

History of Whaling and Estimated Kill of Right Whales, *Balaena glacialis*, in the Northeastern United States, 1620–1924

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Introduction

This study of shore whaling for right whales, *Balaena glacialis*¹ (Fig. 1), along the U.S. east coast is part of a broad review of the history of right whaling in the western North Atlantic. Previously, Reeves and Mitchell surveyed whale charts (1983) and compiled catch data for shore whaling on Long Island,

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N.Y. (1986a), American pelagic whaling in the North Atlantic (1986b), and shore whaling in North Carolina (1988). Reeves and Barto (1985) reviewed the scant information on shore and pelagic whaling in the Bay of Fundy, a present-day summering ground for right whales. Other authors have discussed the large 16th and 17th century Basque hunts for balaenids, including both right whales and bowhead whales, *Balaena mysticetus* (Cumbaa, 1986), in the Strait of Belle Isle and along the Labrador coast (Barkham, 1984; Aguilar, 1986; Proulx, 1993; Ross, 1993). New England whalers are said to have killed “a good many” right whales in the Gulf of St. Lawrence during the 18th century (Wakeham, 1913), although the species composition and size of their catches have yet to be properly evaluated (cf. Mitchell and Reeves, 1983).

The main objective of our catch-history studies has been to assess early distribution and abundance. An ultimate goal is to improve understanding of the population history and contribute to analyses of trends. Although it is unlikely that the carrying capacity for right whales would be the same at present as it was in the mid 17th century when American whaling began, we have no reliable means of estimating either the direction or magnitude of change in carrying capacity through time. It is possible that aspects of the

¹ Recent usage has established *Eubalaena* as the genus name for the right whales (Schevill, 1986). However, in his list of marine mammals of the world, Rice (1998) reverts to the genus name *Balaena*, and recognizes two subspecies of right whale, the Northern Hemisphere right whale, *B. g. glacialis*, and the Southern Hemisphere right whale, *B. g. australis*.

ABSTRACT—This study, part of a broader investigation of the history of exploitation of right whales, *Balaena glacialis*, in the western North Atlantic, emphasizes U.S. shore whaling from Maine to Delaware (from lat. 45°N to 38°30'N) in the period 1620–1924. Our broader study of the entire catch history is intended to provide an empirical basis for assessing past distribution and abundance of this whale population.

Shore whaling may have begun at Cape Cod, Mass., in the 1620's or 1630's; it was certainly underway there by 1668. Right whale catches in New England waters peaked before 1725, and shore whaling at Cape Cod, Martha's Vineyard, and Nantucket continued to decline through the rest of the 18th century. Right whales continued to be taken opportunistically in Massachusetts, however, until the early 20th century. They were hunted in Narragansett Bay, R.I., as early as 1662, and desultory whaling continued in Rhode Island until at least 1828. Shore whaling in Connecticut may have begun in the

middle 1600's, continuing there until at least 1718. Long Island shore whaling spanned the period 1650–1924. From its Dutch origins in the 1630's, a persistent shore whaling enterprise developed in Delaware Bay and along the New Jersey shore. Although this activity was most profitable in New Jersey in the early 1700's, it continued there until at least the 1820's. Whaling in all areas of the northeastern United States was seasonal, with most catches in the winter and spring. Historically, right whales appear to have been essentially absent from coastal waters south of Maine during the summer and autumn.

Based on documented references to specific whale kills, about 750–950 right whales were taken between Maine and Delaware, from 1620 to 1924. Using production statistics in British customs records, the estimated total secured catch of right whales in New England, New York, and Pennsylvania between 1696 and 1734 was 3,839 whales based on oil and 2,049 based on baleen.

After adjusting these totals for hunting loss (loss-rate correction factor = 1.2), we estimate that 4,607 (oil) or 2,459 (baleen) right whales were removed from the stock in this region during the 38-year period 1696–1734. A cumulative catch estimate of the stock's size in 1724 is 1,100–1,200. Although recent evidence of occurrence and movements suggests that right whales continue to use their traditional migratory corridor along the U.S. east coast, the catch history indicates that this stock was much larger in the 1600's and early 1700's than it is today. Right whale hunting in the eastern United States ended by the early 1900's, and the species has been protected throughout the North Atlantic since the mid 1930's. Among the possible reasons for the relatively slow stock recovery are: the very small number of whales that survived the whaling era to become founders, a decline in environmental carrying capacity, and, especially in recent decades, mortality from ship strikes and entanglement in fishing gear.

environment are better for right whales now than they were at some other times during the past 400 years. It is usually assumed, however, that human activities have altered conditions in a mainly negative way and that the coastal marine environment off eastern North America is capable of supporting fewer right whales now than was the case in pre-modern times (Katona and Kraus, 1999). We believe that a minimum estimate of pre-exploitation population size can be useful in designing and assessing recovery efforts. In its Final Recovery Plan for the northern right whale, the National Marine Fisheries Service (NMFS) Right Whale Recovery Team indicates that the establishment of recovery goals and the evaluation of progress toward them “should be based on pre-exploitation numbers, if possible” (NMFS, 1991:40). The plan further urges that such “numbers” be refined through historical research in addition to that available in 1991. Our goal is to use the present compilation, along with other related studies, for a comprehensive reconstruction of the catch history and a more rigorous estimate of the population size in the 17th century (Reeves et al.²).

The catch history of the North Atlantic right whale is difficult to reconstruct due, in large part, to the antiquity of the whaling enterprise (Fig. 2). According to Allen (1916), right whales had already become scarce in New England by about 1725 due to overhunting. Much of the whaling for right whales before and after that date (Fig. 3 and 4) was undocumented or poorly documented. Some of the documentation that did exist has been lost or destroyed. What survived is often difficult to find and interpret.

The geographic emphasis of the present paper is on the New England and mid-Atlantic states from Maine to Delaware (from about lat. 45°N to 38° 30'N) (Fig. 2 and 5). The temporal focus is from 1620, the year of the *Mayflow*-

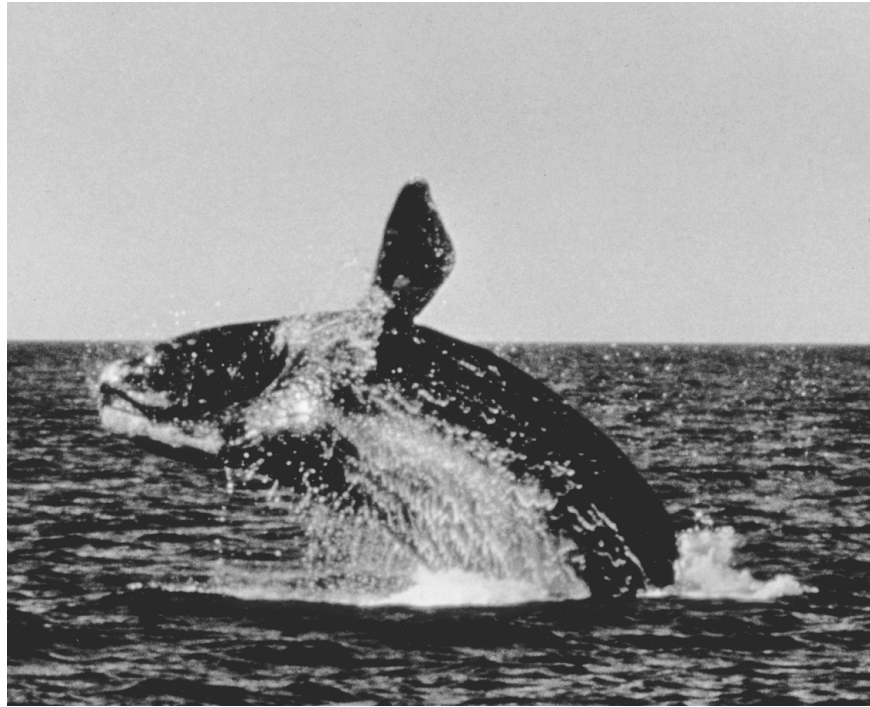


Figure 1.—Breaching right whale, *Balaena glacialis*. Photograph by A. Knowlton, New England Aquarium.

er's arrival near present-day Provincetown, Mass., to 1918, when the last right whale was struck at Long Island, N.Y. Our intention is to document as fully as possible the kill of right whales off the eastern United States from the early 1600's to 1924, when the last Long Island whaler retired (Reeves and Mitchell, 1986a).

Schevill et al. (1986) compared the frequency of right whale sightings off Cape Cod for 1955–81 to the frequency of records listed by Allen (1916) for the period 1620–1913. They concluded that right whales did not appear to be greatly reduced in numbers in New England during the recent period when compared to data from 350 years previously: “The population of right whales passing near Cape Cod is at worst only slightly smaller now than it was in the 17th century” (Schevill et al., 1986). That conclusion runs counter to the widely held belief that the western North Atlantic population remains severely depleted and has failed to recover (Mitchell, 1975; Reeves et al., 1978; Mead, 1986; Gaskin, 1987; Kraus et al., 1988).

Gaskin (1991) used the analysis by Schevill et al. (1986) to support the hypothesis that right whales summering in the Bay of Fundy and Roseway Basin areas are a deme or “substock” of the more widely distributed western North Atlantic population. A supposed preference for deeper shelf water would have allowed this group to at least partially escape “the full pressures of colonial whaling” (Gaskin, 1991). Gaskin argued that because they remained south of Cabot Strait in summer, these whales also would not have been subjected to exploitation by the early Basque whalers to the north. This interesting hypothesis is not supported by the evidence of long-distance movements by individuals (e.g. from the Scotian Shelf to Denmark Strait and from the southeastern United States to the Labrador Basin (Knowlton et al., 1992)). However, surviving founders may have contributed to a drift toward reclusive behavior in the current population.

Materials and Methods

We made an extensive literature search, including sources cited by Star-

² Reeves, R. R., J. M. Breiwick, and E. Mitchell. 1992. Pre-exploitation abundance of right whales off the eastern United States. U.S. Dep. Commer., NOAA, Natl. Mar. Fish. Serv., Northeast Fish. Sci. Cent. Ref. Doc. 92-05:5-7.



Figure 2.—Northeastern coastal map of 1679 with a whaling vignette off Long Island representing the local right whale shore fishery. Ingalls, 1987, No. 543; Courtesy, Peabody Essex Museum, Salem, Mass.

buck (1878), Clark (1887), True (1904), Allen (1908), Allen (1916), Edwards and Rattray (1932), Weiss et al. (1974), and Lipton (1975). Many more sources were identified in whaling museum indexes and our own files. A sample of newspapers was searched systematically using indexes whenever possible (Table 1).

Allen's (1916) review of baleen whales in New England included a search of at least the *Nantucket Journal* (1878–99), *Nantucket Inquirer* (1822–64), and *Nantucket Inquirer and Mirror* (1867–1909), and apparently some is-

Table 1.—A sample of newspapers searched for information on right whale catches.

Newspaper	Town or city, state	Years checked	Indexed
<i>Daily Eagle</i>	Brooklyn, N.Y.	1891–1902	Yes
<i>Herald</i>	New York, N.Y.	1913–1918 (incomplete)	Yes
<i>Evening Post</i>	New York, N.Y.	1873–1921 (incomplete)	Yes
<i>Tribune</i>	New York, N.Y.	1862–1865, 1875–1906	Yes
<i>Times</i>	New York, N.Y.	1851–1893, 1905–1924	Yes
<i>Morning News</i>	Savannah, Ga.	1850–1875	Yes
<i>Journal</i>	Nantucket, Mass.	1884–1897	No
<i>Inquirer</i>	Nantucket, Mass.	1822–1864	No
<i>Inquirer and Mirror</i>	Nantucket, Mass.	1870–1891	No
<i>Whalemen's Shipping List and Merchants' Transcript</i>	New Bedford, Mass.	1843–1914	No
<i>The Whaleman</i>	New Bedford, Mass.	1854	No
<i>Reporter and Seaman's Weekly Visitor</i>	New Bedford, Mass.	1846–1847	No
<i>Pioneer</i>	Mystic, Conn.	1859–1861	No

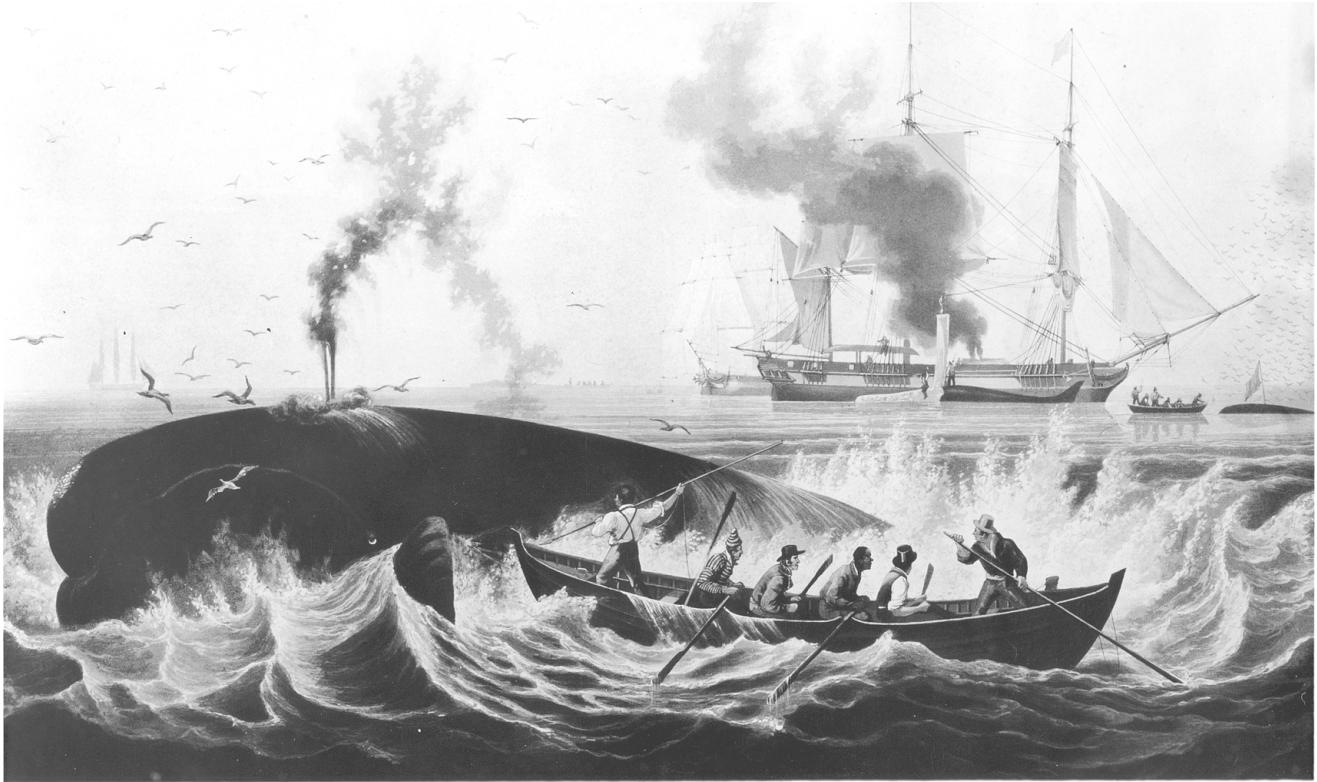


Figure 3.—The practice of approaching and attacking a right whale was consistent across national fisheries, oceans, and times. This print is representative of the mid 19th century American fishery in the Atlantic, even though it is a copy of a French aquatint of the South Sea Whale Fishery. Ingalls, 1987, No. 298; Courtesy, Peabody Essex Museum, Salem, Mass.

sues of the *Provincetown Advocate*, *Boston Journal*, *Boston Daily Globe*, *Forest and Stream*, *Boston Semi-Weekly Advertiser*, *Newburyport Herald*, *Boston Gazette*, and *Barnstable Patriot*. We made our own search of the Nantucket newspapers (most of the right whale data for New York was reported by Reeves and Mitchell (1986a)) and checked some issues of newspapers from other areas where whaling was known or suspected to have occurred. In these searches, we gave special attention to periods immediately preceding or following dates on which whaling events had been reported. Some manuscripts, including correspondence, diaries, and account books of companies and individuals involved in shore whaling, were checked at whaling museums, historical societies, and local libraries in New England.

One of us (Reeves) examined customs records of the London Board of Trade for information on whale products imported to Great Britain from

the American colonies, including Carolina, Virginia, and Maryland (Reeves and Mitchell, 1988), Pennsylvania, New York, New Providence, New England, Newfoundland, the Bermudas (Fig. 6), and the West Indies, as well as “prize goods” taken by British vessels from captured ships. These and other manuscript records in the Public Record Office, Kew, London, supplemented the catch data from published sources. We assumed that all of the oil and baleen attributed to the American colonies in the British customs records through 1735 came from whales killed (or found dead from natural causes) in the western North Atlantic.

The British customs records give product quantities in units that are not all familiar today: oil in tuns (abbreviated as “T”), hogsheads (Hh), and gallons (gal); baleen (whalebone or whale “fins”) in hundredweight (cwt), quarters (qtr), and pounds (lb). With the exception of the blubber returns from Newfoundland, all of the relevant values for

oil are given as liquid (volume) measures (Fig. 7, 8). Lindquist (1992) provided a valuable review of old whale oil measurements, and we have used his equivalents as standards. Thus, we have assumed that tuns (or T in some records) represent 252 gallons. The gallon was not standardized until 1707 (during the period with which we are concerned, 1697–1734), before which time its size usually varied between 224 cubic inches (3.671 liters) and 282 cubic inches (4.621 liters). In 1707 it was standardized (as “Queen Anne’s gallon,” which is the same as today’s U.S. standard gallon) at 231 cubic inches (3.785 liters). This means that our production data pre-1707 are approximate, while those from 1707 onward are more exact. It should be noted that the imperial standard gallon was not established in the United Kingdom until 1825. A hogshead was a quarter of a tun (63 gallons), and the gallons were assumed to be “Queen Anne’s gallons.” The weight measures were assumed to be straight-

forward: a hundredweight representing 112 lb (50.8 kg), a quarter being 28 lb (12.7 kg), and a lb being the standard 16 ounces (0.45 kg). An oil cask or barrel was defined in 1675 (General Court of Assizes, New York) as containing 31.5 gallons (Edwards and Rattray 1932:274–275), so we assumed throughout this paper that barrels contained 31.5 (U.S.) gallons of oil.

Estimates of average yield are required for converting amounts of oil or baleen to estimates of whales caught. We used the available data on yields from various parts of the North Atlantic to obtain such estimates (Table 2). The values used for conversions (44 barrels of oil and 647 lb of baleen per whale) are similar to those used by Reeves and Mitchell (1986a, b) but are substantially different from those used by Best (1987). The latter author estimated average yields for right whales of 67 barrels of oil and 563 lb of baleen based on samples of 3,080 and 884 whales, respectively. These large samples included whales from the Southern Hemisphere and the North Atlantic but not the North Pacific.

Newspaper reports often referred to expected, rather than realized, yields of oil and baleen. Usually, but not always, the estimates of yield prior to flensing proved to have been upwardly biased. Whalers and newspaper reporters were often overly optimistic about how much a whale would produce. For example, a 40 foot (12.2 m) right whale taken off Amagansett (Long Island, N.Y.) in February 1897 was expected to produce 30 barrels of oil and 600–700 lb of baleen (Reeves and Mitchell, 1986a, their Table 1), but it actually produced only 18 bbl and 375 lb (our Table 7, below). Although we tried to eliminate untrustworthy reports from our sample, the estimated averages in Table 2 are probably influenced by this bias to some degree. We suspect that, in some cases, there was also a tendency to report the yields of exceptionally large whales and to leave out any mention of yield when describing unremarkable whales. The effect of both types of bias (exaggerated reporting and selective reporting) would have been to cause an over-estimation of average yield, and, in turn,



Figure 4.—“Cutting in” a right whale, here at the stage of hoisting the rostrum to cut off the slabs of baleen or “whalebone” for separation and drying. In the late 19th century the baleen from the right whale (and bowhead) came to rival whale oil in importance and price. Lithograph designed by Benjamin Russell. Ingalls, 1987, No. 269; Courtesy, Peabody Essex Museum, Salem, Mass.

Table 2.—Yields of oil and baleen estimated from North Atlantic catch data.¹

Area	Period	Oil (bbl)			Baleen (lb)			Source ⁴
		N ²	Mean	SE ³	N	Mean	SE	
Northeast U.S. shore-based	1725–1895	24	53	5.5	9	698	136	A
Long Island	1707–1918	69	34	1.6	5	659	126	B
Southeast U.S. pelagic	1875–1882	16	58	4.7	15	676	44	C
Southeast U.S. shore-based	1874–1916	7	38	3.6	7	539	93	D
Cape Farewell	1868–1886	9	66	9.0	4	600	— ⁵	C
Cintra Bay	1856–1880	12	55	7.9	—	—	—	C
All areas combined		137	44	1.9	40	647	40 ⁶	

¹ Generally not including values reported as “expected” yields.

² N = number of whales.

³ SE = Standard error of the mean.

⁴ A = This paper, B = Reeves and Mitchell (1986a), C = Reeves and Mitchell (1986b), D = Reeves and Mitchell (1988).

⁵ Data were reported as 2,400 lb obtained from 4 whales; no information on individual yields.

⁶ SE = 45 if the Cape Farewell sample is not included.

an underestimation of the number of whales taken. For reasons explained in the Results section, no catches were estimated from the British import data from New Providence, Newfoundland, the Bermudas, the West Indies, or “prize goods.”

Results

Summaries by State

Maine

Norton (1930) summarized evidence of whaling along the Maine coast but

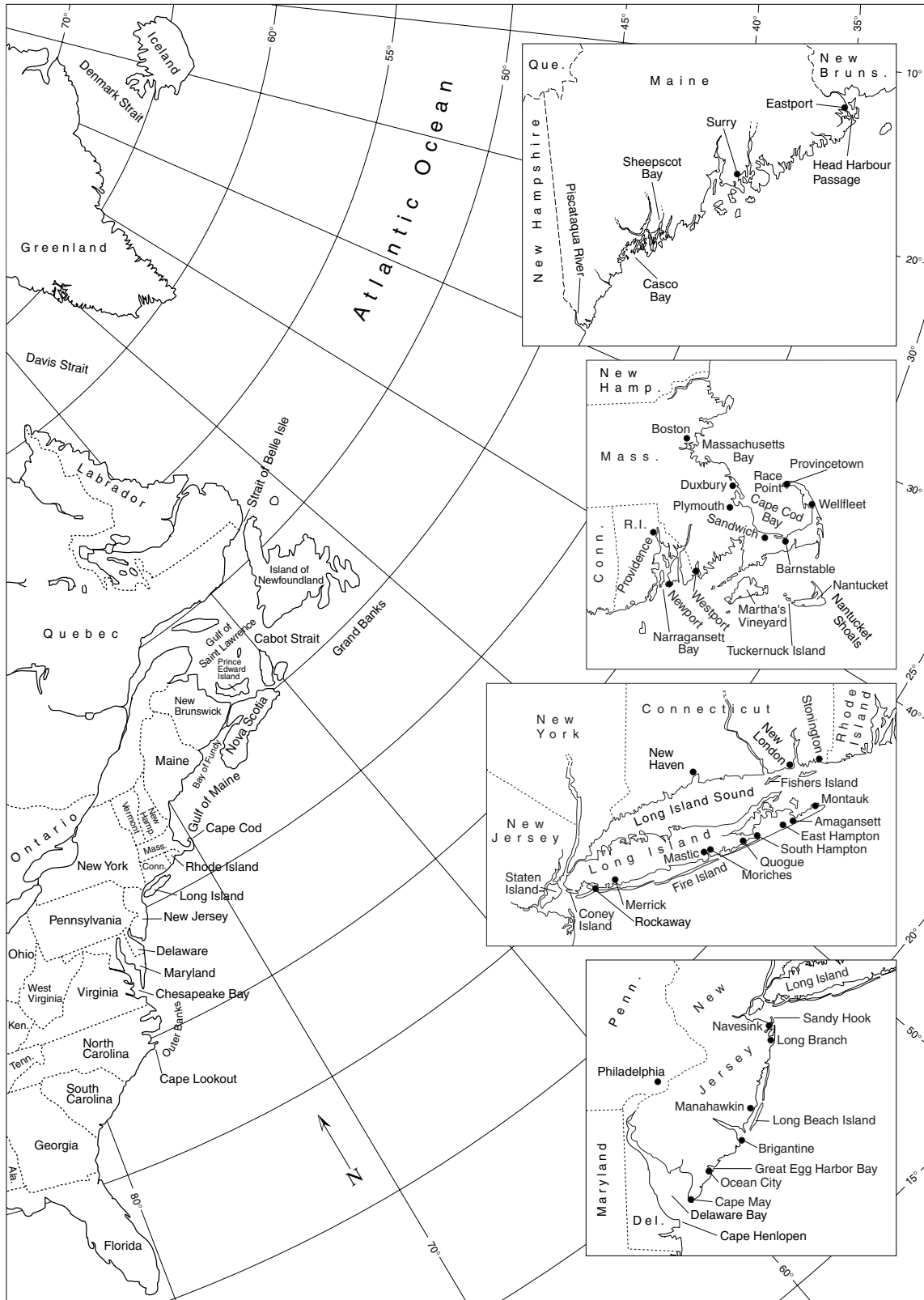


Figure 5.—Map and insets of eastern coast of United States, part of Canada and Greenland showing places mentioned in the text. Prepared by David Stanton, NMFS Scientific Publications Office.

found little evidence that right whales were taken (also see Allen, 1916). Whaling began in what is now Maine as early as the 17th century and continued at least sporadically until the early 20th century (Martin, 1975). The whaling that was conducted from the 19th century on,

however, appears to have been directed primarily at fin whales, *Balaenoptera physalus*, and humpback whales, *Megaptera novaeangliae* (Goode, 1884:27; Clark, 1887:41; Allen, 1916:313; Mitchell and Reeves, 1983). There is little evidence of whaling in the Bay of Fundy, apart

from cruises for humpbacks and fin whales by New England whalers during the 1880's (Reeves and Barto, 1985). One whale, probably a right whale, was taken in the bay and brought to Boston in August 1733 (Starbuck, 1878), and another was taken in Head Harbour Passage near Eastport in the late 1700's (Reeves and Barto, 1985). A whale was shot at Surry, Maine, in late September 1865 after stranding between two reefs (*Whalemens' Shipping List* 23(31), Oct. 1865). A right whale came ashore dead in Sheepscot Bay in summer 1919 (Norton, 1930).

New Hampshire

Allen (1916) mentioned nothing of shore whaling in present-day New Hampshire. A 50 ft whale, with a head 16 ft broad and "shaped like that of the horse," and differing from "all others that have been seen by those acquainted with that species of fish," was captured in the Piscataqua River, late June 1827 (*The Corrector*, Sag Harbor, N.Y., 6(9), 30 June 1827). It is unclear whether this capture was by whalers or fishermen.

Massachusetts Mainland Including Cape Cod (1620–1910)

Beginnings of shore whaling (1620–1690). Shore whaling in the eastern United States may have begun at Cape Cod, particularly at Provincetown (Freeman, 1862:631; Shearman, 1876). At

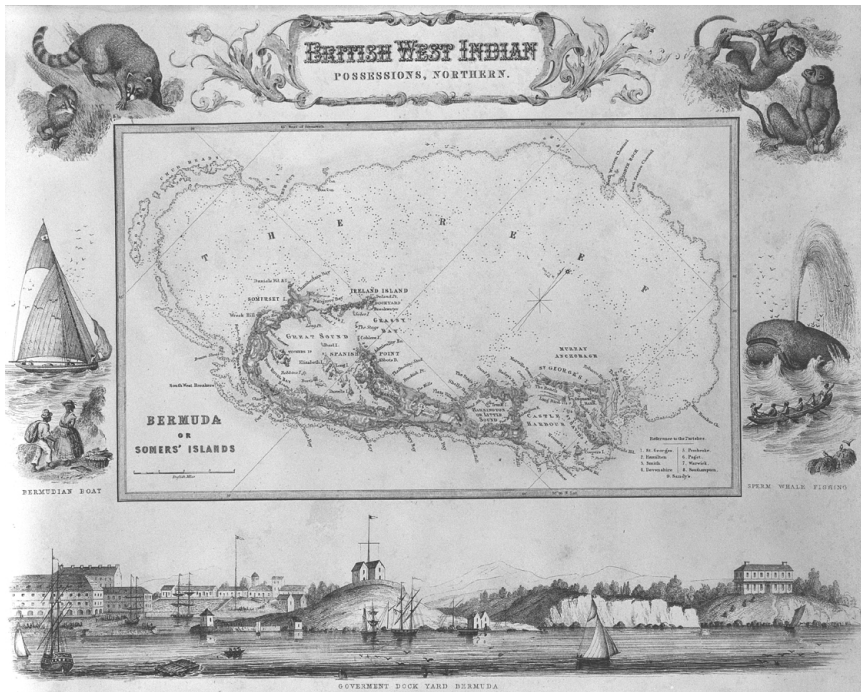


Figure 6.—Chart of Bermuda about 1860–1870, with a mislabeled vignette that actually shows right whaling. Sperm and humpback whales were taken off Bermuda in the 19th century, but the existence of an early right whale fishery in these offshore waters is not well documented. Ingalls, 1987, No. 555; Courtesy, Peabody Essex Museum, Salem, Mass.

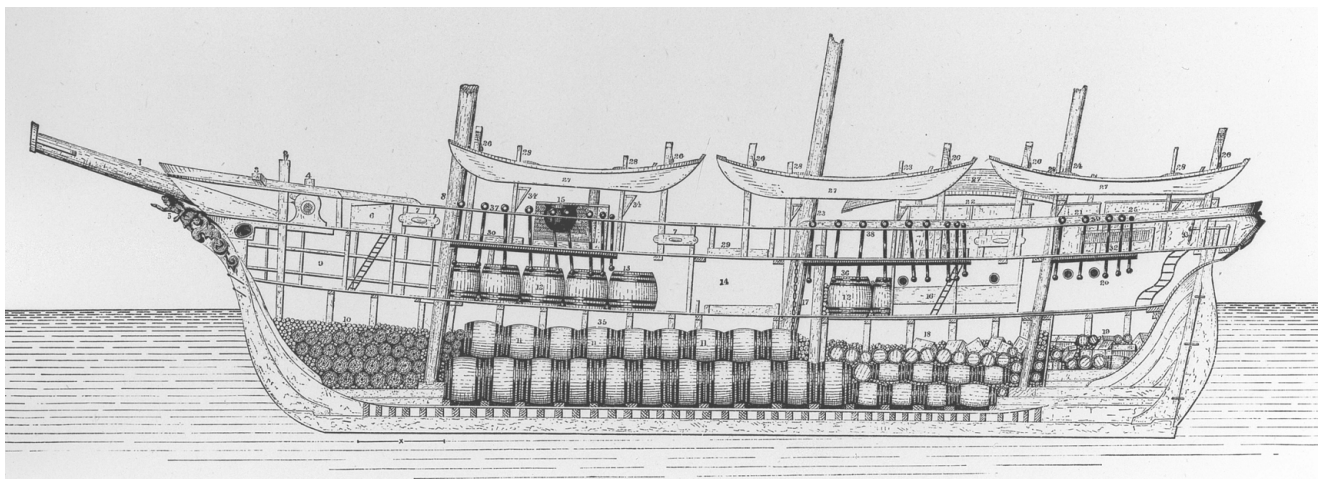


Figure 7.—The main product from whaling voyages, in terms of bulk, was oil, partially processed and decanted into barrels which were securely stowed in the vessel's hold. Drawing of bark *Alice Knowles* of New Bedford, by C. S. Raleigh (Goode, 1884–1887).

least one British expedition came to New England “to take whales” in the first quarter of the 17th century (Smith, 1624:204), and some of the Plymouth settlers in 1620 apparently were equipped for whaling (Thacher, 1832:20–21). The master and mate of the *Mayflower* expressed their intention of hunting whales off Cape Cod in winter 1620–21 (Anonymous, 1802:204), but we do not know whether they in fact did so. Winthrop (1825, 1:157) claimed when 3–4 whales were “cast ashore” on Cape Cod in April 1635 that this was not unusual. Whether these were drift whales harpooned but not secured by whalers is impossible to tell (see Drift Whales, below).

The direct hunting of right whales probably began in early New England well before 1650, when, according to some authors, the first private whaling company in North America was licensed at Southampton, Long Island (Hedges et al., 1874:70; Starbuck, 1878:9–10). Starbuck (1878:6) noted: “As important as the pursuit of whaling seemed to have been considered by the first [New England] settlers, many years seem to have elapsed before it was followed as a business, though probably something was attempted in that direction prior to any recorded account that we have.” De Vries (1853) referred to the English “experimenting off the coast of New England with a limited kind of shore whaling” in the 1630’s. They supposedly had trained selected Native Americans to serve as harpooners and oarsmen, in the absence of skilled Basques to fill these roles. Allen (1908:314) claimed that “a few whales, in addition to stranded or drift whales, were taken in Massachusetts Bay as early as 1631.” A man was killed trying to secure a struck whale in Boston harbor in 1668 (Bradstreet, 1855:44), and Ipswich Bay was described in the early 1670’s as a place “where they fish for Whales” (Josselyn, 1833:323). We can safely assume, then, that shore whaling was well established in Massachusetts by no later than the 1670’s. Governor Hinckley’s representation to the King of England on behalf of New Plymouth Colony in 1687 emphasized the relative importance of whale prod-

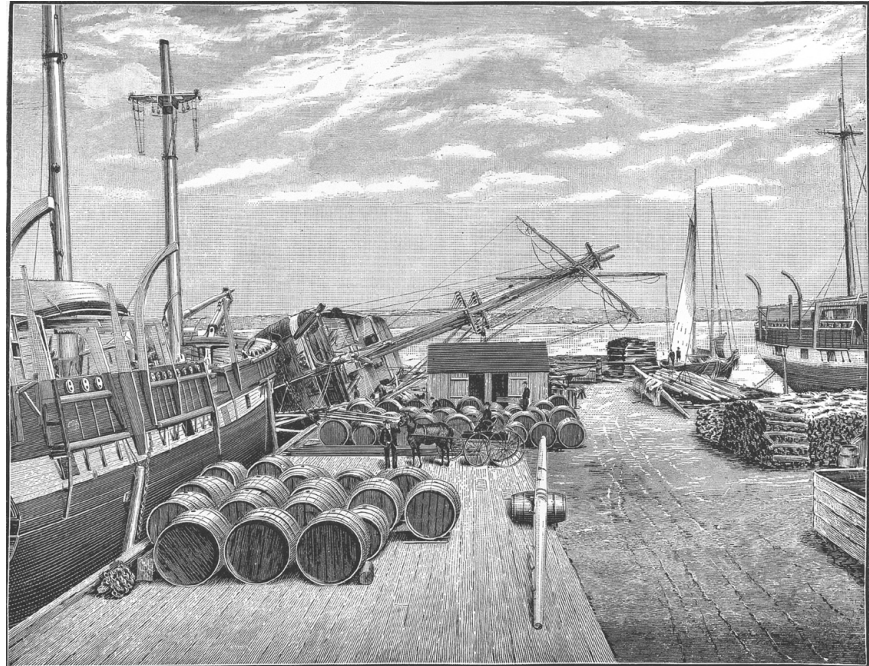


Figure 8.—Barrels of oil were usually, but not always, landed at home port (Goode, 1884–1887).

ucts in the economies of the Cape Cod towns (Collect. Mass. Hist. Soc., Ser. 4, V:178), and a resident of the colony proclaimed in 1688 that the people had made “great profit by whale killing” (Randolph, quoted in Felt, 1849:223).

Peak Years of Shore Whaling (1690–1725). Shore whaling was a major industry on Cape Cod and the Massachusetts mainland from the last decades of the 17th century through the first quarter of the 18th century. Although only several dozen captures of right whales are documented for this period (Table 3), many more must have been made. The catch of 29 whales in one day in Cape Cod Bay in 1700 implies that several crews were engaged. The Cotton Mather (1912:379) journal for 1716 refers to “our numerous tribe of Whale-Catchers.”

The people of New England chafed under the British colonial administration’s policies toward whaling and the disposal of whale products (Collect. Mass. Hist. Soc., Ser. 5, VI). Their complaints in the first decade of the 18th century resembled and coincided with those of the Long Island whalers against the latter’s colonial government (Reeves and Mitchell 1986a; also see below).

Post-1725 Shore Whaling (1726–1799) (Fig. 9). By all accounts, shore whaling for right whales had passed its peak by about 1725. The whale catch at Cape Cod was poor in the winter of 1726–27, as it had been for several years previously. The residents had some recent success, however, in hunting whales from larger vessels, and they were poised to resume this off-shore whaling in spring 1727 (Smith, 1922:71). In March 1729, whalers were working out of Duxbury and Plymouth (Winsor, 1849:350), probably hunting right whales in Cape Cod Bay. In 1739 the people of Provincetown regarded their winter’s catch of 7 or 8 whales as inadequate, and the principal whaling families made plans to move to Casco Bay, Maine (Smith, 1922:247). In 1746 only three or four whales were taken at Cape Cod, and Douglass (1760:59) believed the nearshore grounds were fished out.

Nineteenth Century Shore Whaling (Fig. 10). Despite their scarcity close to the coast, right whales continued to be pursued at every opportunity. For example, Charles W. Morgan (1841) of New Bedford noted in his diary on 13 May 1841: “Went to Westport Point in

Table 3.—Records of right whales from New England (excluding Nantucket: see Table 4). State is Massachusetts unless otherwise indicated. For additional Connecticut records, see Tables 6 and 7.

Date	Locality	Whales					I.D. certainty ¹	Comments	Sources
		Seen	Taken	Struck/lost	Chased	Drift			
Dec. 1620	Cape Cod	+					1	"Large whales of the best kind for oil and bone."	Thacher, 1832:20
April 1635	Cape Cod					3–4	2	"Cast on shore."	Winthrop, 1825:157
1654	Weymouth					1	1	"Taken" or found.	Shurtleff, 1854:191
1662	Off Narragansett Bay		1				1	See text.	Sporri, 1677 (<i>in</i> Bridenbaugh, 1974, app. V, p. 144–145)
1662	Barnstable					1	1	Plymouth Colony received tax on a [drift?] whale.	Shurtleff, 1857:165
1665	Yarmouth					2	1	Taxes ordered paid on 2 [drift?] whales.	Shurtleff, 1855:99
1668	Boston Harbor			1			1		Bradstreet, 1855:44
1672	Yarmouth					1	1	[Damaged carcass].	Crapo, 1876:66; Allen, 1916:151
Winter 1690	"Cape Cod Harbour"		1				1	"Large."	Felt, 1849:224; Starbuck, 1878:18
Winter 1691	Cape Cod		1				1		Felt, 1849:224; Starbuck, 1878:18
1692	Edgartown		1				1	"Cast on shore"; supposedly killed by a harpooner, "on a whale design."	Starbuck, 1878:18
1697	Yarmouth		2				1	Mother 55 ft and calf 20 ft.	Allen, 1916:129, 133
Winter 1699–1700 (before 27 January)	Cape Cod Bay		29+				1	29 in one day by all the boats working in the area.	Allen, 1916:131
February 1703	Martha's Vineyard		3				1	"Great whales, betwixt six and seven and eight foot bone."	Starbuck, 1878:35 [erroneously attributed to 1793 by Crapo, 1876:65, and subsequently Allen, 1908:319]
Late in 1706, probably Dec.	Ipswich		Several				1		Felt, 1834:109
Early December 1707	Boston Harbor		1				1	40 ft.	Starbuck, 1878:34; Allen, 1916:133
25 Nov. 1712	Duxbury				1		2	Boat chasing a whale, "all drowned."	Allen, 1916:134
1720	Squibnocket, Martha's Vineyard					1	2		Banks, 1966a:44
1722–23	Vicinity of Salem					2	1	"Drift" whales, "claimants may prove their right [to the carcasses] before courts of the admiralty."	Felt, 1849:224
Spring 1723	Massachusetts Bay (?)		8				2	Brought into Boston by vessels from that port; some may have been sperm whales.	Starbuck, 1878:168
1725	Noman's Land		1				1	26-barrel, by a 6-man crew.	Banks, 1966a:435
March 1736	Off Provincetown		1[2?]				1	"Large," est. 100 bbls oil; taken "at sea" by a Provincetown vessel.	Allen, 1916:134; Starbuck, 1878:32, 158 [see <i>Boston News-Letter</i> , 18 March and 1 April 1736]
11 May 1736	40 leagues E. of Georges Bank			2			2	Could have been sperm whales, judging by location and circumstances.	Starbuck, 1878:32 [see <i>Boston News-Letter</i> , 27 May 1736]
Up to 5 Jan., season of 1737–38	Provincetown		2				2	"Small."	Allen, 1916:158–159; Starbuck, 1878:32–33
Up to Feb., season of 1737–38.	Yarmouth		1				1	Baleen 8–9 ft; large	Allen, 1916:159; Starbuck, 1878:32–33
1738–39	Provincetown		6				2	"Small."	Allen, 1916:159; Starbuck, 1878:32–33
1738–39	Sandwich		1 2				1 2	"Large," baleen 6 ft. "Small."	Allen, 1916:159; Starbuck, 1878, p. 32–33
1746	Cape Cod		≤3 or 4				2		Douglass, 1760:59
10 Feb. 1755	Truro				1		2		Allen, 1916:134
Dec. 1756	King's [Lynn] Beach		1				2	75 ft, man "rode into his mouth, in a chair drawn by a horse"; 2 ribs were used for gate posts.	<i>The Corrector</i> , Sag Harbor, 8(42), 13 Feb. 1830

Continued on next page

Table 3.—Continued.

Date	Locality	Whales					I.D. certainty ¹	Comments	Sources	
		Seen	Taken	Struck/lost	Chased	Drift				
1770	Duxbury					1	2	Carcass found near shore, being eaten by sharks, 16+ bbls.	Winsor, 1849:86	
14 Jan. 1795	In Buzzards Bay				2		2	Two 40-bbl whales chased by "several" boats within 3 mi of New Bedford.	<i>New Bedford Medley</i> , 16 Jan. 1795	
4 Dec. 1808	Winter Island, near Salem						1	2	Found "in the offing"; "grounded," 60 ft.	Bentley, 1911:400
April 1822	Boston Bay			1				2	By a Cape Cod vessel; broke line and escaped.	Allen, 1916:134–135; <i>Nantucket Inquirer</i> 2(17): 25 April 1822
Late March 1824	Martha's Vineyard		1					2	"Small." Found dead by schooner <i>Ruby</i> of Boston; blubber taken to Edgartown for trying out; made 33–40 bbls; thought to have been struck by whalers operating from S side of island.	<i>Nantucket Inquirer</i> 4(15): 5 April 1824
5 April 1824	New Haven, Conn.				1[?]				In harbor, chased by local "enterprising seamen."	<i>Nantucket Inquirer</i> 4(16): 12 April 1824
19 Feb. 1828	Newport, R.I.		1					1	70 bbls, 44 ft, pursued by 4 boats and twice harpooned on 18 Feb.; finally taken by Capt. Potter of Newport.	Allen, 1916:135; Clark, 1887:48; <i>New London Gazette</i> , 27 Feb. 1828
11 April 1835	Provincetown		1					1	By schooner <i>Columbia</i> of Provincetown, expected to produce 75–80 bbls.	<i>New-Bedford Mercury</i>
1 Sept. 1838	Newburyport						1	1	Ca. 40 ft; found dead; ca. 40 bbls.	Allen, 1916:135, 140
25 March 1841	Edgartown		1					1	40–45 bbl.	<i>New Bedford Mercury</i> , 34(40), 2 April 1841
12 May 1841	Westport Point		2					1	Ca. 50 ft, 40 bbls; ca. 25 ft, 20 bbls; 4–5 boats chased; 1,500 gallons oil expected.	Morgan, 1841; <i>New Bedford Mercury</i> , 34(46), 14 May 1841
11 May 1843	SE of Chatham (Great South Channel)		1					1	Very large. By schooner <i>Cordelia</i> of Provincetown; 125 bbls and 300 lb baleen saved; 14 ft baleen. Length of baleen and potential yield (supposedly ca. 1½ tons baleen, ca. 300 bbls) suggest a bowhead.	Allen, 1916:135; Jennings, 1890: 193–94
Mid-April 1848	Plymouth	+			+			1	"Considerable number" seen, chased by 5 vessels.	Allen, 1916:136
Late Jan. 1850	Provincetown Harbor		1					1	"Large."	Allen, 1916:136
Early Feb. 1850	Provincetown Harbor		1					1	"Large," 50 bbls.	Allen, 1916:136
1 Nov. 1850	Provincetown		1					1	"Large," 60 bbls.	Allen, 1916:136; Clark, 1887:41; Goode, 1884:24 <i>n</i>
Mid-May 1852	Provincetown (in Massachusetts Bay)		1					1	"Large," 75 bbls, 8 ft baleen.	Allen, 1916:136
Early Oct. 1852	Massachusetts Bay		2					2	By a Provincetown schooner.	Allen, 1916:136
April 1853	Provincetown Harbor		2	1?				2		Allen, 1916:136–137
11 Dec. 1854	Provincetown		1					1	Drifted ashore mid-Dec. at Sandwich, 48 ft, 30–40 or 60 bbls; harpoon suggested it was Provincetown whale killed but lost on 11th.	Allen, 1916:137; <i>Nantucket Inquirer</i> , 34(153):25 Dec. 1854; <i>WSL</i> 12(43):26 Dec. 1854
Late Nov. 1858	Provincetown					1		1	One whale "several times fired at with harpoon guns, eventually escaped."	Allen, 1916:137
17–24 March 1860	Provincetown	Several	1					2	By Samuel Loper and others; "several" seen in harbor on 18 March.	<i>WSL</i> 18(3): 27 March 1860
April 1864	Plymouth (but towed to Provincetown)		1					1	Large, 47–48 ft; produced 80 [or 83] bbls, 14 gallons; 1001 lb baleen. Skeleton in Museum of Comparative Zoology; baleen 7 ft.	Allen, 1916:118, 137, 171; Allen, 1908:322
1867	Cape Cod Bay, near Provincetown		1					1	Large, 48 ft, 84 bbls, 1,000 lbs baleen.	Goode, 1884:24
1 March 1870	Provincetown Harbor	2		1				1	Mother and calf, cow struck; while lancing, the line had to be cut.	Allen, 1916:137

Continued on next page

Table 3.—Continued.

Date	Locality	Whales					I.D. certainty ¹	Comments	Sources
		Seen	Taken	Struck/lost	Chased	Drift			
1887	Provincetown		1				1	Large, male, 47 ft; 70 bbls.	Allen, 1916:138
20 May 1888	Provincetown (Massachusetts Bay)		2				1	Large, produced 170 bbls (one gave 80 bbls, 800 lbs baleen).	Allen, 1916:138–139, 171; WSL 46(17):29 May 1888
May 1888	Provincetown		1				1	Large, found dead near Georges Bank; probably killed by steamer <i>A.B. Nickerson</i> ; 50 ft.	Allen, 1916:139; WSL 46(17):29 May 1888
1 June 1888	Provincetown		1	1			1	Mother and calf. Mother 55–60 ft, produced 100 bbls, 1,500 lb baleen; "unusually large and fat"; calf sank; killed with bomb lances by steamer <i>A.B. Nickerson</i> . ²	Allen, 1916:130–131, 139, 143, 171; WSL 46(19):12 June 1888
1893	Tiverton, R.I.		1				2	Large, ca. 50 ft, stranded at Newport, R.I.	Allen, 1916:139
1894	Fort Adams, R.I.		1				1	First seen off Conanicut Is., R.I.	Allen, 1916:139
October 1894	Boston Bay	1					1	Thought to have been the whale killed at Nahant the following March; may have overwintered in this area.	Allen, 1916:139
Late March 1895	Nahant		1				1	Large, male, escaped towing gear; found dead on 1 April, 25 mi N. of Race Point; 42 ft, 50–60 bbls; 5½ ft baleen.	Allen, 1916:120, 139; True, 1904:268
15 Jan. 1909	Provincetown		1				1	Small, female, entangled in fish trap, killed with bomb lance; 10.59 m; a "scrag."	Allen, 1916, plate 9, 119, 140
Spring 1910	Provincetown	1					1		Allen, 1916:140

¹ The degree of certainty of our identification of the whales as right whales was evaluated according to the following criteria: 1=whale was taken by shore whalers in 1725 or earlier; baleen at least 3 ft long or considered worth saving; yield 40 bbl oil or more; whale clearly identified as a balaenid by our source (any one of these criteria is sufficient). 2=whale was taken after 1725; no definite evidence it was a balaenid, but also no definite evidence that it was not. Drift whales are classified as "2" unless some evidence was available to identify them as right whales. "The Right Whale and less often the Humpback, were the only species regularly hunted in our waters until the introduction of more deadly apparatus than the hand harpoon, so that it may usually be assumed that when 'whales' are mentioned in the old accounts as seen or pursued, the Right Whale is the species intended. Especially is this the case, since Finbacks or Humpbacks are usually so designated" (Allen, 1916, p. 132). No whale other than the bowhead has baleen longer than 3 ft. Though large sperm whales often yielded more than 40 barrels of oil, mysticetes other than balaenids rarely did, particularly when only the blubber was tried out (see Mitchell and Reeves, 1983, p. 188, for a discussion of humpback yields).

² Whalers were also hunting fin whales at this time.

company with many others to see two whales which had been caught off there day before. They were cutting one in - about 48 ft. long and will make about 40 bbls of oil (right whale). It was a curious sight and quantities of people were present from N. Bedford and surrounding country. The other was much smaller, perhaps 20 bbls." These two whales were also mentioned in the New Bedford newspapers (*New-Bedford Mercury*, 34(46), 14 May 1841), and in the 12 May entry of Samuel Rodman's diary (Pease, 1927:220).

Referring to Provincetown, Freeman (1862:623) wrote: "Even now, if peradventure one [whale] occasionally shows itself within the range of the practised sight of a seaman, no objection is made to the vicinage of the game, and it is almost sure to be 'brought to' by the unerring harpoon of the expert." He added that the occasional sighting of a whale "of the larger kind" in Barnstable Bay, Wellfleet Bay, or

Provincetown Harbor was "the signal for sport that is generally successful" (Freeman, 1862:655). Pelagic whaling vessels were sometimes delayed from departing Provincetown when their masters received news that whales had been sighted near Race Point (e.g. the *R. E. Cook* and *Seychelle*, April 1853, *Whalemens' Shipping List* 11(8), 26 April 1853; the *Rienzi*, June 1857, *Whalemens' Shipping List* 15(15), 23 June 1857).

Captain N. E. Atwood of Provincetown stated during the 1860's that right whales were taken there occasionally but that their appearance had been more regular in the past (Allen, 1869:202–203). Two or three right whales were killed near Provincetown between 1867 and 1884 (Goode, 1884:24). However, the only specific Provincetown record that we found for this period refers to a mother, accompanied by a calf, that was lanced but not secured in March 1870 (Allen, 1916:137).

An intensive hunt for balaenopterids (almost entirely fin and humpback whales), involving steam-powered vessels and explosive harpoons, took place in Cape Cod and Massachusetts Bays and in the Gulf of Maine during 1865–95 (Clark, 1887:41–48; Allen, 1916; Mitchell and Reeves, 1983; Reeves and Barto, 1985). A close lookout would have been kept for right whales, and any seen would have been chased.

Martha's Vineyard. Allen (1908:314) claimed that whaling began at Martha's Vineyard in 1652 (Allen, 1916:167–68 provides more on early whaling and drift whale salvaging operations). The practice of including claims to products from drift whales with the title to land (Banks, 1966a:55) apparently grew out of purchase agreements made with Indians as early as 1658 (Banks, 1966b:432). Items listed in personal inventories in the late 1660's (e.g. barrels of oil, "great kittells", and a large "iron pot") indicate that Vineyard resi-



Figure 9.—Joseph Russell probably started whaling in New Bedford in 1755, and in this scene of 1763 his initials JR can be seen on the barrels (Scammon, 1874).



Figure 10.—New Bedford in 1853, with oil refineries, rail depots, factories, and other commercial buildings relating to the prosperous whaling industry of the day. Ingalls, 1987, No. 279; Courtesy, Peabody Essex Museum, Salem, Mass.

dents were processing whale products at that time. Try houses (for rendering whale blubber into oil) were present at Holmes Hole “quite early” and at the Butler homestead before 1748 (Banks, 1966b:432–433).

John Butler and Thomas Lothrop, the first Vineyard whalers on record, killed three whales in February 1703 (Banks, 1966b:434). Butler, at least, had been engaged in whaling for a considerable time before then. In 1724 a Vineyard

man made a joint whaling expedition in Barnstable Bay with a man from Barnstable (Banks, 1966b:435). Shore whaling continued at Martha’s Vineyard through at least the first quarter of the 19th century (Table 3).

Table 4.—Nantucket shore whaling.

Date	Evidence of whaling activity	Right whales			I.D. certainty ¹	Source ²
		Seen	Taken	Drift		
1686	Possible sale of products from drift whale by Indians.			1	2	1:32
1691	Possible sale of products from drift whale by Indians.			1	2	1:32
1691–1695	Four whaling stations active on S side.					1:19, 22
1696–1719 [or 1731]	Evidence of whaleboat building and whaleboat oar crafting on the island.					1:Tables 5, 6
1696–1733	Tools for whaling from boats in blacksmith's account book.					1:Table 7
1702–1723	Shore whaling stations active.					1:25
7 th day, 11 th month 1708	A "stunt."		1		1	Blacksmith, 1683–1738; also see 1:11
1709	Sloops with 2 whaleboats each whaling on Nantucket Shoals.					1:11–12
Winter 1710	A "cutter" paid for cutting blubber.		1[?]		1	1:8
1711	A "dryskin," a "yearling," and possibly a third "fat" whale taken. ³		2-3		1	1:11, 75
1712	First sperm whale ("Spermaseta") taken by Nantucket whalers; taken "accidentally some distance south of Nantucket."					Blacksmith, 1683–1738; 1:12
Ca 1712	"Triing of 2 barills of fat whale."		1[?]		1	1:app. 10
1713	A "dryskin" and possibly a second "fat" whale taken. ³		1-2		1	1:11, 75
1714	Reference to "the first whale."		1		1	Macy, 1707–1760
1715	References to "the first whail" and "the second whail."		2		1	1:app. 10, p. 76
1715			15(est.)			See text
1717	Reference to "whaleing and fishing on this shore"; reference to "the vinyar whale" (attributed to 1714 by Little); "18 long bone sold."		1(+?)		1	Macy, 1707–1760; 1:75–76
1718	Complaint by Indians about their whaling returns.					1:70; Starbuck, 1924:143
1718	Began whaling "out in the deep."					1:12
1721			1		1	3
1724			2		1	3
1726	28 boat crews of 6 men each.		86		2	Starbuck, 1924:356; Macy, 1835:31; Starbuck, 1878:22; 3
1726	ca 27-30 "whale houses" on Nantucket.					1:25
December 1727	A day's whaling trip.		1		2	1:7, 70; 3
1727			1		2	1:32, app. 7; 3
1728	At least 1 alongshore.		2		1	3
1728	At least 1 alongshore; 1 at Bowbell, Nantucket Shoals.		5		2	3
February 1729 or 1730	Whaling voyage in whaleboat, Nantucket to Martha's Vineyard.					1:7, 70
1729	At least 1 at Bowbell; 1 in "ye deep."		2		2	3
1729	1 alongshore; 1 at Bowbell.		2		1	3
1730	In "ye deep."		1		2	3
1730, winter	Alongshore.		1		1	3
Late February 1731	"A whale day."					1:7-8
1731	2 in "ye deep"; 1 "went to the bay."		2	1(?)	2	3
1731			1		1	3
1732	Possibly 27 "companies" whaling alongshore.					1:33, app. 2
Spring 1732	In "ye deep."		1		2	3
1733	1 in "ye deep"; 1 at Bowbell.		2		2	3
1734	At least 1 in "ye deep" or at Bowbell.		2		2	3
1735	3 in "ye deep", 1 alongshore, 1 at Bowbell (summer).		5		2	3
1736	One in summer.		2		2	3
1736	Alongshore.		1		1	3
1737	One in spring.		2		2	3

Continued on next page

Nantucket. Records given in Table 4 are principally from Allen's (1916: 163–67) account of shore whaling at Nantucket, derived largely from Macy (1835) and St. John de Crèvecoeur (1782) for the early years and from Allen's search of Nantucket newspapers; Little's (1981, 1988) searches of

archival documents; and our own reexamination of some of their sources. A few of the records require explanation.

According to Macy (1835:31; and see Little, 1988), shore whaling continued at Nantucket until about 1760, after which time whales were taken by boats from shore "only occasionally." Most

of the whales taken by these boats were said to have been right whales (Shearman, 1876).

In 1715, six sloops whaling from Nantucket produced 600 barrels of oil and 11,000 lb of baleen (Macy, quoted in Collect. Mass. Hist. Soc., Ser. 1, 3:161) worth £1,100 sterling (Macy, 1835:37).

Table 4.—Continued.

Date	Evidence of whaling activity	Right whales			I.D. certainty ¹	Source ²
		Seen	Taken	Drift		
1737			2		1	3
Spring 1738	At least 1 at Bowbell.		2		2	3
Summer 1738			1		2	3
1739			1		2	3
Summer 1739			1		2	3
1740	1 in spring.		3		2	3
1741	At least 1 at Bowbell.		3		2	3
1742	At least 1 at Bowbell (summer); 1 in fall.		3		2	3
1742			2		1	3
Spring 1743			1		2	3
1743			1		1	3
1744	At Bowbell.		1		2	3
Summer 1745			1		2	3
1746–1750	At least a "cow & calf" taken.		2		2	1:16
1746			1		2	3
1747	At Bowbell.		1		2	3
1748			1		2	3
Spring 1749			1		2	3
1750	1 in winter.		2		2	3
1751	Sloop <i>Ann</i> .		2		2	3
1752			1		2	3
Spring 1754			1		2	3
1754	Alongshore.		1		1	3
1755			3		2	3
1755			1		1	3
Spring 1756			1		2	3
Winter 1757			1		1	3
1757			1		2	3
1758			1		2	3
1760	"Along-shore whaling continued at Nantucket until 1760." 28-30 max. no. of shore whaleboats at Nantucket.					1:15-16
1775	Whale houses and look-out masts in place at Siasconset.					1:18
No date (before 1792)	30 whaleboats at sea S of Nantucket.					1:8
3 May 1796	A floating sperm whale found and towed by a sloop to Nantucket; made 50 bbl body oil and 35 head; sold for \$2,689.					<i>N.B. Medley</i> , 6 and 20 May 1796
10, 19 April 1800	One large and one small, 31 and 16 barrels oil on 10 April. 30 barrels oil on 19 April.	+	3		1	Macy, 1835:150–151; Allen, 1916:129, 134
Early June 1854	"A large humpback or right whale" seen for several days, preparations made to chase it.	1			2	<i>The Whaleman</i> , New Bedford, 9 June 1854; <i>WSL</i> 12(15): 13 June 1854
10 November 1863	One whale seen, not chased.		1		1	2:137
End November 1864	2 whales seen and chased.		2		1	2:137
April 1871	Found dead in the sound; towed to Nantucket and flensed.			1	1	Stackpole, 1982
1 st week November 1876	Large (40 bbl) whale chased.		1		1	2:137–138
1 November 1877	A "large scrag whale" seen.		1		2	2:138
Mid April 1886	Produced 125 barrels oil and 1500-2000 lb baleen, all told. One sank in 11 fathoms. Nantucket and Tuckernuck (one towed to New Bedford).		4		1	2:126–128, 138, 171; <i>WSL</i> 44(13): 4 May 1886; Stackpole, 1982
Late April to early May 1886	Up to 25 whales seen near coast; chased by schooner <i>Glide</i> .		ca 25		1	2:138
10 May 1886			1		1	2:138
1 st week April 1891	"Several" seen.		2+		1	2:139
1–4 April 1897	"Several" seen and chased.		2+		1	2:139–140
Ca 24 May 1913	S shore of Muskeget Island.		2		1	2:140

¹ The certainty of our identification of the whales as right whales was evaluated according to the following criteria: 1=whale was taken by shore whalers in 1725 or earlier; baleen at least 3 ft long or considered worth saving; yield 40 barrels oil or more; whale clearly identified as a balaenid by our source (any one of these criteria is sufficient). 2=whale was taken after 1725; no definite evidence it was a balaenid, but also no definite evidence that it was not. See Table 3, footnote 1.

² 1 = Little (1981), 2 = G. M. Allen (1916), 3 = Little (1988).

³ Little (1981, e.g. p. 11) interpreted the listing "... fat whale ..." in the account books she examined to refer to "fat" whales taken. However, we suspect that in the context it may have meant "whale fat." Thus, it should not necessarily be interpreted as evidence that an additional whale was caught.

Because long-distance whaling cruises on large vessels had not yet become commonplace for the colonists (the sloop voyages lasted no longer than about 6 weeks, according to Macy, 1835:37), and shore whaling for right whales was still a rewarding enterprise at the time, we believe that the returns listed came primarily from right whales. Some of the oil could have been from sperm whales, *Physeter macrocephalus*. The first sperm whale taken at sea by the Nantucket whalers supposedly was killed in about 1712 (Macy, 1835:32), but sperm whales were known from the Massachusetts coast much earlier (Josselyn, 1672, 1833). Mary Starbuck's account book refers to spermaceti, a product obtained only from sperm whales, in connection with a voyage in 1729 (Little, 1988). Nevertheless, it appears that sperm whales were not commonly taken in the early years of sloop whaling when effort centered on Nantucket Shoals (Little, 1988). Oil and baleen from bowheads also could have been included in the returns. However, although Starbuck (1878:168) referred to one New England whaling voyage to Davis Strait (as far as lat. 66°N) in 1732, Nantucket vessels did not regularly begin visiting the northern regions where bowheads would have been a primary target until about 1746 (Macy, 1835:54). The earliest catch of a whale at Greenland, possibly a bowhead, mentioned in Mary Starbuck's account book was in 1737–38 (Little, 1988). If all 11,000 lb of baleen produced in 1715 did come from right whales, then an average yield of 657 lb per whale would indicate a secured catch of about 17 animals.

Starbuck (1878:168) surmised that the 1715 effort and catch by the Nantucket sloops was "probably for some years pretty constant." They certainly continued to catch right whales and sperm whales east of the Grand Bank and elsewhere through at least the 1760's (Fonda, 1969; Reeves and Mitchell, 1986b; Table 5). Some of the oil (and presumably baleen as well) secured by Nantucket sloops in Newfoundland was exported directly to England without having passed through a New England port (E. A. Little *in litt.*, 17 August 1991; see below).

Table 5.—Catches reported by Little (1988) for Nantucket whalers at grounds in the Northwest Atlantic north of New England.

Date	Place	No. of right whales	I.D. certainty ¹
1733	Canso	1	2
Sept. 1735	Canso	1	1
Spring 1736	Canso	1	2
1737	Greenland	1	2
Summer 1738	Newfoundland	1	2
1741	Newfoundland	1	2
1743	Newfoundland	1	2
1747	Newfoundland	1	2
1753	Carolina	1	1
1754	Newfoundland	1	2

¹ According to the following: 1 = almost certainly a right whale because baleen was saved and the latitude is outside the bowhead's range; 2 = probably a right whale, but could be sperm, humpback, or bowhead.

Occasionally, pelagic whaling vessels in port put to sea off Nantucket in pursuit of whales sighted near the island (e.g. mid-May 1827, the brig *Quito* [*Nantucket Inquirer*, 26 May 1827]; several vessels in April 1847 [*Nantucket Inquirer*, 21 Apr. 1847]). Smaller vessels continued to make short cruises to Nantucket Shoals during the heyday of Nantucket's distant-water whaling (e.g. 6–10 Sept. 1825 by the sloop *Sarah Porter* [*Nantucket Inquirer*, 12 Sept. 1825]; Mitchell and Reeves, 1983).

An article entitled "The Whaling Business at Nantucket" appeared in *The Corrector*, Sag Harbor, 19 June 1852: "The recent close approach of whales to the island which has so thinned their ranks, has started 'off-shore fishermen', and three fine schooners are now fitting for the service. This is the old business of Nantucket over again. May it prove profitable and acceptable." One of these schooners was the *Hamilton*, which sailed 12 June to cruise on the shoals (*The Corrector*, Sag Harbor, N.Y., 26 June 1852, from "New Bedford Shipping List"). The *Hamilton* took six humpbacks and struck but lost five more during the first 3 weeks of August 1852 on Nantucket Shoals (Allen, 1916:137). It is unclear whether right whales were among those whales that appeared off the Nantucket coast in the early 1850's. However, the occurrence of a group of right whales off Tuckernuck in April 1886, three of which were caught (a fourth was lost but later found dead and towed to New Bedford), was discussed by Allen (1916:138) and again by Stackpole (1982). The latter gave

the year as 1887 (incorrectly: see *Nantucket Inquirer* and *Whalemen's Shipping List*).

Rhode Island

Allen (1916:168–170) found relatively little evidence of early shore whaling in present-day Rhode Island although bounties were being offered on whale oil and baleen in 1751. Such bounties had, in fact, already been offered on these commodities as early as 1731 (Arnold, 1860:103; Potter and Rider, 1880:31–32). The bounties were renewed for 10 years in 1738 but repealed in 1745 (Preston, 1932:28). During 1733–38, bounties were paid on 1,211 barrels of whale oil and 3,843 lb of baleen (equivalent to about 6 right whales at 657 lb of baleen per whale). By this time, some of the oil could have come from sperm whales and some of the oil and baleen from bowheads taken in cruises to the north. The sloop *Pelican* sailed from Newport in 1733 and returned with 114 barrels of oil and 200 lb of baleen (Arnold, 1860:110). Although the *Pelican* has been described as Rhode Island's "first regularly equipped" whaling vessel (Arnold, 1860:110), a vessel from Rhode Island took a large sperm whale in May 1723 (Starbuck, 1878:168).

The coastal Indians of Rhode Island had a tradition of using the products of drift whales (Arnold, 1859:85). Also, according to Arnold, whales were taken "often" with boats in Narragansett Bay before about 1750. The description of a whale's being taken off Narragansett Bay in March 1662 (Sporri, 1677; Bridenbaugh, 1974, app. V:144–45), "among the earliest accounts of fastening to a whale with a whaleboat in colonial America" (Kugler, 1980:8n), lends credence to Arnold's claim. The Narragansett Bay whalers attacked the whale in two boats, each carrying a crew of six or seven men, using the established European (Basque) technique of fastening to the whale with a harpoon and line. The March 1662 whale was definitely a right whale, judging by Sporri's (1677) description: "This fish was fifty-five feet long and sixteen feet high; it had only two fins; the tail was broad. Its blubber was two feet thick . . . The

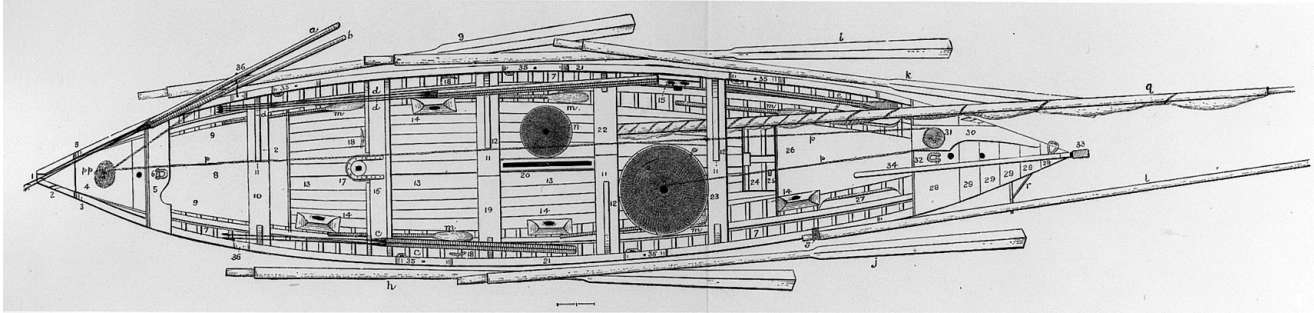


Figure 11.—Plan and equipment of mid 19th century American whale boat. Drawn by C. S. Raleigh (Goode, 1884–1887).

teeth, which are as much as six feet long and saw-like, are the whale-bone which is shipped to us [in Holland]” (Bridenbaugh, 1974:145).

The inventories of possessions of Rhode Island residents during the early 1700’s occasionally included quantities of baleen (e.g. Rogers et al., 1894a:249; 1894b:119). Rhode Island merchant vessels sometimes carried oil to the West Indies (e.g. in 1723—Preston, 1932:26), but much of it could have been the result of “previous trading with neighboring colonies” (Preston, 1932:28). The Rhode Island General Treasurer’s accounts for 1723 indicate payment of £171 for 433 lb of baleen and 2 tons of oil (Preston, 1932:28).

Allen’s (1916:135) record of a right whale killed “off Providence” in 1828 (his source was the *Nantucket Inquirer* of 1 March 1828, not 22 February as given) can be further described from information in *The Gazette*, New London, Conn., 27 February 1828 (citing *The Cadet* of Providence; also see Clark, 1887:48). The whale, “of the largest size,” was chased by four whale boats (Fig. 11) and harpooned twice on 18 February. It was finally killed near Newport the next day by Captain Potter of Newport. This whale probably was the one seen near Providence lighthouse “some weeks since.” Cope (1865, 1866) referred to the periotic bones of a large right whale from Newport, but he gave no further details to indicate whether this was a different specimen from that taken in 1828.

Connecticut

More shore whaling was probably conducted in Connecticut than is suggested by Allen’s (1916:170) brief

Table 6.—Entries referring to whales or whaling in Manasseh Minor’s diary, 1696–1720 (Miner and Miner, 1915). Entries are direct quotations.

Date	Entry	Diary page
3 December 1697	Robin Abnar and pelig went a whalin.	26
17 October 1698	I went to fishars island for oyle.	31
14 December 1702	Abell went a whaling.	57
24 February 1703	Sam hand & Company cam hear.	59
25 February 1703	the whale brak their boat.	59
3 March 1703	... a whale broght on shore.	59
4 March 1703	... the boat lanchd.	59
5 March 1703	wee went to see the whale.	59
10 March 1703	a whale at wadawanvk.	59
16 March 1703	Abel came from whaling.	59
22 March 1703	Samvel hand came a whaling.	59
23 March 1703	killed 3 whals amongst them	59
27 March 1703	Sam hand went to cut his great whale	59
4 March 1705	... a whal killed.	75
8 March 1705	I sold one barril of sider to the whalmen	75
4 August 1706	wee feched the whal boat	94
14 August 1706	we went to fishas island in a whal boat.	94
22 April 1709	I feched the whal boat home.	115
21 December 1714	I broght oyle from SC.	120

account. One company was offered a monopoly on whaling by the Connecticut General Court in 1647 (Trumbull, 1850:154), but we found no evidence of their taking up this offer. Caulkins (1895:638) understood the listing of a whale boat in an enumeration of goods to imply that “excursions were sometimes made in pursuit of whales” during the late 17th and early 18th centuries. Two early diaries kept by Connecticut residents show that Caulkins was right. Comfort Davise rented Joshua Hempstead’s whale boat “to go a whaling” at Fishers Island between 13 January and 20 February 1718 (Hempstead, 1901:72). Manasseh Minor, a Stonington farmer, may not have participated directly in whaling himself, but he reported the activities of whalers in his diary kept from 1696 to 1720 (Miner and Miner, 1915; our Table 6). At least five of his acquaintances were

whalers. Some (Robin, Abnar, Pelig, and Abel) apparently were local; others (Sam Hand and associates) were from elsewhere, perhaps Long Island. At least three whales were taken on the Connecticut coast in early 1703 and one in March 1705.

These data substantiate the comment by Hurd (1882:677; reiterated by Wheeler, 1900:131) that as early as 1701, and for some time thereafter, whales were taken and brought ashore at Wadawanuck (Stonington Point). The oil was exported to Boston and the West Indies. A sloop was fitted out for whaling from New London in 1718 (Colby, 1990).

Some whaling took place in Long Island Sound during the 19th century. Reeves and Mitchell (1986a) listed several sightings and catches of right whales (and a sperm whale) in Long Island Sound, and additional records are given in Table 7. A whale seen for several

Table 7.—Information on Long Island shore whaling not included in Reeves and Mitchell (1986a, their Table 1). Where Reeves and Mitchell (1986a) is cited as one of the sources, the data presented here supplement or clarify those given in their table.

Date	Locality	Comments	Source
4 September 1766	Coney Island	40 ft, expected to yield 70 bbl.	Weiss et al., 1974:104.
June 1850	Peconic Bay	Whale taken; 33 ft.	Caulkins, 1895:639
March 1883	Amagansett	Large [right] whale struck and lost; carcass seen floating "miles off the shore" next day.	<i>New York Tribune</i> , 26 Jan. 1885, p. 5
27 December 1893	Southampton	The large right whale was taken by 2 boats headed by Captains Rogers and Hubert White, "two retired Arctic whalers"; estimated worth: \$2,000.	Reeves and Mitchell, 1986a; <i>New York Tribune</i> , 28 Dec. 1893, p. 5
Winter 1883-84	Amagansett	No whales seen.	<i>New York Tribune</i> , 26 Jan. 1885, p. 5
7 April 1894	Amagansett	Large right whale, 50 ft long, baleen 7 ft, expected yield of at least 50 bbls.	<i>New York Tribune</i> , 8 Apr. 1894, p. 1; <i>Brooklyn Daily Eagle</i> , 8 Apr. 1894, p. 2; Reeves and Mitchell, 1986a
Early March 1895	Bridgehampton	Right whale chased by 2 boats.	<i>Brooklyn Daily Eagle</i> , 10 March 1895, p. 7
17 October 1895	Easthampton and Amagansett	Right whale and fin whale chased by 2 boats.	<i>East Hampton Star</i> , 18 Oct. 1895; <i>Brooklyn Daily Eagle</i> , 19 Oct. 1895, p. 7
4 November 1895	Gardiners Bay	Fin whale chased by 2 Greenport boats.	<i>Brooklyn Daily Eagle</i> , 4 Nov. 1895
20 February 1897	Amagansett	40 ft right whale, produced less oil and bone than expected. Actual yield was 18 bbls, 375 lbs; expected yield had been 30 bbls, 600-700 lbs.	Reeves and Mitchell, 1986a; <i>Brooklyn Daily Eagle</i> , 26 Feb. 1897, p. 4
Early December 1905	E of Fire Island Inlet	Capt. Tyson Dominy of Easthampton killed 3 finbacks; all sank.	<i>New York Tribune</i> , 11 Dec. 1905, p. 8
22 March 1907	Amagansett	5 boats chased a whale.	<i>New York Sun</i> , 23 March 1907, p. 5
21 March 1911	Southampton	2 boats chased a "school" of whales.	<i>New York Tribune</i> , 22 March 1911, p. 14

days in New Haven harbor the first week of April 1824 was pursued by some "enterprising seamen" (*Nantucket Inquirer*, 12 Apr. 1824), but the "idle harpooners passing away their winter in New London" did not chase the two large whales seen between New London lighthouse and Fishers Island, late January 1835 (*Nantucket Inquirer*, 4 Feb. 1835). The reported capture of a "young" 60 ft whale in New Haven harbor, May 1834 (Watson, 1855, 2:429) may have been a hoax (*Sag Harbor Cor-rector* 13[5], 24 May 1834; *Nantucket Inquirer*, 10 May 1834, quoting from the *New Haven Herald*).

A 27-barrel right whale was taken off Stonington in about 1840, and another in the same group was killed and towed to Montauk, New York (Linsley, 1842:352n; both noted by Reeves and Mitchell, 1986a: their Table 1).

New York (Long Island)

Reeves and Mitchell (1986a) reconstructed much of the history of right whale hunting on the Long Island coast (Fig. 12). Here we present some additional information and data (Table 7). In reconstructing the catch, we have tried to avoid double-counting and thus have not generally included in the tables for the present paper those catches that were included in the tables of Reeves and Mitchell (1986a). The few records that are repeated are so designated.

One of the earliest specific references to a Long Island whaling company concerns the fitting out of a small vessel by John Ogden in 1658, apparently at Southampton (Ross, 1902:871). In addition to Southampton and Easthampton, which definitely had whaling companies as early as 1650 and 1651, respectively, Southold, on Long Island Sound, had one in 1652 (Ross, 1902:872). Colonial correspondence with the London Board of Trade (C.O. 5, 1051, 26i; Public Record Office, Kew, Lond.) confirms that by 1664 Long Island residents were killing whales at sea. One individual claimed to have begun whaling in about 1666 and to have continued into the early 1700's. During this time, "the captors had good success, Laded severall vessels with oyle and whale bone for this Kingdom [England] to purchase the manufacture of the same" (C.O. 5, 1051, 31iii; Public Record Office, Kew, Lond.).

Reeves and Mitchell (1986a) noted that at least 14 whaling companies were active in 1687 from Quogue (or Ketchaponack) east. R.M. Bayles (in Ross, 1902:872) listed 18 companies in 1690 from Mastic east. In 1699, Col. Smith, whose whaling company was based at Mastic, reported that he had cleared £500 sterling in a single year (Bayles, in Ross, 1902:873).

In 1726, 11 whales were killed at Southampton; six of them yielded 220

barrels of oil and 1,500 lb of baleen (Bayles, in Ross, 1902:873). This record was attributed to the season 1732–33 by Reeves and Mitchell (1986a, their Table 1). Samuel Mulford obtained some whale oil and baleen without a license late in 1705 (Headlam, 1930: 159), and this corroborates the evidence for a whale's being taken that year according to information in Mulford's diary (Reeves and Mitchell 1986a). Eight whaling licenses were issued in New York in 1705–09 (Headlam, 1930: 159).

A statement to the British Council of Trade and Plantations in 1717 indicated that "imports of whale oil and bone [baleen] from New York have greatly decreased, owing to disputes with the Governor as to a duty demanded for whales caught there" (Headlam, 1930:16). This belief, however, was disputed by Governor Hunter, who claimed that the whaling effort was constant or increasing on Long Island. The difference, according to Hunter, was that the products were being sold and exported from Boston rather than New York.

Reeves and Mitchell (1986a) failed to note that, according to Edwards and Rattray (1932:232), the whaling station at Smith's Point alone averaged 20 whales per winter during the early 18th century. Reeves and Mitchell (1986a) estimated that 20–30 whales were taken



Figure 12.—Shore whaling off Long Island. Drawn by W. P. Bodfish, in *Harper's Weekly*, 31 January 1885. Ingalls, 1987, No. 321; Courtesy, Peabody Essex Museum, Salem, Mass.

per year in the entire Long Island fishery between 1700 and 1725.

Reeves and Mitchell (1986a) had little evidence of shore whaling on Long Island at the end of the 18th century and beginning of the 19th. They presented no catch data from 1784, when the schooner *Eagle* cruised along the south shore, to about 1815, when whaling definitely was being conducted. However, some whales were taken on the south coast of Long Island in the winter of 1801–02, and after being “much neglected,” the whale fishery had “considerably increased” (Starr, 1876:72n).

Some whaling was conducted by the people of Staten Island. On 13 December 1705 a license was issued to Thomas Jones to take drift whales “on the gut joining Mr. Nicoll’s land and the west end of Gravesend beach” (Leng and Davis, 1930, II:990). An unspecified quantity of oil and baleen was taken on or prior to 26 March 1711 “on Mereck beach, Rockaway beach and at Nicoll’s beach” (Leng and Davis, 1930, II; also see Reeves and Mitchell, 1986a, their Table 1). Sometime in the

spring of 1730 (before 9 April), Adam Mott, Joseph Carman, and company of Staten Island petitioned for the oil and baleen of a whale “wounded by them in the bay of New York, and afterwards cast ashore at Cape May” (Leng and Davis, 1930, II:991). Judging by the year, season, and locality, and the fact that baleen was at issue, this was probably a right whale. The Staten Island Whaling Company, which was active during the 1830’s, apparently was concerned with pelagic whaling rather than shore whaling (Freedman et al., 1975).

A sloop sailed out of Moriches on the south coast of Long Island for whaling between Fire Island and Coney Island in 1831. It cruised daily for 40 days, sheltering each night at either Fire Island or Coney Island. One whale was sighted, but it was a finback, “a kind too lively to land with harpoons and lines” (*Brooklyn Daily Eagle*, 20 Aug. 1899:12).

Reeves and Mitchell (1986a) mentioned that they had no evidence of schooners whaling along the coast of Long Island after the 1850’s. However, Weiss et al. (1974:110) referred to a

40-barrel whale, worth \$2,000, taken by two schooners off that coast in March 1860. The vessels had been whaling between New Jersey and Long Island for a month. It is likely that this was a right whale, considering the month and locality of capture and the great value of the whale in spite of its modest oil yield. A balaenid baleen plate 71.5 inches long scrimshawed with a panoramic view of what is thought to be Long Island Sound may be from mid 19th century Long Island whaling (Ball, 1994:95).

An East Bay sloop, the *Branch*, cruised for “whales, leatherback turtles, sea serpents, devilfish, etc.” between East Moriches and Gravesend Bay during August and (possibly) September 1899 (*Brooklyn Daily Eagle*, 20 Aug. 1899:12). We have no information on sightings or catches.

*New Jersey, Delaware,
and Pennsylvania*

Shore whaling in areas south of Long Island began in the first half of the 17th century, and some whaling was still being conducted as recently as the late 19th

Table 8.—Records of right whales from the coasts of Delaware, Pennsylvania, and New Jersey.

Date	Locality	Whales					I.D. certainty ¹	Comments	Sources
		Seen	Taken	Struck/ lost	Chased	Drift			
5 Dec. 1632	Near Cape Hinlopen	1					2		Parr, 1969:118.
1–2 Jan. 1633	Well inside Delaware Bay	3					2		Parr, 1969:125.
1 Jan.–end of March 1633	Delaware Bay		7	10			1	32 barrels of oil; the 7 secured whales were the smallest of those struck.	Parr, 1969:127, 130.
1646	North River	2					1	1 "grounded on an island."	Weiss et al., 1974:103.
1668–1671	Navesink					1	1	1 whale "cast ashore" and "delivered to" a whaling company	Weiss et al., 1974:16.
Ca. 1683	Mouth of Delaware Bay		11				1		Watson, 1855, vol.2, p. 428.
1684	Near mouth of Delaware Bay		9	3			1	All before 4 April.	Weiss et al., 1974:15.
1685	Delaware Bay		1				1		Lipton, 1975:11; Weiss et al., 1974:24.
1688	Delaware River up as far as Trenton Falls	1					2		Watson, 1855, vol. 2, p. 428.
Winter 1693–1694	Cape May		8				1		Beesley, 1857:175–176.
Winter 1695–1696	Cape May		2				1	"Old cow and calf."	Beesley, 1857:175–176.
Winter 1696–1697	Cape May		+				1	"Made a great voyage."	Beesley, 1857:175–176.
Winter 1717–1718	Cape May Egg Harbor		6 12				1 1		Weiss et al., 1974:22, 34 [<i>The Boston Newsletter</i> , 24 March 1718].
1730	North of Cape May		1				2	"Cow" whale, 50 ft long, stranded, apparently killed by local whalers.	Watson, 1855, vol. 2, p. 429.
April 1733	Delaware River near Philadelphia				2		2	Cow and calf.	Watson, 1855, vol. 2, p. 429.
February 1736	Cape May		2				2	40 barrels of oil.	Watson, 1855, vol. 2, p. 429.
Ca. April 1742	Eastward of Cape May		2				1	Ca. 4½ ft bone, near 7 ft bone.	Lipton, 1975:17 [<i>Boston Gazette</i> or <i>Weekly Journal</i> of May 11, 1742]; Weiss et al., 1974:22.
February 1744	Sandy Hook		1[?]				2	36 ft long, tail 10 ft broad.	Weiss et al., 1974, p. 104 [This Old Monmouth of Ours, W.S. Horner, Freehold. 1932].
March 1752	Briganteen Beach		2				1	1 a yearling, 1 a stunt.	Table 9.
Spring 1753	Cape May		6				2		Weiss et al., 1974:22 [Sarah A. Thomas. Cape May Co. Mag. Hist. And Geneal., June 1950, p. 118].
February–April 1756	Pecks Beach	3+					2		Table 9.
March–April 1757	Five Mile Beach, Cape May Co.	2+					2		Table 9.
February–March 1759	Absecon	2+					2		Table 9.
April 1764	Townsend's Inlet	2+	1	1	2+		1	Secured whale sank and was recovered 2 days later; 23 barrels oil, 230 lbs bone, 4ft 8 in. long.	Table 9.
February [and later] 1765	Pecks Beach (Ocean City), Ludlam's Beach (Cape May Co.)	"Plenty"	4				2		Table 9.
January 1766	Pecks Beach	+					2		Table 9.
1766	"Below the Narrows on the east side"						1	2	Cast ashore, 49 ft long. Weiss et al., 1974:104 [Journals of Capt. Montessoro. N.Y. Historical Society Collections, vol. 14, 1881].
September 1766	Coney Island		1				2	40 ft long, 70 barrels oil (expected); taken by 2 men from Elizabethtown, N.J., at Coney Island, N.Y.	Weiss et al., 1974:104 [Proc. N.J. Hist. Soc., vol. 13, no. 4, 1928].
1782	Manasquan Beach		1				2	Found dead 15 Sept. with harpoon in carcass.	Weiss et al., 1974:18, 104 [<i>New Jersey Gazette</i> , Oct. 9, 1782].
1792	Absecon Beach		1				2	Washed ashore at Absecon bearing 2-3 harpoons.	Weiss et al., 1974:34 [Wilson, H. 1953. <i>The Jersey Shore</i>].
1803	Absecon Bar		1				1	Stranded on Absecon Bar; had been struck and lost by Long Beach Island whalers.	Lipton, 1975:17 [Kraft, B.R. 1960]; Weiss et al., 1974:34, 104 [Wilson, H. 1953. <i>The Jersey Shore</i>].
1809	Delaware River near Chester, Pa.		1				2		Watson, 1855, vol. 2, p. 429; <i>contra</i> Weiss et al., 1974:109.

Continued on next page

Table 8.—Continued.

Date	Locality	Whales					I.D. certainty ¹	Comments	Sources	
		Seen	Taken	Struck/ lost	Chased	Drift				
1813	Absecon Beach					1	2	Dead whale floated ashore.	Weiss et al., 1974:104–105 [Diary of Samuel Mickle, in Notes on Old Gloucester County, N.J. F.H. Steward, Ed., 1917, vol. 1, p. 197].	
November 1814	Delaware River just below Trenton Bridge		1				1	22 ft long, 1 ft 8 in. baleen.	Weiss et al., 1974:18, 105, 109, 111 [<i>Sussex Register</i>]; Rhoads, 1903:11.	
6 May 1820	Sandy Hook			1			2		See text.	
13 May 1820	Sandy Hook		1				1		See text.	
20 May 1820	Sandy Hook(?)		1				2	Washed ashore in Long Island Sound, thought to have been harpooned earlier off Sandy Hook.	Weiss et al., 1974:18, 105; see text.	
1824	Near Bayonne, N.J.						1	2	Washed ashore on 7 April, 52 ft or 58 ft long.	Weiss et al., 1974:18, 105–106 [<i>The Washington Whig</i> , Bridgeton, N.J., Aug. 28, 1824].
End of March 1825	Cape May				+			2		Weiss et al., 1974:22 [<i>The Bridgeton Observer and Cumberland, Cape May and Salem Advertiser</i> , April 2, 1825].
8 November 1861	Delaware River near Richmond	1						2	Swimming downstream.	Weiss et al., 1974:106.
1862	Delaware River near Philadelphia		1					1	37 ft.	Cope, 1865, 1866.
Ca. 1864–1865	Raritan Bay		1[?]					1		<i>New York Times</i> , 15 March 1891.
30 May 1874	Raritan River near Sayreville		1					1	48 ft (or 42 ft), 4 ft baleen	Cope, 1874:89; Rhoads, 1903:11.
Ca. 10 May 1878	Long Branch		1					1	“A Greenland whale”; 42 ft, expected to produce 60 bbls oil.	<i>New York Times</i> , 12 May 1878.
Spring 1882	Near Egg Harbor		1					1	“Shot with a rifle, hacked with an axe, and at last killed with a harpoon”; 48 ft, female.	Weiss et al., 1974:110–111; Holder, 1883.
1900–1910	Asbury Park						1	2	“Enormous whale was washed ashore.”	Weiss et al., 1974:107 [Postcard in Special Collections, Rutgers University Library].

¹ The degree of certainty of our identification of the whales as right whales was evaluated according to the following criteria: 1=whale was taken by shore whalers in 1725 or earlier; baleen at least 3 ft long or considered worth saving; yield 40 barrels oil or more; whale clearly identified as a balaenid by our source (any one of these criteria is sufficient). 2=whale was taken after 1725; no definite evidence it was a balaenid, but also no definite evidence that it was not. See Table 3, footnote 1.

century (Table 8). The Dutch were probably the first Europeans to hunt whales in and near Delaware Bay, although the bay had been discovered and named (St. Christopher’s Bay) by the Spanish in 1525. A Dutch colony (called Swanendael) was established near Cape Henlopen in 1631 for the express purpose of whaling (Parr, 1969:108–114). After reviewing the information provided by van der Donck (1841) and De Vries (1853), Mead and Mitchell (1984:37) concluded that the whales hunted in Delaware Bay “may not have been right whales.” Although some may have been gray whales, *Eschrichtius robustus*, as implied by Mead and Mitchell (1984), right whales were certainly taken (Table 8). Delaware Bay has been visited by right whales at least occasionally in recent years (Ulmer, 1961; Hamilton, 1995).

The promise of shore whaling was a major inducement for the first British settlers on the New Jersey shore and in the mouth of Delaware Bay (Beesley, 1857:171). Many came from Long Island (Williamson, 1951; Wood, 1968) where an organized whale fishery was active by 1650 and possibly earlier (see above). Whalers from Connecticut and Long Island might have hunted whales along the coast of Cape May and in the mouth of Delaware Bay as early as 1638 (Alexander, 1975:185). Licenses were granted to companies of shore whalers operating from Navesink and Sandy Hook south to Long Beach Island in 1668 and 1678 (Lipton, 1975:18). William Penn referred to a well-established whale hunt at the mouth of Delaware Bay by 1683 (Watson, 1855, II:428). A catch

of 11 whales in one season suggests that the enterprise was successful.

The earliest permanent European settlement in Cape May County is believed to have been established by whalers in about 1685 (Alexander, 1975:185), by which year three companies were whaling in the mouth of Delaware Bay (Weiss et al., 1974:15; Lipton, 1975:5) and whales were being hunted “from Sandy Hook to the Delaware Cape” (Weiss et al., 1974:32). Certainly by 1691 Cape May town, at Town Bank on the Bay shore, was recognized as “the residence of the whalers, consisting of a number of dwellings” (Beesley, 1857:163). Beesley inferred from the close contiguity of the 15–20 houses shown on a contemporary map of Town Bank that the early whalers cooperated in an organized hunt. Another source

refers to 13 houses in Cape May town in 1696 (Beesley, 1857:177). Beesley (1857:171) identified 21 individual whalers living in Cape May County before 1700, and he believed that there were many others.

In 1692 the New Jersey Assembly asserted the province's prerogative to profit from all whales killed in Delaware Bay. Complaining that until then, the whaling had been "in so great a measure invaded by strangers and foreigners" who exported the oil and baleen without duty, the Assembly required that a tenth of the value of the oil from all whales killed in Delaware Bay be paid to the governor. The West New Jersey Society, a group of London businessmen, tried to develop whaling in Cape May County during the early 1690's (Weiss et al., 1974:21). "Great numbers" of whales and "prodigious" quantities of oil and baleen were taken each year in Cape May County, according to Gabriel Thomas (1952), writing in 1698.

A manuscript by Thomas Leaming, 1674–1723, provides some detailed information on 17th century whaling at Cape May (Beesley, 1857:175–6; also see Lipton, 1975:7). Leaming whaled in four consecutive winter seasons, 1694–98. The first year he reported that eight whales were caught and the next year at least a cow and calf were taken. The third season was apparently successful, but all we learn from Leaming is that he "made a great voyage." No hint is given about his catch in the fourth season. Leaming's father, Christopher, had moved to Cape May from Long Island in about 1691 (Beesley, 1857:176). When not whaling, Christopher Leaming worked as a cooper. This occupation was lucrative at the time because "the great number of whales caught in those days, made the demand and pay for casks certain."

All evidence seems to suggest that the years when Thomas Leaming was whaling represented the peak of the Delaware Bay whale fishery. The tract owners at Town Bank sold their land and left the area soon after Christopher Leaming's death in 1696 (Anonymous, 1976). Humphrey Hughes, a Long Island whaler who immigrated to Cape May County about 1689, sold

his land, which had been owned jointly with another whaler, in about 1700 (Williamson, 1951). Although Cape May and Delaware Bay whaling may have been past its peak by the 1700's, it continued long after that time.

John Peck was whaling at Pecks Beach (now Ocean City, N.J.) in about 1700 (Darby, 1951), and whaling was still being conducted at the mouth of Delaware Bay, on both the Cape May and Cape Henlopen sides, in 1708 (Oldmixon, 1708). Apparently referring to the first half of the 18th century, Darby (1951:137) claimed: "Whaling was still a flourishing industry, the whalers working from the shore in small open boats."

The diary of Aaron Leaming, Jr., includes the following entries for the month of February 1737 (Dickinson, 1979:550): on the 4th "They kill a whale"; on the 22nd "The whalers chased the whales & struck two." Whalers settled permanently on Long Beach Island as early as 1690, and their efforts to catch whales continued, possibly without any major interruption, through at least the 1820's (Lipton, 1975:23–26). The average catch by Stephen Inman's family in the early 1820's was two or three whales per season, producing 40–50 barrels of oil per year (Watson, 1855, II, app.:547). In a letter to his son Tucker in Dartmouth, Massachusetts, Philip Taber (1745) reported the recent arrival of George Sisson at Sandy Hook. Sisson and his associates were eager to "go off a whaling," and they wanted Taber's son to bring a whale boat and "some good hands" to aid their efforts. This letter has been interpreted as evidence that "New Bedford vessels were engaged in offshore whaling" (meaning pelagic whaling) in the 1740's (Littlefield, 1965:5n). However, it seems more likely to us that these New Englanders planned to whale in New Jersey from shore. Such an interpretation would be consistent with that of Lipton (1975:22–23).

The diary of Lewis Cresse (1968), who whaled along the New Jersey shore between Brigantine and Five Mile Beach at least from 1752 to 1766, mentions numerous sightings; one whale struck and probably killed, but lost, and

one secured in 1764; and four taken in 1765 (Table 9).

At the same time that Cresse was whaling along the coast of New Jersey, some Cape May whalers were exploring grounds farther south. Twelve men and two whale boats sailed aboard the sloop *Susannah* in November 1753, bound for a winter of whaling along the Carolina coast (Smith, 1973:34; Reeves and Mitchell, 1988, provide a derivative summary). After some desultory whaling near Cape Lookout, the men established a whaling camp at Lockwood Folly Inlet, southern North Carolina, then returned to Cape May in March 1754, having had no success (Smith, 1973:41). They were essentially shore whalers, and we regard their expedition of 1753–54 as corroborative evidence that shore whaling around Cape May had become less profitable by this time.

Aaron Leaming, Jr., writing in 1772, claimed that whaling had "long since" failed in Cape May County (Leaming, 1978). A whale was taken in 1723, a "yearling" in 1731, and another "yearling" in spring 1772. In the same document, Leaming wrote that no whales had been brought ashore between 1732 and 1771, in spite of the fact that some effort was maintained: "... they went a whaling on this beach every year for 40 years" after 1731. Up to 12 boats were involved. In 1772, Leaming guessed that six or seven whale boats were still in use, each with a crew of six. Leaming considered whaling to have become nothing more than a pretext for the "whalers" to roam the beaches in pursuit of other game: "Whaling seems to be the least part of their Errand. For they carry Guns and repair to the Beaches & Gun for Deer foxes Raccoons ...". He was particularly incensed by the fact that such activities disturbed the cattle that were allowed to forage on or near the beach. We cannot explain the discrepancy between Leaming's two accounts regarding the dates of whale captures. He may have failed to mention the 1737 capture simply to strengthen his case against the whalers, or he may have forgotten in what year prior to 1772 the last whale had been taken. From 1810 to 1820 a crew of seven

Table 9.—Whaling data from Lewis Cresse's diary, 1752–1766. Source: Cresse (1968); some parts of the diary were quoted by Lipton (1975:15–16) and Weiss et al. (1974:26–28).

Year	Whaling season		Sightings	Struck/lost	Killed/secured	Whaling sites
	Start date	End date				
1752	?	?	?	?	1 "stunt" on 23 March; 1 "yearling" on ca 22 March	Briganteen Beech
1753	1 March	1 st week April	?	0	0	Briganteen
1754	27 Feb.	9 April	0	0	0	Absecon
1755	7 March	8 April	"Saw Several Spouts at Several times but Concluded they was chiefly fin backs."	0	0	Briganteen
1756	24 Feb.	7 April	One in late Feb.; "several" in late March or early Apr.	0	0	Pecks Beech
1757	4 March	15 April	"Saw Whales and Spouts Several times."	0	0	Five mile Beech
1758	3 April	18 April	0	0	0	"Rangd as far as briginteen."
1759	26 Feb.	26 March	"Saw Several Spouts."	0	0	Absecon
1760	4 March	2 April	0	0	0	Briganteen
1764	?	?	"Plenty" on 2 April; more on 9 April.	1; "it was generally agreed She would Die of the wound" (2 April).	1 killed 9 Apr., sank, came ashore 11 Apr. "west of the Dry inlet"; 23 bbbs, 230 lbs bone (4 ft 8 in. long).	Five mile Beetch; Townsends Inlet
1765	February	?	"Plenty".	0	2 by Cresse's company.; 1 by them in cooperation with Ludlams Beach company.; 1 by Ludlams Beach company alone.	Seven Mile Beach; Peck Beach; Ludlams Beach
1766	28 Jan.	?	"Saw no whales onely Som Spouts."	0	0	Pecks Beach

men led by Captain John Sprague of Manahawkin "followed whaling exclusively," launching their whaleboat from the beach whenever a whale was sighted (Clark, 1887:48). Results were described as "fair."

In the spring of 1820, whales were reported as "frequently seen in the neighborhood of Sandy-Hook" (*Commercial Advertiser*, N.Y., 15 May 1820). This prompted a crew to go whaling in the pilot boat Clinton. As far as we know, only one whale was taken in three cruises by the Clinton. Although initially reported as a "young" 45 ft sperm whale (*Centinel of Freedom*, Newark, 16 May 1820) and cited as such by Weiss et al. (1974:105), this whale, struck about 7 miles from Sandy Hook on 13 May, was almost certainly a right whale (*True American*, Trenton, 5 June 1820; Weiss et al. 1974:110). Another large whale had been struck "on the bar" near Sandy Hook, 6 May; it escaped bearing two irons and towing 18 fathoms of line with a drag attached (*Centinel of Freedom*, 9 May 1820). Weiss et al. (1974) incorrectly stated that this whale was cut free "while it was being towed in." The whale was in fact towing the boat at the time of cutting, according to their source, and their conclu-

sion that the whale secured 13 May was the one struck on 6 May is not supported by the information in the newspaper sources that they cite. The whale struck but lost 6 May was probably also a right whale, and all or most of the 25–30 whales seen during the Clinton's second cruise could have been right whales. The whale that washed ashore in Long Island Sound 20 May 1820 could have been one of those struck a week or two earlier off Sandy Hook (Weiss et al. 1974:18, 105).

More whaling took place off Sandy Hook during 1822–23 (Reeves and Mitchell 1986a). The sloops *Ocean* of Sag Harbor and *Hampton* of Providence were involved, along with one or more smacks from New London. In early April 1822, "another" large whale was taken off Sandy Hook (Allen, 1916:134; *Nantucket Inquirer*, 4 April 1822), the implication being that this was not the first that season. Ulmer (1961) believed that whaling had ended in New Jersey by 1833.

Although we believe that the vessels cruising along the New Jersey and Long Island coasts were in search of right whales primarily, sperm whales were taken occasionally. Vessels returning from more distant, lengthy cruises also took sperm whales. For example,

the ship *Mansfield* of Hudson, arriving in New York 21 March 1839 from a 21-month voyage to the South Atlantic (Starbuck, 1878:342–343), encountered a large school of sperm whales off Cape May (*Sag Harbor Corrector*, 27 Mar. 1839). Five were killed, but two of these were lost because of darkness. The blubber of the other three was brought into port on deck.

It appears that by the second half of the 19th century, organized whaling had been discontinued and that the few documented kills along the New Jersey coast in the 1870's and early 1880's were the result of chance encounters rather than of systematic watching or searching. For example, Long Branch fishermen "drove" a 42 ft whale to shore and killed it with a scythe in May 1878 (*New York Times*, 12 May 1878). Judging by its expected oil yield (60 barrels) and the fact that it was identified in a newspaper account as a "Greenland whale," this was probably a right whale. The same article claimed that "several of the species [i.e. 'Greenland whales'] have been seen off the coast recently." A right whale with 5 ft 9 inch baleen was captured in spring 1882 by "a crew of experienced Egg Harbor [N.J.] whalers" (Holder,

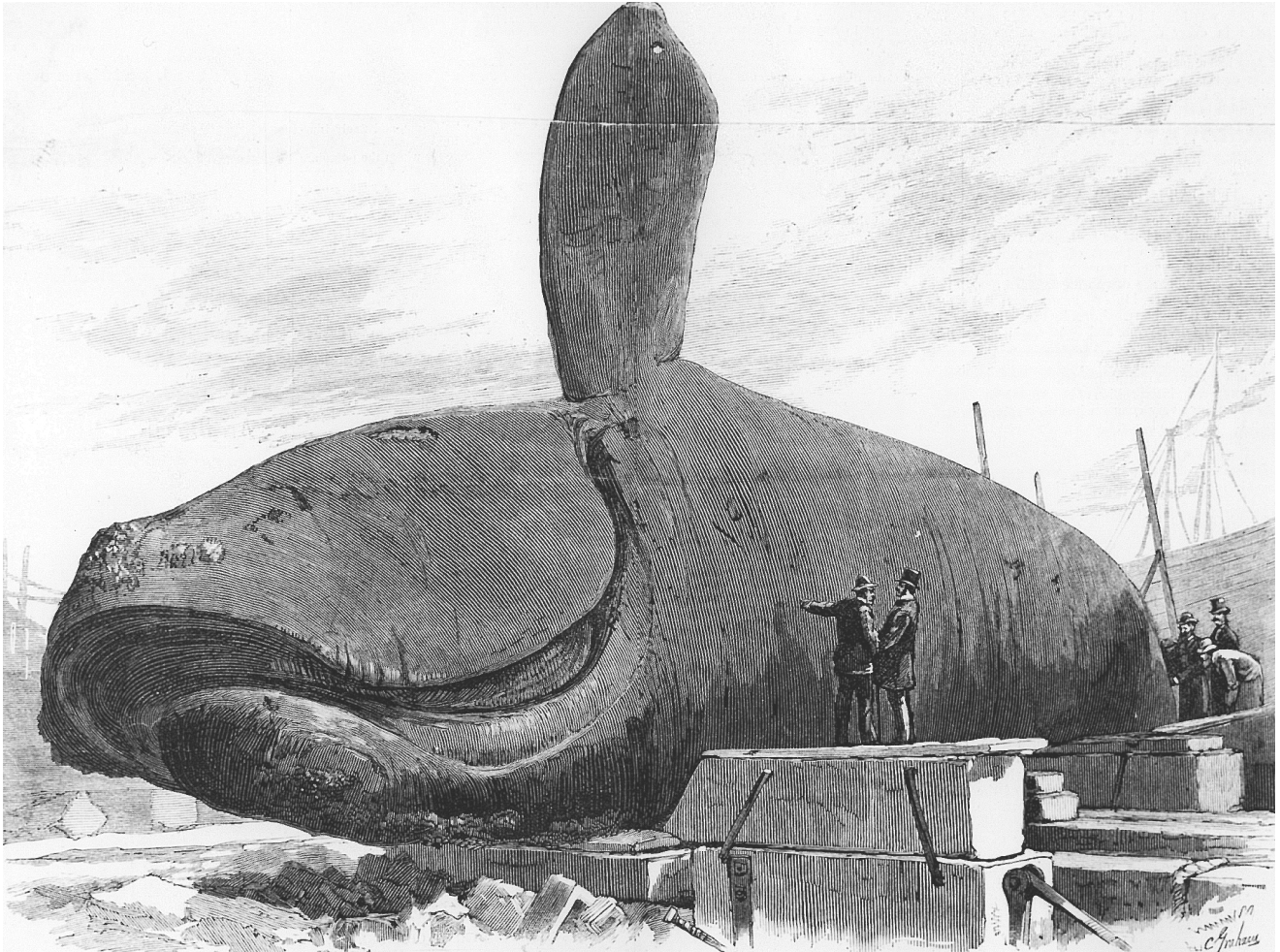


Figure 13.—Right whale approximately 50 feet long captured in the harbor of Charleston, S.C., in 1880. Ingalls, 1987, No. 526; Courtesy, Peabody Essex Museum, Salem, Mass.

1883:106). At the time, an old man told a reporter for the *New York Evening Post* (24 Oct. 1883) that his great-grandfather “used to catch all the blubber he could tend to right off Long Branch.” Apparently, this particular whaler had given up whaling before the War of Independence (1776). The reporter claimed that after a century of little or no whaling, whales had, by 1883, “grewed plenty again, and the old Jersey fishin’ has revived.” Probably referring to the Egg Harbor specimen of 1882, he noted that a right whale had been taken recently on the New Jersey coast and that “a regular crew of whalers . . . are in the business there.” He added that “numbers of boats all

down the coast make daily trips to sea in search of whales.” This last statement is difficult to evaluate. At face value, it could be taken to suggest that shore whaling effort increased during the early 1880’s not only locally (near Egg Harbor), but also along much of the New Jersey coast and southward. However, the only example given in support of the statement is a reference to Manigault’s remark (in Holder 1883) that several schooners were “now engaged in their [right whales’] pursuit” off South Carolina (Fig. 13). As discussed elsewhere (Reeves and Mitchell, 1988), Manigault probably had in mind the New England vessels that made winter cruises for right whales on the South-

east U.S. Coast Ground from the mid-1870’s through the 1880’s (Reeves and Mitchell, 1986b).

In early December 1886 a large whale that had been seen alive in the Delaware River for several days died, supposedly after being crushed between two ice floes (*New York Times*, 9 Dec. 1886). The carcass was towed to Philadelphia where the blubber and baleen, expected to be worth \$800, were removed. Considering the timing of the whale’s appearance and the fact that its baleen was saved, it was probably a right whale. Three whales seen close to shore off Cape May the first week of November 1893 drew a crowd of onlookers, and local fishermen made plans to attempt

their capture on the 6th (*New York Tribune*, 6 Nov. 1893:1).

British Customs Records

Whale products imported by Great Britain from the American colonies during the first third of the 18th century (Tables 10, 11, 12) were likely from whales killed somewhere between Newfoundland and the Carolinas. Although some whale products may have been trans-shipped between colonies (e.g. from Carolina to New England—see Reeves and Mitchell, 1988; Little, 1988;

from Long Island to Boston—see above), we have no reason to suspect that the oil and baleen exported from Boston, New York, or Philadelphia came from anywhere other than the western North Atlantic.

The quantities of oil and baleen imported from New Providence, the Bermudas, and the West Indies or obtained as “prize goods” were so small in most years as to be negligible (Table 13). In contrast, very large amounts of “train oil” or blubber, and in a few years some baleen as well, were imported

from Newfoundland (Table 13). Some (unknown) proportion of the products from Newfoundland could have come from right whales, but much of the train oil and blubber could as easily have been from seals and from whales other than right whales. For some years, the lists show hundreds or thousands of seal-skins to have been imported from Newfoundland in addition to the oil. Some Boston merchants, at least in 1734, bought whale oil from Nantucket sloops operating in Newfoundland waters, then shipped this oil directly to England to avoid paying English taxes on colonial vessels (E. A. Little, *in litt.*, 17 August 1991). Nantucket vessels certainly hunted sperm, humpback, and right whales in Newfoundland waters during the 1750’s and 1760’s (Reeves and Mitchell, 1986b, their Table 1), but we do not know enough about the identity, labeling, and routing of products to comment on how the oil and baleen would have been registered by British customs. If any of the oil, blubber, or baleen imported from Newfoundland during the late 1600’s and early 1700’s (Table 13) was from right whales, this would mean that our removal estimates based on customs data (see Estimates of Catch from Customs Data, below) are negatively biased.

Whale products imported from the American colonies before about 1715 would have come almost entirely from right whales. A small part of the production probably came from naturally stranded whales and perhaps an occasional sperm, humpback, gray, or pilot whale, *Globicephala* sp. For the years after 1715, the attribution becomes somewhat more complicated, as whaling from sloops extended the whalers’ range of operations offshore. Increasing amounts of oil from other species, especially the sperm whale, are likely to have been mixed in the returns. However, the sloops of 25 tons from Nantucket initially went offshore only to Nantucket Shoals and might not have taken many sperm whales before the late 1720’s (Little, 1988). In spite of its different properties, sperm oil usually was not distinguished in commerce from right whale or humpback oil before about 1750, by which time

Table 10.—Whale products from New England imported by Great Britain (London and outports combined), 1696–1734. Source: CUST 2 and 3, Public Record Office, Lond.

Period ¹	Oil (U.S. gal)	Baleen (lb)	Value of oil (£:s:d)	Value of baleen (£:s:d)
25 Sep 1696–25 Mar 1697 ²	31,235	8,526	1,486:0:11	228:7:6
25 Mar 1697–25 Sep 1697 ³	757		36:0:0	0:0:0
25 Sep 1697–25 Sep 1698	29,998	7	1,664:16:8	0:8:9
25 Sep 1698–25 Dec 1698	5,182		286:18:9 3/4	
1698–1699	34,077		1,756:6:6 1/2	
1699–1700	105,844	13,527	5,035:19:5	936:0:5
1700–1701	90,649	22,985	4,312:19:5	1,641:15:8 1/4
1701–1702	120,824	62,530	5,749:0:0	4,466:8:6 3/4
1702–1703	64,983 ⁴	15,859	3,091:4:4	1,097:7:8 1/2
1703–1704	53,956	35,664	2,566:19:9 3/4	2,407:10:7
[No data for 1704–1705]				
1705–1706	2,560 ⁵	1,342	121:10:0	95:17:1 1/2
1706–1707	131,931	3,210	6,276:18:6	229:5:8 1/2
1707–1708	151,381 ⁶	15,583	7,202:13:3 1/2	1,113:1:5
1708–1709	65,450	12,045	3,222:2:11	859:17:1 1/2
1709–1710	100,202	18,377	4,767:5:1 1/2	1,312:12:10 1/4
1710–1711	89,154	17,140	4,242:3:9	1,224:5:9
[No data for 1711–1712]				
1712–1713	68,833	28,929	3,274:17:7 3/4	2,066:7:2
1713–1714	114,649	26,062	5,454:12:4	1,861:11:9 1/4
1714–1715	193,569	34,651	9,210:1:5	2,417:18:9
1715–1716	172,605	57,169	8,212:15:8	7,283:9:11
1716–1717	90,209	13,950	4,291:10:9	996:8:6
1717–1718	148,810	16,660	7,080:4:3	1,115:12:6
1718–1719	133,564	34,143	6,354:13:4	2,438:15:8
1719–1720	180,255	48,444	8,576:12:3	3,460:5:7
1720–1721	241,771	40,260	11,503:7:6	2,875:14:2
1721–1722	151,172	28,996	7,192:17:1	2,071:2:10
1722–1723	196,434	42,111	9,346:12:4	3,007:18:6
1723–1724	203,861	90,870	9,700:2:9	6,490:14:2
1724–1725	177,252 ⁷	67,141	8,423:10:5	4,795:15:8
1725–1726 ⁸	177,135	68,310	8,428:7:7	4,879:5:8
[No data for 1726–1727]				
1727–1728	259,829	61,621	12,540:19:1	4,401:10:0
1728–1729	168,019	27,705	8,042:1:9	1,978:18:6
1729–1730 ⁹	258,333	89,834	12,292:1:11	6,416:14:2
1730–1731	180,525	39,500	8,589:6:6	2,821:8:6
1731–1732	234,886	26,887	11,175:19:10	1,920:10:0
1732–1733	233,075	45,495	11,089:11:4	3,249:12:10
1733–1734	343,973	67,884	16,366:9:5	4,848:17:0

¹ From 25 Dec. 1698, all periods are Christmas to Christmas.

² In addition, 75 lb of spermaceti (fine) valued at 8–9 shillings per lb.

³ Also for this period, 31 gal of train oil was imported from New Providence.

⁴ Of this amount, 246 tuns, 3 hogsheads, 57 gal was classified as “ordinary oil,” but the value was given as £11–13 per tun, i.e. the same as for train oil. Thus, we have considered it as whale oil.

⁵ In addition, 39,626 gal of “ordinary oil,” valued at £30 per tun, or at about 2.5 times the value of train.

⁶ In addition, 525 gal of “ordinary oil,” valued at £24–30 per tun.

⁷ In addition, 2 hogsheads of “blubber” valued at £8–9 per tun.

⁸ In addition, 154 oz of ambergris valued at £18–20 per oz.

⁹ In addition, 113 cwt 3 qtr 5 lb of spermaceti valued at £5:10–8:10 per cwt.

its superiority over mysticete oils as an illuminant had become widely recognized. "Thereafter, the two kinds of oil—sperm and whale—would be distinguished in the market place, each being sold as a separate commodity and priced accordingly" (Kugler, 1980:5).

If the catch composition changed greatly between 1696 and 1734, particularly with an increasing proportion of sperm whales, we would expect the ratio of oil (gallons) to baleen (lb) to have increased with time. A regression of the ratio of oil to baleen against period, however, shows no significant trend (Table 10: $P = 0.49$; $df = 31$; Table 11: $P = 0.43$; $df = 24$; Table 12: $P = 0.41$, $df = 2$). The domestic (i.e. within the colonies) consumption of sperm oil for candle-making (Fig. 14) could have been proportionately greater than that of whale oil. If so, the oil:baleen ratio could be a misleading and poor index of changing catch composition.

Bowheads are the only whales other than right whales that were valuable sources of baleen during the 17th and early 18th centuries. The nearest grounds where American east-coast whalers could have encountered bowheads would have been along the coast of Labrador and in the Strait of Belle Isle. Much of the American whaling on those grounds took place during May–October (Reeves and Mitchell 1986b, their Table 1) which probably would have been largely out of phase with the bowheads' presence there (Moore and Reeves, 1993). Starbuck's (1878:168) reference to a New England whaling voyage to Davis Strait in 1732 is the earliest record of American participation in Arctic bowhead whaling. We thus assume that the baleen figures in the British customs records before 1732 mainly represent catches of right whales. Occasional references to oil and baleen from Hudson Bay and Greenland do appear in the British customs records, but we have ignored these in order to avoid mixing bowhead products in our catch estimations.

Drift Whales

The subject of drift whales arises frequently in the literature of colonial whaling. Drift whales were whales that died at sea and were found afloat off-

Table 11.—Whale products from New York imported by Great Britain (London and outports combined), 1696–1734. Source: CUST 2 and 3, Public Record Office, Lond.

Period ¹	Oil (U.S. gal)	Baleen (lb)	Value of oil (£:s:d)	Value of baleen (£:s:d)
25 Sep 1696–25 Sep 1697 ²	28,968	8,254	1,263:5:10 3/4	221:1:9 1/2
25 Sep 1697–25 Dec 1698 ³	565		30:16:7 1/4	
1698–1699	1,242	202	63:11:9	10:7:5
1699–1700	15,639		743:12:4	
1700–1701	15,016	2,509	714:8:5 1/2	177:14:7 1/2
1701–1702	38	224	1:9:4	16:0:0
1702–1703 ⁴	11,545	5,301	548:16:3	378:12:11
1703–1704	3,379	756	160:10:0	54:0:0
[No data for 1704–1705]				
1705–1706	623 ⁵	168	36:9:9	12:0:0
1706–1707	31,980	1,182	1,521:1:3	84:8:7
1707–1708	9,738	168	463:2:10 1/2	12:0:0
1708–1709	10,752	6,033	510:16:2	430:13:6 1/4
1709–1710	9,628	46,430	457:15:2 3/4	3,316:8:6 3/4
1710–1711	9,488	1,364	451:4:8	97:8:3
[No data for 1711–1712]				
1712–1713	141	3,797	5:12:1 1/2	271:4:3 1/4
1713–1714	5,916	3,675	281:0:11 1/4	262:10:0
1714–1715	15,111	2,719	718:3:1	194:4:3
1715–1716	5,756	682	273:15:0	48:11:4
1716–1717	2,774	174	132:0:0	12:8:6
1717–1718	20,497	16,240	975:4:8	1,159:19:11
1718–1719	15,253	5,746	724:6:1	410:8:6
1719–1720	19,233	3,840	913:14:3	274:5:8
1720–1721	15,938	2,910	758:0:0	207:17:0
1721–1722	1,879	2,488	206:14:0	177:14:3
1722–1723	10,493	2,105	498:11:4	150:7:1
1723–1724	560	11,628	26:3:9	830:11:5
1724–1725	789	1,204	37:5:9	86:0:0
1725–1726	8,232	6,048	390:18:6	432:0:0
[No data for 1726–1727]				
1727–1728	1,702	269	80:9:6	19:4:2
1728–1729	950	0	45:2:10	0
1729–1730	1,009	542	48:0:0	38:14:3
1730–1731	0	169		12:1:5
1731–1732 ⁶	1,906	0	90:11:5	0
1732–1733	4,099	1,576	195:0:0	112:11:5
1733–1734	3,094	1,080	146:13:4	77:2:10

¹ From 25 Dec. 1698, periods covered are Christmas to Christmas.

² In addition, 1 cwt, 1 qtr of spermaceti (coarse), valued at £9–14 per cwt.

³ In addition, 47 tuns of "seal oyl," valued at £15 per tun.

⁴ In addition, 9 tuns of "ordinary" oil, valued at £24–30 per tun, i.e. at least twice the value of train oil.

⁵ Listed as "ordinary" oil, but value, £15 per tun, was similar to that of train oil.

⁶ In addition, 6 cwt, 2 qtr, 26 lb of spermaceti, valued at £5:10–8:10 per cwt.

shore or stranded onshore. Whales that came ashore alive ("live stranded") probably were also considered drift whales. Ownership of drift whale carcasses was often contentious, and this caused them to be mentioned in court and tax records (Pulsifer, 1861; Allen, 1916). In some places, such as Sandwich in 1702, drift whales in their entirety were donated to the church (Freeman, 1862:85). A part of each drift whale was appropriated for the ministry at Eastham beginning in 1662 (Freeman, 1862:362).

Little and Andrews (1982) proposed that on Nantucket, Martha's Vineyard, and certain parts of the mainland coast,

Indians practiced "drift whaling" before the arrival of Europeans. By drift whaling they meant an organized effort to find and process the carcasses of stranded whales. In especially favorable areas, "drift whales were so numerous that no need had arisen to go to sea to kill them" (Little and Andrews, 1982:4). Whales of many species, not only right whales, would then, as now, have come ashore from time to time in the absence of active whaling. For present purposes, it is important to separate whales that came ashore due to natural causes from those that were killed or injured, but not secured, by whalers. The latter would be considered part

of fishing mortality while the former would be part of natural mortality.

Several authors have concluded that a high proportion of the drift whales mentioned in early records were casualties of whaling. For example, Freeman (1862:50) noted concerning drift whales in Cape Cod Bay: "So numerous were whales in the Bay, and such was the activity of the whalers, that instances were frequent of whales, escaping wounded from their pursuers and dying subsequently, being washed to the shores." Allen (1916:145–154) and Little (1981) also concluded that most drift whales in New England during the 17th century had been harpooned but not recovered at sea. In our tables of catches, we did not count all drift whales as whaler kills. Rather, we counted only those whales for which there was evidence suggesting that they had been struck; for example, when a salvaged carcass was claimed by a whaler, or when a harpoon was still

imbedded. This procedure probably caused some whales to be excluded from our catch summary even though whalers killed or mortally wounded them. This effect is probably offset, to some extent, by the occasional inadvertent inclusion of whales that were not right whales. There was no way of identifying what proportion of oil and baleen included in the customs records came from drift whales.

Total Catches From Literature Sources

The total catch of right whales in the area between Delaware and Maine, based solely on the literature reviewed for this paper (Tables 3–9) and by Reeves and Mitchell (1986a, their Table 1), was about 750–950 during 1620–1924. The low end of this range was obtained by summing only those takes that were considered "certain" to have been of right whales. The high end was obtained by summing all takes tabu-

lated, including those with uncertain species identifications. In accounting for the catches in Reeves and Mitchell (1986a, their Table 1), we used their conversion of oil returns to whales landed, on the basis of 36 barrels per whale (values indicated in parentheses in the "Catch" column of their table) rather than the 44 barrels used in the present paper (see below).

Estimates of Catch From Customs Data

Annual catches during the period 1697–1734, by region, were estimated from British customs data (Table 14). In most years, the estimates based on oil production were much higher than those based on baleen production. Because of the possibility that oil from cetaceans other than right whales was routinely included in the oil production values, it is probably reasonable to regard the baleen-based estimates as the more accurate (i.e. less biased) estimates of the right whale catch.

The yields of oil and baleen for six whaling areas are shown in Table 2. A one-way Analysis of Variance comparing oil yield per whale between areas indicates a significant difference ($F_{5,131} = 9.53$, $\text{Pr}(F) < 0.01$). A similar analysis using the baleen yield gives $F_{4,35} = 0.46$, $\text{Pr}(F) = 0.76$ (0.67, excluding Cape Farewell). Thus, baleen yield is less variable than oil yield. The baleen sample size was only 40, however, compared to 137 for oil. Due to the difficulty in stratifying the data, we used the overall mean of 44 barrels per whale to estimate catches from oil production.

The variability of the estimated total catches for the period 1696–1734 was calculated by bootstrapping the oil and baleen yield data summarized in Table 2. Table 15 gives the bootstrap estimates of catch by area (New England, New York, or Pennsylvania) and whale product (oil or baleen). The bootstrap means are similar to the estimates given in the last row of Table 14. The 2.5% and 97.5% quantiles of the estimated catch distribution are approximate lower and upper 95% confidence limits for the estimated catches given in the last row of Table 14. Although similar confidence limits could have been calcu-

Table 12.—Whale products from Pennsylvania imported by Great Britain (London and outports combined), 1696–1734. Source: CUST 2 and 3, Public Record Office, Lond.

Period ¹	Oil (U.S. gal)	Baleen (lb)	Value of oil (£:s:d)	Value of baleen (£:s:d)
25 Sep 1696–25 Sep 1697	1,978	0	87: 7: 5	0
25 Sep 1697–25 Dec 1698	0	0	0	0
1698–1699	0	560	0	28:15: 0
1699–1700	378	0	18: 0: 0	0
1700–1701	267	0	14:13: 3	0
1701–1702 to 1703–1704	0	0	0	0
[No data for 1704–1705]				
1705–1706	126	28	15: 0: 0	2: 0: 0
1706–1707 to 1708–1709	0	0	0	0
1709–1710	0	84	0	6: 0: 0
1710–1711	0	0	0	0
[No data for 1711–1712]				
1712–1713	0	0	0	0
1713–1714	190	0	9: 0: 0	0
1714–1715	1,009	1,122	48: 0: 0	80: 2: 10
1715–1716	2,270	0	108: 0: 0	0
1716–1717 to 1717–1718	0	0	0	0
1718–1719	2,270	0	108: 0: 0	0
1719–1720	1,198	0	57: 0: 0	0
1720–1721	1,797	0	85: 4: 8	0
1721–1722	820	0	39: 0: 0	0
1722–1723	1,980	392	94: 0: 0	28: 0: 0
1723–1724	8,008	0	381: 0: 0	0
1724–1725	7,818	505	372: 0: 0	36: 1: 5
1725–1726	3,759	111	178: 0: 10	7: 18: 6
[No data for 1726–1727]				
1727–1728	0	0	0	0
1728–1729	64	0	3: 0: 0	0
1729–1730	0	0	0	0
1730–1731	383	0	17: 13: 4	0
1731–1732	694	0	33: 0: 0	0
1732–1733	0	0	0	0
1733–1734	252	0	12: 0: 0	0

¹ From 25 Dec. 1698, all periods covered are Christmas to Christmas.

lated on a yearly basis, we have shown only those for all years combined in Table 15. The quantiles and, thus, the 95% confidence intervals, were derived by assuming that the only source of variability in the catch estimates was in the oil and baleen yield per whale data. We treated the total oil and baleen production figures as known constants, but, as mentioned earlier, there is some (unquantifiable) uncertainty in these values as well due to the possible mixing of whale products from other species and from drift whales that died from causes other than whaling.

Loss Rates

Hunting loss occurs in virtually all whaling operations, so catch statistics need to be corrected to account for animals killed but not secured. In a protected area such as Cape Cod Bay, the prospects of a lost whale's being found were reasonably good. Winthrop (1892:55), for example, noted that the whalers at Sandwich were confident that a lost whale, one of three they killed in one day, would "drive on shore in the bay." At Long Island, extraordinary efforts were made to secure whales that sank, and a network of informants along the island's south shore stood to be rewarded for helping to recover a lost whale (Reeves and Mitchell, 1986a).

We used a loss rate factor (LRF) of 1.2 (meaning 1 of every 6 whales killed or mortally wounded was lost) for correcting catch data from U.S. shore whaling. This is lower than the LRF's calculated for 19th century pelagic whaling (1.25–1.57 by Reeves and Mitchell, 1986b) but consistent with our impression of shore whaling at Long Island (Reeves and Mitchell, 1986a) and the Outer Banks of North Carolina (Reeves and Mitchell, 1988). Best and Ross (1986) also used 1.2 as an LRF for pre-modern shore whaling for right whales in southern Africa, even though their data suggested that almost as many whales were struck and lost as were taken. In all cases, it was assumed that some struck whales survived and recovered from their wounds.

By using the same LRF for all areas and times, no allowance is made for differences in technique or technology,

Table 13.—Whale products from New Providence, the Bermudas, the West Indies, Newfoundland (probably including seal oil—see footnote 3), and "prize goods" (obtained from seized vessels) declared through British customs at London and outports, 1696–1734. Source: CUST 2 and 3, Public Record Office, Kew.

Area/period ¹	Oil (U.S. gal)	Blubber (U.S. gal)	Baleen (lb)	Area/period ¹	Oil (U.S. gal)	Blubber (U.S. gal)	Baleen (lb)
New Providence				1709–1710	212,217		
25 Mar.–25 Sept. 1697	31			1710–1711	144,855		
Bermudas				1712–1713	195,253	1/2	
25 Sept. 1697–25 Sept. 1698				1713–1714	138,308	3/4	
1698–1699	25		490	1714–1715	162,993		
1710–1711	3,087			1715–1716	102,196		
1714–1715	63			1716–1717	121,910	1/2	
1716–1717	630			1717–1718	149,637		
1719–1720	252			1718–1719	123,589		
1720–1721	2,546			1719–1720	193,296		168
1721–1722	1,512			1720–1721	249,964		
1722–1723	1,027			1721–1722	296,185		
1730–1731	10,836			1722–1723	199,878		
West Indies				1723–1724	304,028		
1722–1723	315			1724–1725	234,203		
1723–1724	42			1725–1726	166,472		84
1729–1730 ²	315			1727–1728	409,991		
Newfoundland ³				1728–1729	452,947	252	53
25 Sept. 1696–25 Mar. 1697	70,812			1729–1730	339,430		133
25 Mar. 1697–25 Sept. 1697	40,113	35,280		1730–1731	361,598		377
25 Sept. 1697–25 Sept. 1698	70,969			1731–1732	642,881		406
25 Sept. 1698–25 Dec. 1698	194,638			1732–1733 ⁴	444,290		1,363
1698–1699	325,147	3/4	252	1733–1734	464,013	5,544	288
1699–1700	228,254	1/2	1,323	Prize Goods			
1700–1701	218,319	1/2		25 Sept. 1696–25 Mar. 1697	3,337		560
1701–1702	126,681	3/4		25 Mar. 1697–25 Sept. 1697	1,197		174
1702–1703	7,173			25 Sept. 1697–25 Dec. 1698		6,552	
1703–1704	211,308	1/2	126	1701–1702	31	1/2	
1705–1706	189,629	1/2	94 1/2	1702–1703	33,095	3/4	11,977
1706–1707	115,930	1/2	229	1705–1706	994		
1707–1708	113,819	1/2		1708–1709			383
1708–1709	201,657			1709–1710	22,757		

¹ From 25 Dec. 1698, periods covered are Christmas to Christmas.

² In addition, 88 oz of ambergris.

³ Sealskins were also declared from Newfoundland in some years: 1708–1,648; 1710–881; 1712–664; 1714–1,405; 1715–145; 1716–750; 1717–76; 1719–3,280; 1720–3,280 (22,743 gal seal oil); 1721–3,223; 1722–3,005 (92,043 gal seal oil); 1723–4,679; 1724–3,192 (61,278 gal seal oil); 1725–470 (87,885 gal seal oil); 1727–2,628 (32,413 gal seal oil); 1728–1,875; 1729–7,025 (49,432 gal seal oil); 1730–567 (52,321 gal seal oil); 1733–1,420. (The year refers to the period beginning with that year.)

⁴ In addition, 1,437 lb of ambergris.

benthic topography, currents, weather, whale behavior, or other factors that could have affected the loss rate. The incompleteness of catch records and the many other uncertainties in the data make us feel that any fine-tuning of the loss rate would give a false impression of precise knowledge. What is important, given our ultimate objective of obtaining a minimum estimate of historical population size, is that we apply a conservative (i.e. negatively biased) loss rate and minimize the risk of upward bias in estimating removals. By including some drift whales in the totals of secured catch, we introduce a small amount of upward bias in the removal estimates. However, since under-reporting of the catch is pre-

sumed to be substantial, this problem can be considered trivial.

Total Kill

By applying the LRF of 1.2 to the catch estimates above for the period 1620–1924, we estimate the total kill of right whales from the literature as 883–1,118. The estimated catch of 2,049 whales between 1697 and 1734, based on amounts of baleen shipped to England, becomes 2,459 whales when adjusted in the same way, while the estimate for the same period based on oil imports is 3,839, adjusted to 4,607 to account for losses. If Best's (1987) estimates of average yield (67 bbl and 563 lb) were applied to these same production data, the total estimates from

baleen (2,355 raw, 2,826 adjusted) and oil (2,521 raw, 3,025 adjusted) would be in closer agreement.

Whaling Seasons

Figure 15 shows the cumulative records of the right whale's occurrence, by month, using data from Reeves and Mitchell (1986a, b, 1988) and this paper. The sample consists of some 305 records for which the month was known; 660 available records could not be used because the month was not known. Each whale represents a "record"; for example, if 2 whales were seen together in one sighting in January, we counted the event as 2 records for that month. No

distinction was made between whales seen and whales taken.

Discussion

Chronology of Whaling Effort

In her study of the role of Native Americans (Indians) in the development of shore whaling at Nantucket, Little (1981) estimated the years when shore whaling (as distinct from drift whaling) began along various parts of the east coast: 1690 for Nantucket, 1688 "or just before" for Cape Cod, 1667 for Long Island, and 1680 for Cape May. Her starting dates for Cape Cod and Long Island are too late, according to

the sources cited earlier in this paper. Whaling was underway in Massachusetts, Cape Cod, and Narragansett bays well before 1688. In fact, shore whaling had become well established and profitable in these areas by that time. Allen (1908:314) gave starting dates of 1631 for Massachusetts Bay, 1652 for Martha's Vineyard, and 1672 for Nantucket. There is also no reason to suppose that Long Island shore whaling began as late as 1667. Whaling companies had been formed in at least three localities at the east end during the 1650's (Ross, 1902). Whaling along the New Jersey coast certainly began before 1680, although the settlement at Cape May apparently was not developed as a whaling center until the early 1680's.

Little (1981) also estimated the peak years of shore whaling at the various sites: Nantucket in 1726, Cape Cod in 1714–1724, Long Island in 1687–1707, and Cape May in 1707–1714. While acknowledging Macy's (1835) claim that the record-high catch of right whales occurred at Nantucket in 1726, it must also be acknowledged that shore whaling had been intensive on the island well before this time. The catch of an estimated 15 right whales by six sloops in 1715 (see above) suggests that the Nantucket whalers were already expanding their effort offshore to supplement the shore-based catch.

Our findings for Long Island (this paper; Reeves and Mitchell, 1986a) agree reasonably well with Little's (1981) conclusion that the peak in whaling effort and catch occurred there at or shortly after the beginning of the 18th century. The largest volume of whale oil was exported from New York to Great Britain in 1706–07 (31,980 U.S. gallons), and the largest amount of baleen was exported in 1709–10 (46,430 lb). Little's estimate of 84 whales as a maximum 1-year catch is somewhat more than our estimate of 71 whales based on the baleen exported in 1709–10. Little reasoned that 28 whaling companies caught an average of 3 whales each in a good year, for a total of 84, and she noted that this number of whales, at 50 barrels each, would produce 4,200 barrels of oil. This is consistent with the return of 4,000 barrels listed for 1707

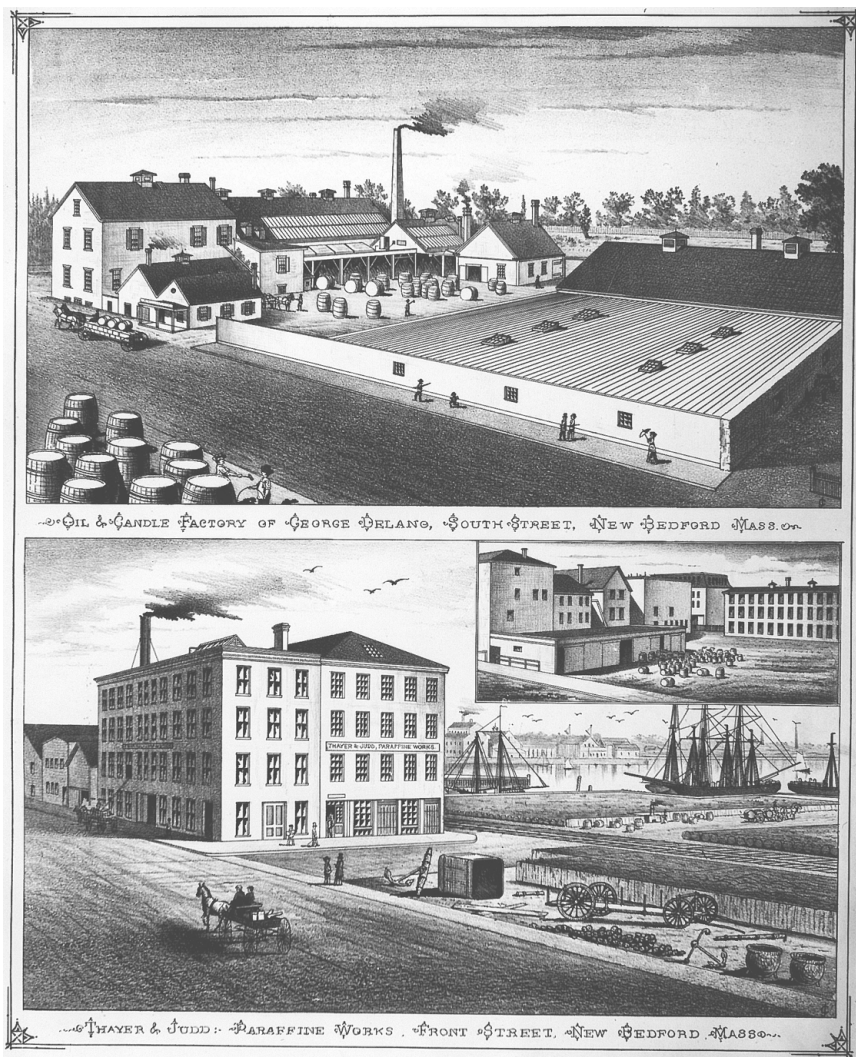


Figure 14.—Delano oil and candle factory in New Bedford about 1881. Courtesy, New Bedford Whaling Museum.

by Cornbury (1708:59). The average yield for right whales killed off Long Island was about 36 barrels (Reeves and Mitchell, 1986a) rather than 50, so the secured catch in 1707 was probably more than 100 whales. An aspect of Little's analysis that is certainly in error is her statement that Long Island shore whaling terminated by 1717. Although the catch might have begun to decline in the 1720's (Table 11), Long Island shore whaling continued for another two centuries.

Little (1981) concluded that Cape May whaling began to reach a peak just as Long Island whaling began to decline. This idea is consistent with the fact that many of the Cape May whalers were immigrants from Long Island. However, there is considerable evidence suggesting that Cape May whaling was already flourishing in the 1690's. While New Jersey shore whaling certainly had declined by 1734, when Little considered it finished, it continued on some parts of the coast for another century.

Overall, whaling for right whales appears to have been particularly intensive in the eastern United States between about 1685 and 1730. During this time, whales were hunted from shore and vessels in much of New England, Long Island (New York), New Jersey, and North Carolina. Shore whaling was underway for several decades before 1685 and continued for nearly two centuries after 1730. The trend toward distant-water whaling by American whalers in the late 18th and 19th centuries, and the transition to sperm, bowhead, and humpback whales as target species, was a reflection of decreased right whale abundance worldwide but did not necessarily give right whales a reprieve along the U.S. east coast. Even as the pelagic whalers turned their attention to other species, they continued to take right whales encountered during cruises as well as coming into or departing ports.

The War of Independence (1776–1783) is said to have lessened whaling effort, and in turn decreased the pressure on whale stocks. Stackpole (1972:4), referring to the years immediately following the war, stated: "Due to the war years the number of whales along

Table 14.—Estimates of right whale catches in New England, New York, and Pennsylvania, 1697–1734, based on British customs records (Tables 10–12). Conversion factors are: oil - 1,386 U.S. gal (44 barrels) per whale (see Table 2); baleen—647 lb per whale. Note that all estimates were rounded down to the nearest integer. See text for a discussion on interpreting the estimates. (0 = none exported; [0] = authors' inference).

Year ¹	Right whale catches							
	New England		New York		Pennsylvania		Total	
	Oil	Baleen	Oil	Baleen	Oil	Baleen	Oil	Baleen
1697	23	13	21	13	1	0	45	26
1698	25	[0]	[0]	0	0	0	25	[0]
1699	25	0	1	[0]	0	1	26	1
1700	76	21	11	0	[0]	0	87	21
1701	65	36	11	4	[0]	0	76	40
1702	87	97	[0]	[0]	0	0	87	97
1703	47	25	8	8	0	0	55	33
1704	39	55	2	1	0	0	41	56
[No data for 1705]								
1706	2	2	[0]	[0]	[0]	[0]	2	2
1707	95	5	23	2	0	0	118	7
1708	109	24	7	[0]	0	0	116	24
1709	47	19	8	9	0	0	55	28
1710	72	28	7	72	0	[0]	79	100
1711	64	26	7	2	0	0	71	28
[No data for 1712]								
1713	50	45	[0]	6	0	0	50	51
1714	83	40	4	6	[0]	0	87	46
1715	140	54	11	4	1	2	152	60
1716	125	88	4	1	2	0	131	89
1717	65	22	2	[0]	0	0	67	22
1718	107	26	15	25	0	0	122	51
1719	96	53	11	9	2	0	109	62
1720	130	75	14	6	1	0	145	81
1721	174	62	11	4	1	0	186	66
1722	109	45	1	4	1	0	111	49
1723	142	65	8	3	1	1	151	69
1724	147	140	[0]	18	6	0	153	158
1725	128	104	1	2	6	1	135	107
1726	128	106	6	9	3	[0]	137	115
[No data for 1727]								
1728	187	95	1	[0]	0	0	188	95
1729	122	43	1	0	[0]	0	123	43
1730	186	139	1	1	0	0	187	140
1731	130	61	0	[0]	[0]	0	130	61
1732	169	42	1	0	1	0	171	42
1733	168	70	3	2	0	0	171	72
1734	248	105	2	2	[0]	0	250	107
Total	3,610	1,831	203	213	26	5	3,839	2,049

¹ The year indicated is always the second of a pair; e.g. 1697 represents 1696-1697 from Tables 10–12.

Table 15.—Estimated catches (bootstrap mean) and estimated quantiles of the distribution of right whale catches, 1696–1734, based on estimates of the oil and baleen production data from Tables 10–12 and the oil and baleen yield per whale data summarized in Table 2. Bootstrap sample size = 5,000.

Area	Whale products	Bootstrap mean	Quantiles		
			2.5%	50%	97.5%
New England	5,007,942 U.S. gal	3,594	3,309	3,590	3,909
New York	283,924 U.S. gal	204	188	204	222
Pennsylvania	35,261 U.S. gal	25	23	25	28
New England	1,183,417 lb baleen	1,827	1,624	1,830	2,064
New York	139,483 lb baleen	215	191	216	243
Pennsylvania	2,802 lb baleen	4	4	4	5

the coast had increased, not having been hunted, and became easy prey for the newcomers. This brought a glut on the American market, especially in Boston, Philadelphia, Baltimore, New York, and Charleston" Although to exactly which "coast" Stackpole's

remark applied is unclear, whaling all along the American east coast presumably was interrupted by the hostilities (Starbuck, 1878:177). Thus, the stocks of right, humpback, and sperm whales in the western North Atlantic may have profited from the war to some degree.

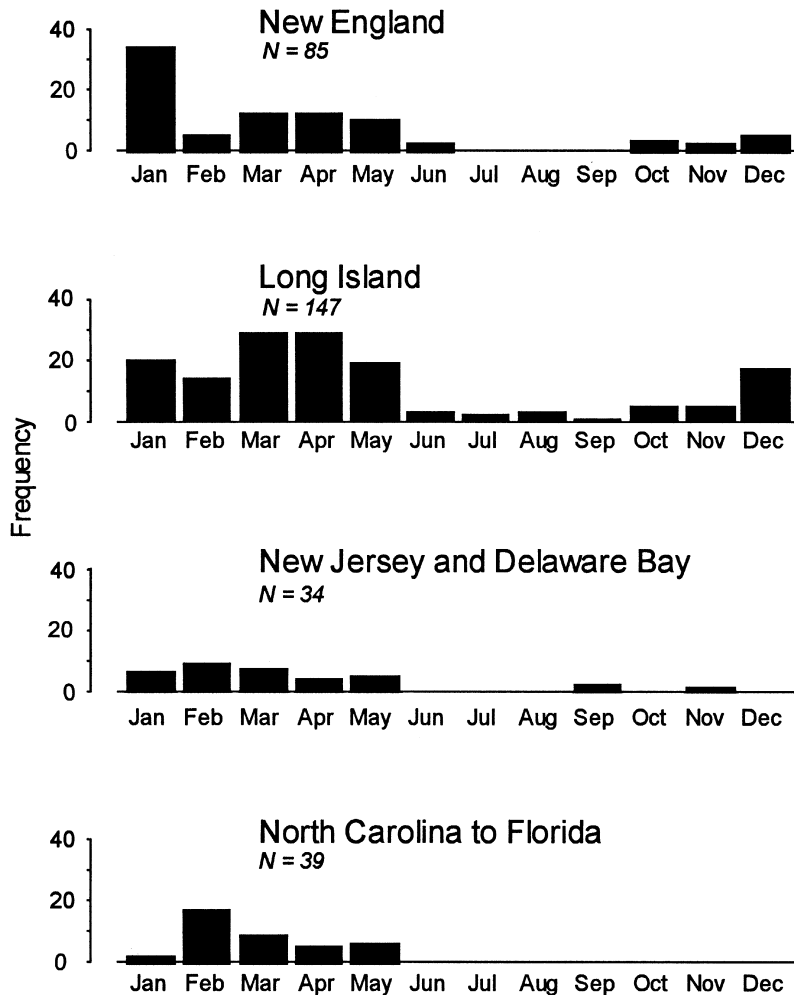


Figure 15.—Bar plots of right whale occurrence (seen, struck, or killed) by month, 1620–1924 (see text for details).

However, the stocks in distant seas would seem to have gained even more of a respite. The Nantucket whaling fleet had already extended its activity far to the north (Davis Strait, Strait of Belle Isle, Gulf of St. Lawrence) and south (Brazil Banks, Falkland Islands) before the war (Stackpole, 1953), but long voyages would have become virtually impossible during it. Starbuck (1878:177–179) listed a number of bonds on whaling vessels as having been filed with the Massachusetts state treasurer during the period 1775–1783, but he had little information on their returns or on where they whaled during this period.

In 1779 or 1780 the whalers of Nantucket obtained permits from the Brit-

ish military authorities in New York “for a few vessels, about fifteen, to whale on our Coast, which were successful” (Rotch, 1916:15). Apparently many of these vessels cruised “in Boston Bay and its vicinity” (Rotch, 1916:26). Twenty-four such permits were secured the following year (Rotch, 1916:27), and permits for 35 whaling vessels were granted by the Continental Congress to Nantucketers shortly before the treaty of peace was signed in 1783 (Rotch, 1916:34). It can only be assumed that what remained of Nantucket’s whaling fleet after the first several years of war with Great Britain cruised at every opportunity in local waters. This would have meant that, during the war years, whaling activity was concentrated on

the coastal stocks of right and humpback whales.

Whaling Seasons and Inferences About Whale Migratory Behavior

Allen’s (1916:140) conclusion that right whales were “practically absent” from New England between early June and October is generally borne out by the historical sources that we reviewed (Fig. 15). Shore whaling in Connecticut began as early as December and apparently finished by the end of March (Table 6). Although a “straggling” right whale could be encountered off Provincetown at any time, they were most common there in late April and early May (Atwood in J. A. Allen, 1869:203). Allen (1916:143) proposed that, after May, the right whale population moved “off the Grand Banks and thence northeasterly, even to Iceland.” He did not mention that right whales congregated during summer in the lower Bay of Fundy and on the Scotian Shelf as they are known to do today (Arnold and Gaskin, 1972; Kraus et al., 1982; Mitchell et al., 1986a; Stone et al., 1988). In fact, there is no certain evidence that these areas had the same relative importance to right whales in Allen’s and earlier times as they appear to have at present. Allen’s speculation that at least part of the population moved east of the Grand Bank and possibly even to Denmark Strait (Allen, 1972:502) is, however, consistent with some of the whaling data (Schevill and Moore, 1983; Reeves and Mitchell, 1986b), as well as with recently documented movements by individual right whales (Knowlton et al., 1992).

The timing of right whale occurrence off New England and Long Island was roughly coincident. On Long Island, whaling usually began in October or November and lasted until April or early May (Reeves and Mitchell, 1986a). Summer records are almost as rare for Long Island as for New England. Although they whaled through the winter, Long Island whalers did not consider the whales to be overwintering in their area. Rather, they believed that the animals were always moving through it, remaining in one spot for no more than a few days (similar to the

spring observations off Cape Cod by Watkins and Schevill, 1982). At least toward the end of the 19th century, late winter was considered the best season for whaling at Long Island. At this time, the whales were believed by the whalers to be on a northward migration (Edwards and Rattray, 1932:18).

By all accounts, the whaling off New Jersey and in Delaware Bay was, like that in New England and New York, prosecuted principally during winter and early spring. The Dutch whale fishery in Delaware Bay lasted from December to March (Parr, 1969: 112). Thomas Leaming's 17th-century account refers to whaling as a winter and early spring activity, the season being finished by no later than the first of May (Beesley, 1857:175–176). Lewis Cresse's diary indicates that whaling began as early as the end of January or early in February and lasted until as late as the middle of April, at least during the 18th century (Table 9). Watson (1855, II:547) indicated that February and March were the peak months of whaling at Long Beach Island. All of the confirmed right whale records in Table 8 that include the month of occurrence are for March, April, or May, with one exception (November). The evidence suggests that some right whales overwintered in Delaware Bay and off New Jersey but that their numbers increased in February and March, perhaps as animals that wintered to the southward or far offshore began arriving on their passage to the north.

Catch Levels and Trends

To Mid 1800's

Any conclusions about the magnitude of removals from the right whale population prior to about the mid 1800's should be made with great caution. The records are far too fragmentary to support reliable quantitative assessments. The surviving sample of pelagic whaling journals and logbooks for the 18th century is small (Fonda, 1969; Sherman et al., 1986). This is the time when right whales may still have been relatively abundant on some grounds (e.g. east of the Grand Bank, in the Strait of Belle Isle and Gulf of St.

Lawrence, and perhaps along the Labrador coast). Other primary sources, such as the *Whalemens' Shipping List* (WSL, 1843–1914), the Dennis Wood (N.d.) abstracts, Starbuck (1878), and the Maury (1852) and Townsend (1935) charts, begin their detailed coverage of American pelagic whaling in the 1780's or later. There are very few good primary sources of data for the critical period between about 1715 and 1760. We do know, however, that people on Cape Cod actively drove blackfish (pilot whales) in the fall and winter and that they whaled in sloops far offshore in the spring and summer, taking mainly sperm whales (Dudley, 1896). With respect to shore whaling, a much higher catch was probably made between 1650 and the early 1800's than our tables show (including those in this paper as well as those in Reeves and Mitchell, 1986a and 1988). The secondary sources, as well as a few primary sources, providing information on shore-based catches during the 17th and 18th centuries do so in a completely unsystematic way. For example, while Winthrop (1892:55) stated that whalers killed 29 whales in Cape Cod Bay in one day prior to 27 January 1700, he provided no information about whales killed on other days that winter. The context suggests that the season's total catch was higher than 29: "... all the boates round the bay killed twenty nine whales in one day, as som that came this week report; as I came by when I was there last one company had killed three, two of which lay on Sandwich beach, which they kild the day before, and reckned they had kild another the same day, which they expected would drive on shore in the bay." It can be inferred that the 3 killed on the day of Winthrop's own visit to Sandwich probably were not part of the 29. Considering that the peak months of the right whale's occurrence off the Massachusetts coast are April and May (Schevill et al., 1986) and that Winthrop's letter was written in late January, perhaps more whales were killed in the bay later in the season. It is not even possible to be certain that 29 was the greatest one-day catch in Cape Cod Bay during the height of shore whaling there, although

Winthrop described the winter season of 1699–1700 as "favorable." Considering the amount of whaling effort required to kill 29 whales in one day, it is clear that substantial whaling activity occurred at Cape Cod in the years immediately before and after 1700 (cf. Table 10).

Prices paid in England for whale oil and baleen were fairly stable during the period 1697–1734. Whale oil remained in the range (usually toward the high end) of £10–14 sterling per tun, while baleen began at £3 in 1697 and increased to £7–9 per cwt by 1700, where it remained through 1734 (unpubl. data from Public Record Office). Some of the variability within these ranges may have been due to differences in quality of the merchandise on its arrival in London rather than to changes in valuation through time. In the absence of evidence to the contrary, we make the simplest assumption that whaling effort was constant or increasing over the period for which customs data are available. Production statistics, and their interplay with prices, may therefore serve as reasonable indices for trends in whale availability.

However strong the incentives were for the colonists to send their whale products to England (Kugler, 1980), the entire colonial production would not have been exported each year. There was some demand for these products in the colonies themselves—"country consumption" as Macy (1835) referred to it. At least small amounts were also shipped to the West Indies (Macy, 1835). However, there is no sensible way of adjusting the production figures to account for domestic consumption or exports to destinations other than England.

One factor that may have influenced the distribution of production levels among states is tax avoidance. As discussed above (see section on New York (Long Island); Headlam, 1930:16), strong dissatisfaction with duties on whales caught in New York waters may have resulted in products being exported instead from Boston (i.e. New England). A sharp, but temporary, decline did occur in imports from New York immediately after 1714–15, but by 1717–18 the returns on oil and baleen were back to earlier levels (Table 11). The exception-

ally high returns of oil and baleen for New England in 1714–15 and 1715–16 are consistent with the possibility that Long Island whalers were smuggling their oil and baleen to Boston rather than paying the taxes in New York. This smuggling, however, was a long-standing practice (Edwards and Rattray, 1932:213–217; Reeves and Mitchell, 1986a), and it probably influenced the New York:New England product ratios in other years as well.

Mid 1800's–20th Century

The catch record is probably more nearly complete beginning in 1822, when the *Nantucket Inquirer* started publication, than it is for the years 1734–1822. From 1822 on, a large percentage of the shore-based catches made in New England and New York probably would have been reported in a whaling-town newspaper (e.g. *Nantucket's Inquirer or Journal*, Sag Harbor's *Corrector*, New Bedford's *Whalemen's Shipping List*). This assumption, however, is speculative. Only about one-third of the dated records given by Allen (1916:141) are from years before 1822, but this should not be interpreted to mean that twice as many observations of right whales were made in the century following 1821 than during the two centuries before then. The increased frequency of Allen's reports over time (for example, 9+ records for 1800–1850 vs. 63+ for 1850–1900 *vide* Schevill et al., 1986), may be an artifact of documentation factors, at least to some extent. Allen's historical record, however "painstakingly compiled" (Schevill et al., 1986) may be considered little more than a collection of random hints at what occurred in colonial and early post-colonial times. It cannot be compared, at face value, to Schevill et al.'s documented record of observations over a 27-year period (1955–1981). The suggestion that "the population of right whales passing near Cape Cod is at worst only slightly smaller now than it was in the 17th century" (Schevill et al., 1986) is not supported by the data, particularly in view of the large amounts of oil and baleen exported to England during the early 18th century (Reeves, 1991; Reeves et al.²; Tables 10–13).

The apparent increase in catches of right whales between about 1840 and 1890 (Tables 3, 4, 7, 8; Reeves and Mitchell, 1986a, b, 1988) is probably due, at least in part, to the steadily improving documentation over this period (more newspapers extant, larger samples of log-books and journals available, etc.). It also may be due, at least in part, to stock recovery as suggested by Allen (1972:503). The period was concurrent with the initiation and collapse of the North Pacific pelagic right whale fishery in the 1840's–1850's (Scarff, 1986), and the resultant search by New England whalers for new whaling opportunities. In addition to exploring the bowhead alternative in the 1850's–1860's, American pelagic whalers discovered a small winter concentration of right whales off northern Florida, Georgia, and South Carolina in the mid–1870's in what is now known to be a calving ground, then hunted it intensively through the early 1880's (Reeves and Mitchell, 1986b, 1988).

It is also possible that improvements in gear would have made right whales easier to approach and secure. For example, the toggle iron, introduced in the middle of the 19th century, was a major innovation which increased whaling efficiency (Lytle, 1984; Mitchell et al., 1986b). Later, steam-powered vessels were used to catch and tow fin and humpback whales off Cape Cod in the 1880's. These factors would have increased fishing power and reduced the loss rate. The use of shoulder guns and to a lesser extent darting guns in some fisheries in the last half of the 19th century may have had the opposite effect.

Early Population Size

It is known that in some years during the 16th century Basque whalers shipped 14,000–18,000 barrels of whale oil from their camps along the Strait of Belle Isle (Barkham, 1984). Assuming that Basque barrels contained 56 U.S. gallons (i.e. 211 liters, *vide* Proulx, 1993:63), that the average yield for right whales was 1,386 U.S. gallons (44 standard barrels at 31.5 U.S. gallons per barrel—this paper), and that half the oil was from right whales (Cumbaa, 1986), this production would

suggest a landed catch in the order of 283–364 right whales per year. Aguilar (1986) estimated that the Basques took 300–500 right whales per year (including an uncertain number of bowheads) between 1530 and 1610, but he refrained from attempting to estimate the initial stock size. It is nevertheless obvious from these Basque whaling data that at least a few thousand right whales inhabited the northern portions of the western North Atlantic stock's range in the early 1500's.

Our data on catches in the northeastern United States after the mid-1600's allow us to make a cumulative catch estimate of the number of right whales present south of Cabot Strait as late as the 1720's. (A cumulative catch estimate assumes that net recruitment is zero so that the original population at the beginning of a short time period such as a decade is the number of whales killed plus the number remaining (Woodby and Botkin, 1993).) Using only the central estimates of landed catch in New England, New York, and Pennsylvania based on baleen production (Table 14), adjusted for hunting loss by multiplying by 1.2, we estimate that at least 1,128 right whales were killed from 1724 to 1734 (there are no data for 1727). It is reasonable to conclude that a stock of at least 1,100–1,200 right whales still existed in the western North Atlantic in 1724.

It could be argued that by the late 1720's the whaling returns included an increasing amount of oil and baleen from bowheads, although the literature (summarized earlier in this paper) suggests that bowheads were not hunted regularly by New England whalers until the 1730's. Even if we were to limit our estimate to catches before 1725, there would have had to be more than 1,000 right whales present in the 1690's to support the documented take levels in the subsequent three decades (Tables 10–14).

Conclusions

Some right whales migrate seasonally between wintering grounds off the southeastern United States and summering grounds off southeastern Canada (Kraus et al., 1986). The whales found

in summer near the Cape Farewell Ground in the southern Irminger Sea, in the Labrador Basin, and off Newfoundland and Labrador also belong to the western North Atlantic stock (Knowlton et al., 1992). There is no reason to doubt Aguilar's (1986) contention that the stock of right whales in the Strait of Belle Isle was depleted by 1610. Thus, the population of whales observed by the Plymouth pilgrims at Cape Cod in 1620 (Thacher, 1832:20), and soon thereafter hunted by the colonists along the U.S. east coast, had already been reduced substantially by Basque whaling to the north, since the distribution of right whales was continuous along the North American coast from Labrador to Florida. This stock's history of exploitation along the east coast of the United States dates back to the mid-1600's. We conclude, based on the documented scale of removals during the late 1600's and early 1700's, that right whales were still at least several times more abundant in the western North Atlantic during the mid to late 1600's than they are now.

From the early 1980's to early 1990's, the western North Atlantic population of right whales was thought to be growing at an annual rate of about 2.5% (Knowlton et al., 1994). This is well below the estimated rates of 7% or somewhat higher for several southern right whale populations that have been monitored since the early 1970's (Best, 1993; IWC, In press). Moreover, right whales are still very rare in many areas of the North Atlantic where they were abundant historically, such as the Gulf of St. Lawrence and Strait of Belle Isle, around Iceland and the British Isles, and the Bay of Biscay. In spite of total protection from whaling since the 1930's, the stock, or stocks, in the North Atlantic have either not recovered or have recovered slowly in comparison with Southern Hemisphere stocks. Many factors may be involved.

Mortality from collisions with vessels and entanglements in fishing gear has certainly contributed to the slowness of recovery in recent decades, if not also earlier this century (Kraus, 1990; Katona and Kraus, 1999). Caswell et al. (1999) report a declining survival

probability from 1980 to 1994. Recent analyses have also found a significant linear increase in the mean inter-birth interval from 1980 to the late 1990's (S. D. Kraus, personal commun. in Caswell et al. 1999). It is also possible that the environmental carrying capacity has declined as a result of intensive human use of coastal areas formerly inhabited by right whales (e.g. Delaware Bay, the New York Bight, Boston harbor).

Low abundance could explain the failure to detect and document recovery of severely depleted populations of baleen whales. The North Atlantic right whale population likely was reduced by 1900 to a few individual founders responsible for its survival for generations (Brown, 1991). The small number of whales remaining alive when whaling stopped, before extensive environmental degradation occurred, represents an important factor in the population's slow recovery and low abundance (cf. Schaeff et al., 1997). The difficulty experienced by shore whalers in New England, New York, and New Jersey in finding right whales during the late 1800's and early 1900's attests to the species' scarcity at that time.

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