Two populations of right whales migrated in the waters around Japan, at least prior to the present century. One migrated through the waters south of Mie, Wakayama and Kochi prefectures (the Pacific population), the other through the waters north of Kyoto to Yamaguchi prefectures and then to the west of Kyushu (the Sea of Japan population). Both populations moved southwards in winter and northwards in spring. The calving grounds of these populations are not known, but presumably lie further south and around the Ryukyu Islands. The northerly migration of the Pacific population went further north along the coast of Japan, reaching the waters near the Kuril Islands in summer; some would enter the Bering Sea. The Sea of Japan population also undertook long migrations and is thought to have entered the Okhotsk Sea in summer. Annual catches of right whales by net whaling in the nineteenth century were estimated as about 50 at their highest from each of the two populations in the former half of the century, but the catches greatly decreased in the latter half. It is thought this was attributable to the operation of American whale ships working in the Sea of Japan, Okhotsk Sea and eastward of the Kuril Islands as far as 170°E. Results of the catches of right whales by Japanese modern whale catchers since 1910 indicate that the Sea of Japan population was more heavily reduced than the Pacific population.

This paper is a review and analysis of all records of right whales (Eubalaena glacialis) in the North Pacific south of 50°N and east of 180°W. The location and season of 786 records from Maury’s (1852 et seq.) chart of sightings by early 19th-century whaling ships are described. The sightings and catch of right whales by both the shore-based and pelagic whalers during the 19th and 20th centuries are reviewed along with the available information on whaling effort. Between 1855 and 1900 there were 14 sightings of at least 19 whales along the California coast. Between 1900 and 1982 there are 9 reliable records from the coast of California, 1 from Baja California, 5 from the coast of Washington, 1 from Hawaii, and 12 from mid-ocean. Between 1910 and 1930 a minimum of 123 right whales was taken in the North Pacific. Between 1931 and 1982, another 101 right whales were killed. The searching effort for whales in the study area is described for the period 1950-82 and the records analyzed in the context of that searching effort. There are no published records which indicate any calving grounds historically or presently for right whales in the eastern North Pacific. It is hypothesized that right whales that summer in the eastern North Pacific mate, calve, and overwinter in the mid-Pacific or in the western North Pacific. Ecological factors which might be affecting population recovery are reviewed. The data in this study suggest that the population in the eastern North Pacific is still very small. There is no evidence of population recovery.

An annotated bibliography (108 items plus an appendix of 21 unseen references) has been compiled for right whales in the North Pacific. Annotations include information primarily concerning sightings, distribution, abundance, migration, historical catches, life history data and prey items.

Historic and recent records of abundance and distribution of Eubalaena glacialis near Cape Cod are scanty and imprecise, and cannot be considered a census. The historical records since 1620 and ours from 1955 to 1981 both show a seasonal peak in April and few sightings in summer months. During the last quarter century our counts show up to 131 individuals in one year; 70+ were the most seen in one day. We have seen 21 calves, up to 4 in one year, with an indication of a 3-year reproductive cycle. Individual whales usually remain in the area only a few days at a time. The evidence available does not demonstrate that E. glacialis in our waters nowadays are really very much fewer than they were in 1620. Our sightings off Massachusetts since 1955 show neither an increase nor a decrease in right whales.

We present and analyze all available data on right whales, *Eubalaena glacialis*, from the Canadian east-coast whaling industry (e.g. sightings and tagging by catcher boats) and a series of whale census and tagging cruises in the Northwest Atlantic between 1966 and 1972. ‘Sightings’ provided by the whalers are sometimes records of encounters as they occurred, but more often they are cumulative totals of whales seen during an hour or half-hour of searching. Only one right whale sighting was made by Newfoundland catcher vessels, of one animal east of Bonavista Bay on 6 June 1970. Blandford (Nova Scotia) catcher vessels reported 1,786 whale sightings between 1966 and 1972, 70% of which involved one or more fin whales, *Balaenoptera physalus*. Right whales were the fourth most commonly seen whale. There were 313 sightings of right whales, of which 11 did not involve any other species. The maximum number of right whales reported in one sighting was 30. Up to six sightings of right whales made on one day were analyzed for repetitive sightings, and we conclude that the maximum number of different individuals observed on one day was 70 whales. The trends in these data are related to sighting effort; thus, the data cannot be used to give an index of population abundance. No calves were reported, but this may be an artifact of data collection. Right whales were concentrated around Roseway Basin between Browns Bank and Baccaro Bank; only 51 of 313 sightings were east of 64° W, and four of these were east of 62° W. There was no clear correlation between right whale occurrence and surface water temperature or weather conditions. Eight right whales were tagged with ‘Discovery’ type tags from catcher vessels and survey vessels. One winter sighting of two right whales was made on 13 March 1971 off Cape Cod. Analysis of associated species in whale sightings indicates that on the Scotian Shelf right whales occurred 20% more frequently with fin whales, *Balaenoptera physalus*, than with any other species (53.5%; with sei, *B. borealis*, 31.9%).


I have been able to locate 1,408 records of right whales in the northwestern Atlantic and the Gulf of Mexico since the turn of the century. Of these, 1,326 represent published records, 12 are museum records and 70 are records accumulated by the Scientific Event Alert Network and the Marine Mammal Events Program of the Smithsonian Institution. There were 1,374 records of sightings, 20 strandings, 8 captures and 6 incidental catches in fishing gear. There are 296 records of two or more animals and 85 of those were records of a large whale and a substantially smaller whale which I have interpreted as an adult accompanied by a calf. There is a much higher incidence of adult/calf pairs reported from Florida (45 out of 79 records of two or more animals) suggesting that calving may take place primarily in the southern portion of their known range. There is an anecdotal report of a right whale giving birth in Florida waters. The records show pronounced geographic seasonality. From Virginia south they are mainly restricted to winter and early spring (November through April). Records from Maryland north through Massachusetts are randomly distributed throughout the year. Those north of Massachusetts are limited to the summer and fall (May through November). The length frequency distribution of stranded right whales shows three modal peaks. There is one at about 440 cm that represents newborn calves, one at about 1,100 cm that represents yearlings and one at about 1,700 cm that represents mature adults. The smallest calf was 407 cm long and the largest reliably measured adult was 1,650 cm.


Twentieth-century records of catches and sightings of right whales (*Eubalaena glacialis*) in the northeast Atlantic Ocean are reviewed. Catch figures are probably incomplete, but a total of between 134 and 137 right whales are recorded caught from whaling stations in Iceland, the Faroe Islands, West Norway, the Shetland Islands, the Hebrides and Ireland in the period from 1900 to 1937, the last caught in 1926. Approximately 85% were taken by stations in the British Isles between 1906 and 1923. In addition, four whales were caught in the Azores and Madeira, the last in 1967. About 23 sightings of some 48 animals recorded as right whales were made during the years 1901 to 1980. Insufficient information is available for a confirmed identification in most cases but they include perhaps six definite sightings of eight animals, seen off Iceland, Spain, the Azores and Madeira. There are apparently no certainly identified strandings of right whales on the coasts of Western Europe in the twentieth century. The sightings records suggest that there are at present very few right whales in the eastern North Atlantic Ocean. They may belong to a small breeding population which perhaps exists on the desert coast of west or northwest Africa. Alternatively they may be stragglers from the more numerous population in the western North Atlantic Ocean.


Right whale sighting data from Florida to Nova Scotia were analyzed for patterns of distribution, movements and relationships to certain environmental variables. The distribution of calves, surface feeding and social activities on the northern feeding grounds were also examined. A general pattern of distribution has emerged with calving occurring during the winter off Georgia and Florida. The winter distribution of social units other than cow-calf pairs is poorly known. In the spring, large numbers of right whales arrive in the Great South Channel (between Cape Cod and Georges Bank) where they feed for up to several months and in the Cape Cod-Massachusetts Bay area. In June they migrate across the Gulf of Maine to the Bay of Fundy and the southeastern Scotian Shelf, where they also feed for several months. In late October-November, they leave these areas, presumably migrating rapidly southward with no prolonged stops along the way. There are, however, scattered sightings in the study area that do not fit the general pattern. Social behavior was not distributed differently with regard to water depth, bottom slope, nor surface temperature, and occurred throughout the northern feeding range. The whales are located generally in water with surface temperatures of 8 to 15°C, over areas 100 to 200m deep except in the shallower Cape Cod Bay and adjacent to steeply sloping bottom topography. Calves were observed closer to shore and in shallower areas with steeper sloping bottom topography than non-calf sightings. Surface feeding sightings occurred at shallower depths than non-feeding sightings and were generally uncommon except in Cape Cod Bay. Areas of concentrations of right whales were found in the Great South Channel, Cape Cod Bay, the Bay of Fundy, and the southeastern Scotian shelf. It is hypothesized that the patchy distribution of the right whale is related to a similar patchiness of their principal prey, *Calanus finmarchicus*. 

Over 200 right whales (Eubalaena glacialis) have been photographically identified between March and November in the Gulf of Maine from 1980 to 1985. Aerial surveys over the coastal waters of the southeastern USA in February and March of 1984 and 1985 yielded sightings and photographs of 25 right whales, including seven newborn calves and one juvenile. This indicates that the region is a significant calving ground for these whales in the western North Atlantic. Twenty-one of the 25 right whales sighted along the southeastern US coast are individuals that have been previously identified in the Gulf of Maine. Long-term sighting data indicate that right whale cows reproduce every 2 to 5 years ($\tau = 3.12, SD = 0.6, n = 17$) and segregate themselves from the rest of the population to give birth and nurse their young. These findings suggest that right whales inhabiting US and Canadian waters of the western North Atlantic comprise a single inter-breeding stock, and confirm a long-distance seasonal migration by this population.


Photographic techniques for identifying individual North Atlantic right whales (Eubalaena glacialis) were investigated. The effects of differences between aerial and shipboard photography were indicated and related to cataloging and matching methods. Photographs of known female right whales were compared, using the collections of Woods Hole Oceanographic Institution (photos from 1956-1983), University of Rhode Island (1973-1984), New England Aquarium (1973-1985), and Center for Coastal Studies (1979-1984). Matches of photographs of individual right whale cows provided information on distribution and minimum calving intervals. The stability of individually identifiable features over time was analyzed in the New England Aquarium’s collection, demonstrating that some features such as callosity outline could change, while others, such as ventral white patches and lip creations, appeared stable over at least the five years compared. Suggestions were made for collecting, analyzing and interpreting future right whale photographs.


Information to 1982 obtained by questionnaire from sources in each Australian State (mainly newspaper accounts, incidental sightings by the interested public, biologists and fisheries officers) has resulted in 128 ‘incidental’ records, of 272 right whales, this century. Before 1960 there were very few sightings recorded, with only 11 records, of 15 animals. Since 1970, and particularly since 1975, there has been a marked increase, but mainly from two States (Victoria and Western Australia) which account for 71% of records since 1970. While reporting effort cannot be quantified, but has presumably increased recently, these data cannot give unequivocal evidence of an increase in the population, although it seems likely that such an increase has occurred. In a series of spotting flights off southern Western Australia since 1976, once a month from July/August to October/November, 229 right whales have been seen, with up to 73 in one year (1980); 41 were recorded in 1982. Most animals have been in singles or pairs (mostly cows and calves), but up to 15 adults have been recorded from one locality at one time. Some of the large groups must contain males. Some parts of the coast are frequented more than others. For those months when animals are most often seen (August and September) there may have been an overall increase since 1976. Continuation of such programmes should provide quantifiable evidence of population trends.


Five new sighting records of southern right whales from Chile between 1976 and 1982 are reported. These sightings support the view of Clarke (1965) that right whales never completely disappeared from Chilean waters.


Since 1970, southern right whales have been studied on their winter/spring aggregation areas in protected waters near the coast of Peninsula Valdes, Argentina. These areas have been repeatedly surveyed from the air and from shore and over 580 individuals have been identified from aerial photographs of natural markings on their heads. Many individuals return to the area each year, but mature females tend to be seen only in years when they give birth (usually every third year). Seventy-four of the known females have had two or more calves, with a mean calving interval of 3.7 ± 1.25 years ($n = 89$ calving intervals). The age of first calving for two females was seven years. Mothers with young calves are usually positioned along the coast in water about 5 m deep. Right whales are found at Peninsula Valdes in three separate areas: one predominantly occupied by mothers and calves, a second predominantly occupied by males and mature females in non-calf years, and a third occupied by all categories of whales including subadults and mating groups.


Identifications of right whales from photographs of their callosity patterns were used to make mark-recapture estimates of the population wintering off Peninsula Valdes, Argentina. Between 1971 and 1976 there were an estimated 450-600 individuals coming to Valdes, of which 120-220 were known females. The population is estimated to have been increasing at 6.8% per year (95% CL 0.0-13.6%). For the total population, the estimates may be biased to the low side because of a tendency for some individual whales to be more frequently photographed than others.

Thirty sightings and five strandings of southern right whales are reported. Opportunistic sightings occurred off Patagonia (thirteen), Tierra del Fuego (six), South Georgia (four) and the South American sector of the Antarctic (seven). Sightings were of one or two animals except for a group of 14 off Puerto Deseado. Whales were seen in the Antarctic during the southern summer (December to March), at the South Orkneys in fall (April), at South Georgia and Tierra del Fuego mostly in fall (April-May) but also in February, July and October, and the Patagonian sightings were from May to October, where animals are known to congregate during winter and spring. A single right whale was seen accompanying a humpback whale. Only five known strandings of this species have been recorded on Tierra del Fuego since 1968, in spite of intensive stranding surveys in the area.


The off-shore distribution of southern right whales in summer is examined using sightings data collected by Japanese research vessels during the years 1965/66-1981/82. Most of the southern right whales seen were distributed in mid-latitude waters, between the Sub-tropical and the Antarctic Convergences in summer, although some whales penetrated into the waters south of the Antarctic Convergence. The highest density of right whales was found in the waters south of Western Australia; no right whales were found in the area between 155-85°W. In most areas right whales migrate furthest south in January. The possibility of the existence of six stocks of southern right whale is proposed from the density distributions. A special sightings cruise was conducted in the waters south of Western Australia in 1981/82, and school sizes, body length composition, sightings efficiency, etc., studied and compared with those from coastal waters at a different time of year. The whaling grounds of the open-boat whaling age did not cover the total range of the right whale even in summer, when they were limited to the northern parts of the range. The distribution of the right whale in recent years is somewhat different from that in the past, possibly due to the different population levels. An increase in density is evident from sightings in off-shore waters south of Western Australia. Natural markings were photographed of three right whales from Antarctic Areas I and II.


Bones found at Red Bay, Labrador during the excavation of a Basque whaling station and associated shipwreck have confirmed Basque hunting of both right, Eubalaena glacialis, and bowhead, Balaena mysticetus, whales in the Strait of Belle Isle in the last half of the 16th century. Identification of the two species has thus far been based primarily on the basis of differences in the scapula, humerus and maxilla. The stratigraphic context of the bones indicates contemporaneity of the two species, with roughly equal numbers of each having been taken. There is little evidence of exploitation of calves. The apparent presence of significant numbers of bowheads may have ramifications for estimates of numbers of right whales killed in Newfoundland and Labrador waters in the 16th century, as most estimates from historical sources have assumed catches of right whales only. Further, the established presence of both species in the Strait of Belle Isle helps confirm aspects of their distributional history which were unclear.


The available information from ancient Basque whaling is reviewed. The operations have been divided into three episodes according to the areas of exploitation. In the local fishery of the Bay of Biscay, Eubalaena glacialis was the main target species, although Physeter macrocephalus and other species might also have been harvested at least occasionally. Whaling seems to have appeared first in the French Basque country in the 11th century and later it spread gradually to the remaining areas but this should not be related to a reduction of stocks. A peak in the overall operations was probably reached around the 16th and 17th centuries but thereafter a decline in the fishery is evident. The catch rate per season was probably not very high but other factors such as the preference of the whalers for the calves would have had detrimental effects on the stock. The total removals are impossible to estimate but the present population in the Bay of Biscay must be negligible, since only a few records of this species have occurred during this century. Whaling in Newfoundland began during the 1530s and reached its maximum success at the end of the 16th century. Eubalaena glacialis probably represented the bulk of the catches, although Balaena mysticetus was also taken, especially from 1610, when the Basques moved further to the north due to the scarcity of whales on the initial whaling grounds. The average catch per boat is estimated at 12 whales or thereabouts and thus, the total harvest per season ranged from 300 to 500 whales. This means that about 25,000 to 40,000 whales might have been killed from 1530 to 1610, when the stock showed signs of depletion. Basque whaling on the Canadian grounds continued until the end of the 17th century. Little information is available for whaling operations in the northeastern North Atlantic, since most of the capital invested came from outside the Basque whaling community, and often they only acted as harpooners or sailors. Purely Spanish expeditions were only occasionally carried out, and they took place from the 15th to the middle of the 18th century. The target species in Ireland, Norway and Iceland was probably E. glacialis, but in North Greenland and Spitzbergen it was B. mysticetus. At the beginning of the 18th century, Spanish whaling operations, both in local and northern grounds, were in clear decline. Several companies, some of them with the support of the Crown, were created in order to carry on whaling in the northern seas, the Canary Islands and South America. However, all the enterprises failed and, in 1797, the last overseas Spanish whaler was back in port.


The Long Island right whale fishery began in about 1650, and the last documented striking of a right whale by local shore whalers was in 1924. Centered at the east end of the island’s south shore, the fishery apparently was active continuously between 1650 and 1924, with a probable peak
between approximately 1670 and 1725. The highest documented one-year catch during this peak period was estimated from oil production to be 111 whales taken in 1707. We documented a total of about 400 right whales caught off Long Island before 1820, but believe this greatly under- represents the actual catch. Data for years after 1820 are more complete. Peaks in catch and activity (and documented catches) for the last century of the fishery appear to have occurred in 1840-54 (an estimated 56 whales killed) and 1885-89 (an estimated 20 whales killed). The seasonal Long Island fishery, which usually began in November and ended in April or early May, was mainly for right whales. Principal whaling communities were Southampton, Bridghamton, East Hampton, Wainscott and Amagansett. Open boats, hand harpoons, and hand lances were used until the late nineteenth century, when shoulder guns and bomb lances (darting guns) were introduced on a limited scale. Mean oil yield used for converting production statistics is estimated as 36 barrels. A high proportion of the landed catch consisted of females (many of them ‘dry-skins’) and calves.

Analysis of catch statistics is confounded by several factors. First, documentation is incomplete and our search for data has not been exhaustive. Second, documented catches for most of the period covered by this study were made by shore whalers who only chased whales that were first sighted from land, but catches during the 1840-54 peak include a high proportion of whales caught by vessels cruising alongshore. Thus, effort levels between periods are difficult to compare. Finally, the Long Island fishery was but one of several that exploited right whales in the western North Atlantic before and after 1650. A quantitative assessment of early population size cannot be made until catch histories have been reconstructed for at least some of these other fisheries that exploited the same stock.


A sample of eighteenth- and nineteenth-century whaling logbooks and journals in American east-coast collections was examined for information on sightings and catches of North Atlantic right whales, Eubalaena glacialis. Three major nineteenth-century North Atlantic grounds were identified: the Cape Farewell Ground, the Southeast US Coast Ground, and the Cintra Bay Ground. The Cape Farewell Ground, centered at about 60-62° N, 33-35° W, approximately 400-500 km east of Greenland, was visited during summer months (June-September). We accounted for a minimum of 12 vessel-seasons on this ground, covering the period 1868-98. An estimate of total fishing mortality from 1868 to 1897 is 25 right whales. The Southeast US Coast Ground, consisting of coastal waters between North Carolina and northern Florida, was mainly a winter and early spring right whaling ground (January-March). Seven vessels are known to have cruised there for right whales between 1875 and 1882, accounting for at least 17 vessel-seasons of effort. Including a few catches by shore whalers, at least 25-30 right whales were killed on the Southeast US Coast Ground from 1876 to 1882. The Cintra Bay Ground, another winter and early spring right whaling ground (November-April), consisted mainly of Bahia de Cintra (23° N, 16° 15’ W), Bahia de Gorrei (22° 50’ N, 16° 20’ W) and nearshore waters along the northwest African coast north and south of these two bays, or generally the southwest coast of the former Spanish Sahara. At least 44 visits to this ground were made by Yankee whaling vessels between 1855 and 1880, mainly from 1855-56 to 1857-58. During this 3-year period approximately 82 right whales were killed on this ground. A possible ‘Iceland Ground’ for right whales was centered at 63°-67° N, 11°-16° W; the cruising season there was April to August. Right whales were occasionally encountered by the nineteenth-century American pelagic whalers elsewhere in the North Atlantic, particularly on the Commodore Morris Ground in summer. During the second half of the eighteenth century, the Nantucket and Dartmouth whales cruised for right whales east of the Grand Bank, in the Strait of Belle Isle and north along the Labrador coast. There is some uncertainty about whether early-season catches at the higher latitudes were of right whales or bowheads, Balaena mysticetus. Estimates of hunting loss in the pelagic right whale fishery resulted in loss rate factors of 1.25-1.57. Mean oil yield on the three major North Atlantic grounds combined was 58-59 barrels (bbls) per whale. At least 20-30% of the whales struck on these grounds were mothers or calves. The hypothesis that there are at least two stocks of right whales in the North Atlantic, one migrating along the east coast of North America and the other migrating along the coast between northwest Africa and northern Europe, is supported by the available evidence. Of the three main nineteenth-century whaling grounds, only the Southeast US Coast Ground is known to be used by right whales today. Field surveys of the Cape Farewell Ground and the Cintra Bay Ground are recommended.


An attempt has been made to estimate the total number of right whales taken by local bay whalers off the southern coasts of Western Australia in the nineteenth century. At least 266 whales may have been taken in a 30 year period from 1836. Estimations are complicated by lack of distinction between right whales and humpbacks, and frequent references to annual yields rather than the total catch. Information is also summarised on the timing, catching strategy, catch rates and possible effect of whaling on whale behaviour, by American pelagic whalers between 1838 and 1849, a period during which pelagic fishing on this species seems to have reached an early peak and rapid decline, at least off this, the ‘Coast of New Holland Ground’.


Estimates of right whale catches have been made mainly from Government documents and other sources listing amounts of ‘black’ oil and whalebone for the Australian and New Zealand colonies from 1827 to 1899, together with some catch data in the early 1900s. At least 26,000 right whales were caught in southwestern Pacific waters. More than two-thirds of these were taken by shore based operations from New Zealand and southeastern Australian stations and by bay whalers of Australian registry. The nature of the returns does not allow complete partitioning between these two or of the limited truly pelagic operations. Many American and French whalers obtained catches by bay whaling and others by pelagic operations in adjacent waters occupied presumably by the same right whale stocks. The significant British catches are incomplete and not included. Nearly three-quarters of all catches were made in the decade 1835-1844 followed by decline which seems to have been due largely to depletion of whale stocks.

This paper shows how existing documents permit computation of the catch of right whales by French whalers. It sums up available data in French archives for all periods and all parts of the world. However the only time for which complete statistics can be accurately compiled is from the end of the 18th century to the mid 1830s, mostly in the South Atlantic. Between 1817 and 1868, about 11,000 right and bowhead whales are estimated to have been taken by French whalers worldwide.


From a combination of historical catch records and production figures, the total number of right whales landed in shore-based open boat whaling along the southern African coast between 1792 and 1912 is estimated as 1,580. Assuming a figure of 20% for the proportion of whales struck and lost that subsequently died, the total mortality inflicted by this fishery is estimated as 1,896. Modern whaling in the coastal waters of southern Africa accounted for at least 105 right whales between 1908 and 1975. The catch in both episodes of whaling was comprised mainly of adults, amongst which females predominated. An assessment of the pelagic catch of right whales from this stock by eighteenth and nineteenth century whalers is needed before original levels of abundance can be estimated.