.F.	6
Bossart, G.D.	11, 18
Boyde, A.	12
Brown, P.	41
Brown, S.G.	11, 12
Brownell, R.L.	28
Buckland, S.T.	12
Bunch, C.	22
Butterworth, D.S.	43
Caldwell, D.K.	12
Caldwell, M.C.	12
Canadas, A.	13
Cattanach, K.L.	12
Caurant, F.	14

Cetacean and Turtle Assessment Program (CeTAP).....	14
Church, T.N.	14
Ciano, J.N.	15
Clauss, N.	41
Copland, H.G.	18
Craddock, J.E.	19, 20
Cray, C.	18
Cronin, C.	40
Culik, B.	15
Dam, M.	15, 26
Davies, J.L.	15
Davis, R.W.	41
de Stephanis, R.	15
Desportes, G.	4, 8, 10, 16
Dietz, R.	10, 22
Doksæter, L.	17
Donovan, G.P.	12, 17, 18, 33
Dover, G.A.	3, 4
Duignan, P.J.	18
Early, G.	18, 19, 36, 37
Edward, K.	6
Erdman, D.S.	12
Esteban-Pavo, R.	15
Evans, P.G.H.	18
Fairfield, C.P.	18
Fairfield-Walsh, C.P.	40
Fehring, W.K.	18
Fernandes, M.	34
Fernö, A.	17
Filho, A.M.P.	35
Firstrup, K.M.	19
Fleischer, L.G.	7
Foote, A.D.	19
Fordyce, R.E.	37
French, T.W.	36
Friday, R.	11
Friedrich, U.	4
Fullard, K.J.	19
Fulling, G.L.	30
Gannier, A.	33
Gannon, D.P.	19, 20, 29
García-Tíscar, S.	13, 15
Garrison, L.P.	6, 20
Geraci, J.R.	18, 20, 28

Gerrior, P.T.	39	Lacroix, A.	16
Gill, A.	35	Lagerquist, B.A.	28
Girton, P.	26	Lastein, L.	8, 9, 23
Gonzalez, A.F.	21	Layne, J.N.	25
Goodall, R.N.P.	21	Leatherwood, S.	21, 24, 26
Gordon, J.C.D.	34, 35	Lien, J.	29, 31
Gowans, S.	21	Lindstroem, G.	26
Grandjean, P.	31	Lockyer, C.	9, 12, 18, 26, 33, 36
Grift, N.P.	29	Lopez, A.	21
Guinet, C.	15	Lynch, J.D.	11, 38
Gunnlausson, T.	12	Lynn, S.K.	41
Hain, J.H.W.	21	Macdonald, D.W.	35
Hansen, L.J.	30	Macleod, K.	27
Hanson, M.B.	6	Macnie, S.V.	21
Hashmi, D.D.K.	22	Madin, K.	27
Hay, K.	22	Majures, T.M.O.	4
Heide-Jørgensen, M.P.	19, 22	Marsh, H.	24
Heimlich-Boran, J.R.	22	Martin, A.R.	12, 18, 27, 33
Heimlich-Boran, S.L.	22	Martin, V.	23
Heinemann, D.W.	33	Martinez, A.	6
Hernandez-García, V.	23	Mate, B.R.	27, 28
Hoggard, W.	30	Matthews, J.N.	35
Hooker, S.K.	23	Maze-Foley, K.	40
House, C.	18	McBearty, D.	26
Hoydal, K.	8, 23	McDonald, D.	26
Hyman, M.	21	McFee, W.E.	28
Ilangakoon, A.	26	McSweeney, D.	36
International Council for the Exploration of the Sea (ICES)	23, 24	Mead, J.G.	20, 24, 28
Irvine, A.B.	24	Meador, J.P.	37
Jean, P.	8	Mercer, M.C.	28
Jefferson, T.A.	24	Meyer, W.	7
Joensen, J.S.	8	Mikkelsen, B.	22
Joergensen, P.J.	31	Mikkelsen, M.	10
Johnson, A.	31	Mintzer, V. J.	29
Jones, G.S.	36	Minvielle-Sebastia, L.	15
Jones, S.J.	12	Miyashita, T.	25, 29
Jørgensen, R.	15	Mooers, C.N.K.	14
Jørgensen, M.P.H.	10	Moore, M.J.	18, 36, 41
Josephson, E.	40	Mori, K.	29
Jover, L.	3	Mouritsen, R.	8, 16
Kacza, J.	7	Muir, D.C.G.	29
Kasamatsu, F.	25	Mullin, K.D.	30
Kasuya, T.	24, 25, 29	Murray, E.	27
Kenney, R.D.	25	Nawojchik, R.	31
Krone, C.A.	37	Nelson, D.	31
		Nicolas, J.R.	19, 33, 39

Nielsen, F.	31	Sauriau, P.G.	14
Nielsen, J.B.	31	Scammon, C.M.	35
Nores, C.	31	Schlotterer, C.	4
Norris, J.C.	41	Schmiegelow, J.M.M.	35
Norris, K.S.	31	Scott, M.D.	24
Norstrom, R. J.	29	Seeger, J.	7
North Atlantic Marine Mammal Commission (NAMMCO)	30	Sergeant, D.E.	25, 35
Nøttestad, L.	17	Shane, S.H.	36
Odell, D.K.	11, 38	Shea, D.	41
Ofstad, L.H.	10, 22	Siebers, D.	7
Ogle, M.	7	Siegismund, H.R.	5
Olsen, E.	17	Siemann, L.	36
Oremus, M.	32	Sigurjonsson, J.	12, 36
O'Shea, S.	7	Simmonds, M.P.	27
Ottensmeyer, C.A.	32, 42	Simon, F.	7
Overholtz, W.J.	33	Simon, M.	29
Parry, B.L.	39	Skaaning, S.	8
Payne, P.M.	33, 39	Smith, T.D.	2, 3
Perez, C.	31	St. Aubin, D.J.	18, 20, 31
Pérez, S.	15	Stacey, P.J.	6, 36
Pfeiffer, C.J.	33	Stefansson, E.	8, 10, 22
Pfeiffer, D.C.	33	Stegeman, J.J.	41
Pollock, C.	40	Sweeny, M.M.	36
Praca, E.	33	Tanaka, K.	25
Prematunga, W.P.	26	Taruski, A.G.	37
Prescott, J.H.	28, 31	Tautz, D.	4
Price, J.M.	36	Taylor, S.	40
Prieto, R.	34	Tilbury, K.L.	37
Rack, R.S.	34	True, F.W.	37
Raga, J.A.	34	Tyack, P.L.	6
Rathjen, W.F.	12	Uhen, M.D.	37
Rayner, G.W.	34	Valeiras, X.	21
Read, A.J.	19, 20, 29	Valsecchi, E.	38
Reilly, S.B.	7	van Bree, P.J.H.	38
Rendell, L.E.	34, 35	Varanasi, U.	37
Reynolds, P.	27	Verborgh, P.	15
Rice, D.W.	35	Vikingsson, G.	36
Richardson, M. G.	27	Voorhis, A.D.	14
Rosing-Asvid, A.	19	Wada, S.	38
Ross G.J.B.	38	Wagermann, R.	29
Rothery, P.	27	Walsh, M.T.	11, 18, 38
Saboureau, M.	16	Wang, A.	33
Sadove, S.	18	Waring, G.T.	18, 33, 39, 40
Sagarminaga, R.	13	Webber, M.	24
Sano, M.H.	18	Weilgart, L.S.	40
		Weir, C.	40, 41

Weisbrod, A.V.	41
Weller, D.W.	41
Wells, R.S.	18, 24
Werth, A.	42
Whitehead, H.	5, 21, 32, 40, 41, 42
Wingfors, H.	26
Winn, H.E.	21, 25

Winsor, M.	28
Würsig, B.	41
Young, W.G.	11, 38
Zabow, G.	43
Zachariassen, M.	9, 10
Zachariassen, P.	8, 9, 10, 43

Index by Region

Indian Ocean	26, 38
North Atlantic	2, 3, 5, 6, 8, 9, 11, 12, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 27, 28, 29, 30, 31, 35, 36, 37, 39, 40, 41
Atlantic Canada.....	5, 8, 20, 21, 22, 25, 28, 29, 31, 32, 35, 41, 42
Caribbean Sea	12, 25, 34
Faroe Islands	3, 4, 5, 8, 9, 10, 14, 15, 16, 22, 23, 26, 27, 31, 34, 42, 43

Gulf of Mexico.....	6, 11, 18, 25, 30, 38, 40, 41
Mediterranean Sea	3, 6, 13, 15, 22, 33, 34
North Pacific	6, 24, 25, 26, 29, 31, 35, 36, 38
South Atlantic	15, 21, 34, 35, 38, 41
South Pacific	7, 21, 32

Index by Subject

acoustics	6, 34, 35, 37, 40, 41
age and growth	9, 10, 25, 26
behavior and association	4, 5, 6, 13, 15, 22, 31, 32, 37, 41, 42, 43
breeding and reproduction ...	3, 4, 10, 13, 16, 19, 24, 27
contaminants and pollution studies.....	3, 10, 14, 15, 16, 26, 29, 31, 37, 41
diet.....	2, 3, 7, 8, 13, 15, 16, 17, 19, 20, 23, 27, 28, 29, 33
disease and parasites	8, 11, 16, 18, 34, 36, 38
diving behavior (<i>see also</i> tagging studies)....	6, 22, 23, 27, 28, 31
fishery interactions.....	6, 8, 16, 18, 20, 39
habitat	14, 21, 22, 25, 28, 33, 34
migration	5, 15

molecular and genetics.....	3, 4, 5, 8, 16, 32, 36, 38, 42
morphology ...	7, 9, 10, 15, 21, 25, 33, 35, 37
photo-identification.....	5, 13, 15, 29, 32, 36
population estimates, distribution, and abundance	2, 3, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 24, 25, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 40, 43
stable isotopes	2, 3, 15
stocks/assessments	5, 14, 17, 29, 30, 40
strandings	6, 7, 11, 12, 18, 20, 21, 24, 27, 28, 29, 32, 35, 36, 37, 38, 41
systematic/taxonomic.....	24, 28, 31, 34, 35, 37, 38
tagging studies	10, 27, 28, 38
whale fisheries (other than Faroe Islands)	12, 22, 31, 34

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