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2 Whales and Whaling

Whales, dolphins, and porpoises make up the biological order Cetacea. The taxonomy of cetaceans, although it encompasses about seventy-seven species, is probably not complete. The ginkgo-toothed beaked whale was discovered, and the Hubbs' beaked whale classified, only in 1963. Also, there is evidence that some marine mammals grouped in a single category might better be presented in more than one—for example, the twelve species of beaked whales, some never observed alive, that are classified in the genus *Mesoplodon.* And there is still disagreement about the appropriate classification of some cetaceans. The Longman's beaked whale, for example, is sometimes placed in the genus *Mesoplodon* and sometimes in the *Indopacetus.*

Current classifications, which place some mammals still widely viewed as whales into families of dolphins, wouldn't make a perfect basis for a study of whaling.[1] The subfamily Globicephalinae of ocean dolphins, for example, contains the long- and short-finned pilot whales and killer whales that are almost always included in a popular or a nineteenth-century whaleman's enumeration of whales.[2] (The common distinction between whales and dolphins is based more on size than on biology.) Nevertheless, taxonomy is a point of departure for a study of whaling, and an outline is presented in appendix 2A.

1. "[T]he popular terms 'dolphin, porpoise and whale' are not very precise taxonomically. For example, if 'dolphin' is used to refer to members of the Superfamily Delphinoidea, this includes the Family Phocoenidae or 'porpoises,' and the Subfamily Globicephalinae which all have common names ending in 'whale.' Members of the Superfamily Platanistoidea are also known as dolphins. To make matters even more confusing, in the USA . . . any small cetacean is known as a 'porpoise'" (*Dolphins, Porpoises, and Whales* 1991, 5–6).

2. Or perhaps it's the family Delphinidae: "Scholars differ in their opinions concerning which genera and species should be included within the Family *Delphinidae.* Some zoologists believe [it] . . . should be large and include all 20 genera and their 39+ species. . . . Other scholars believe that some genera and their species . . . are sufficiently different in their anatomical structure to warrant the creation of additional families for them" (Tinker 1988, 119). The family Globicephalinae is one of these "additional families."

Cetaceans are divided into two suborders: the Mysticeti (from Greek *mystax*, moustache, and *ketos*, whale), which includes only whales, and the Odontoceti (from Greek *odontos*, tooth, and *ketos*, whale), which includes dolphins and porpoises as well as whales. The Mysticeti, or baleen whales, eat by straining seawater containing krill and other small creatures through a curtain of flattened rods of whalebone (baleen) that hang from the roof of the mouth. The Odontoceti have teeth, although few have sets that would please a dentist. The two teeth of the adult male strap-toothed whale, for example, curl around the upper jaw, and prevent the animal from fully opening its mouth.[3] The male narwhal has, in addition to two teeth in its upper jaw, a long, twisted tusk that extends through its upper lip.[4] Odontoceti feed mainly on squid and octopi.

Whales range in weight from the 340-pound dwarf sperm—about the size of a large National Football League offensive tackle—to the 300,000-pound blue—about the size of the entire NFL (see table 2.1).[5] The species of whales that Americans primarily sought are forty to sixty feet long (see table 2.2), roughly twice the length of the slender boats from which they were hunted.

Both the cost of hunting and the value of the catch have influenced whalemen's choices of prey, but cost seems to have dominated. On the one hand, if technology had not improved, it would have been impossible for the type of animal harvested to have progressed from what was initially the least costly to what was initially the most costly—that is, from dead whales to slow whales to fast whales. On the other hand, no matter what the market may have dictated, at the end of a voyage a captain with space in his hold attempted to harpoon any cetacean that crossed his path. Table 2.3 summarizes the speeds of the whales that have been most frequently hunted.

3. "From the examination of the stomach contents of stranded specimens, it is known that strap-toothed whales eat squid, but how the males feed if they cannot open their mouths remains a mystery" (Ellis 1985, 155–56).

4. "One of the earliest written records of the unicorn would seem to predate the discovery of the narwhal by almost a thousand years . . . [b]ut once the [narwhal's] tusks began to appear, it was easy enough to fit the tusk to the fable. . . . [In] 'The Unicorn Tapestries,' in the collection of the Cloisters in New York . . . [e]verywhere the unicorn appears . . . his horn is a perfect illustration of a narwhal tusk. It is long, white, tapered, and spirally twisted" (Ellis 1985, 72–75).

5. In 1994 the NFL had twenty-eight teams of forty-five players each. Players averaged about 240 pounds: 28 x 45 x 240 = 302,400 pounds. With this comparison we join the poetic company of those who describe the sizes of whales: "[The blue] is the whale species about which all those comparisons are made: it weighs more than 40 elephants, 200 cows, 1,600 men [apparently not football players], etc. . . . [T]he blue whale . . . is approximately the same length as the 128-passenger Boeing 737, which, fully fueled, weighs one-fourth as much as an adult blue whale. . . . [Its tongue] is about the size of a small automobile" (Ellis 1991, 18–19). "How does one weigh an animal [the blue whale] whose heart weighs half a ton, whose tongue is bigger than a taxicab" (Small 1971, 32). "The heart of a blue whale weighs several tons. . . . The aorta leading from its heart is large enough for a child to crawl through, and the major blood vessels appear to be about the size of a sewer pipe" (Ackerman 1992, 118). "[The sperm whale] is the largest carnivore on earth. . . . Imagine a four-hundred-pound heart the size of a chest of drawers" (Lopez 1988, 121–22).

Table 2.1 **Weights of Whales (pounds)**

	Species	Heintzelman	Watson[a]
Gray	*Eschrichtius robustus*	40,000	56,000 M, A 68,000 F, A
Minke	*Balaenoptera acutorostrata*	20,000	12,000–16,000 A 20,000 L
Bryde's	*Balaenoptera edeni*	36,000	26,000 A 44,000 L
Sei	*Balaenoptera borealis*	46,000	28,000–34,000 A 64,000 L
Fin	*Balaenoptera physalus*	128,000	80,000–100,000 A 152,000 L
Blue	*Balaenoptera musculus*	300,000	180,000–288,000 A 392,000 L
Humpback	*Megaptera novaeangliae*	90,000	68,000–90,000 A 106,000 L
Right	*Eubalaena glacialis/australis*	144,000	120,000 A 212,000 L
Bowhead	*Balaena mysticetus*	244,000	220,000 A 244,000 L
Pygmy right	*Caperea marginata*	10,000	10,000 A
Beluga	*Delphinapterus leucas*	2,400	1,400 M, A 890 F, A
Narwhal	*Monodon monoceros*	2,000	3,600 M, A 2,000 F, A
Sperm	*Physeter macrocephalus*	120,000	80,000 M, A 44,000 F, A
Pygmy sperm	*Kogia breviceps*	1,500	1,600 A 1,800 L
Dwarf sperm	*Kogia simius*	—	340 A 600 L
Arnoux's	*Berardius arnuxii*	17,000	14,000 A 17,000 L
Baird's	*Berardius bairdii*	24,000	20,000 A 25,000 L
Cuvier's	*Ziphius cavirostris*	11,000	7,000 A 10,000 L
Shepherd's	*Tasmacetus shepherdi*	5,400	5,000–6,000 E
Northern bottlenose	*Hyperoodon ampullatus*	18,000	8,000 M, A 7,000 F, A
Southern bottlenose	*Hyperoodon planifrons*	7,000	6,000 A 9,000 L
Hector's	*Mesoplodon hectori*	—	—
True's	*Mesoplodon mirus*	3,000	3,000 A
Gervais'	*Mesoplodon europaeus*	6,000	6,000 ?
Ginkgo-toothed	*Mesoplodon ginkgodens*	3,200	3,400 E
Gray's	*Mesoplodon grayi*	1,700	2,000 A
Hubbs'	*Mesoplodon carlhubbsi*	—	3,400 E
Longman's	*Mesoplodon pacificus*	—	—
Stejneger's	*Mesoplodon stejnegeri*	2,800	2,600 E

Table 2.1 (continued)

	Species	Heintzelman	Watson[a]
Andrews'	*Mesoplodon bowdoini*	—	2,400 A
Sowerby's	*Mesoplodon bidens*	3,000	3,000 ?
Strap-toothed	*Mesoplodon layardi*	2,800	2,750 E
Blainville's	*Mesoplodon densirostris*	2,400	2,000 A
Pygmy killer	*Feresa attenuata*	350	375 M, A
			330 F, A
Short-finned pilot	*Globicephala macrorhyncha*	7,350	6,600 M, L
			3,200 F, L
Long-finned pilot	*Globicephala melas*	8,400	8,500 M, L
			4,000 F, L
Killer	*Orcinus orca*	16,000	16,000 L
Melon-headed	*Peponocephala electra*	400	350 A
False killer	*Pseudorca crassidens*	4,800	5,000 M, L
			2,500 F, L

Sources: Heintzelman 1981; Watson 1985.

Notes: How do you weigh a whale? "Accurate weights are . . . difficult to obtain, but a 29.5 m female Blue Whale, shot at South Georgia in 1930, was calculated to weigh 177 tonnes, on the basis of the number of cookers filled with its blubber, meat and bone, and making some allowance for losses in the form of blood and guts" (Bonner 1980, 5).

[a] *A* = average; *E* = estimated; *F* = female; *L* = largest; *M* = male; *?* = perhaps.

2.1 Where the Whales Were

Before 1868 only five species of whales were systematically hunted: principally the sperm, the bowhead, and the right, secondarily the humpback and the gray. Humpbacks and grays are smaller than the others, their oil and baleen are of relatively poor quality, and they pose special problems for hunters. The humpback usually sinks when killed; the gray can be a ferocious fighter.

Whalemen would have liked to hunt the faster-swimming rorquals—the blues, seis, minkes, and finners—but with the technology of the time were seldom able to capture them.[6] When in *Moby-Dick* Melville writes about the habits of the five whales that were hunted in the mid-nineteenth century, he is informative and accurate; when his subject is any rorqual except the humpback, he is often wrong.

In the nineteenth century, sperm whales were hunted in the tropical and subtropical oceans. Both males and females were killed, although—males being two to three times as large as females—whalemen chose males when they could. In the twentieth century, sperm whales were hunted from shore stations in Australia and Antarctica. Because the migratory patterns of male and female

6. The rorquals are the members of the family Balaenopteridae. *Rorqual* comes from "the old Norwegian *rörhval* [furrow whale], referring to the grooves that run from just behind the lower lip to the chest" (Burton 1983, 22).

Table 2.2 **Lengths of Whales (feet)**

	Baker	Burton	Minasian	Tinker	Evans
Gray	40–45 M 43–50 F	46 L	45–50	42.5 M 49.2 F, L	36.4–46.9 M 38.4–49.9 F
Minke	26–30	32 L	30 L	26.2–31.1	23.0–32.2 M 24.6–36.1 F
Bryde's	40–46 M 43 F, A	49 L	48 L	39.4–46.0	41.0–45.9
Sei	48 M 51–68 F	59 L	60 M, L 65 F, L	49.2–59.0	39.4–57.4 M 41.7–68.9 F
Fin	65–70 A ≤82 F	85 L	88 L 64.5 A	62.3–87.9	59.1–82.0
Blue[a]	75–82 A	109 L	75–80	98.4 L 82.0–85.3 A	78.7–91.9
Humpback[b]	40–62	49 L	62 L	49.2–62.3	36.1–49.2 M 37.4–49.2 F
Right	50	59 L	58 L 50 A	49.2–59.0	49.2–59.0
Bowhead	50–58	59 L	50	49.2–65.6	49.2–60.7
Pygmy right	21	20 L	20	21	16.4–21.0
Beluga	16	—	16	16.5–19.6 M 14.5–17.6 F	9.8–16.4
Narwhal	11–16	—	15.5 M 13–15 F	13–18 M 13 F	13.1–16.4
Sperm	61	59 L	60 M 40 F	49–65 M 36.0–55.5 F	51.8–61.0 M 35.8–39.4 F
Pygmy sperm	11	12 L	11 L	10–13	8.9–11.2
Dwarf sperm	7–9	10 L	6.75–8.75	6.5–8.9	6.9–8.9
Arnoux's	29.5	—	30 L	32 L	29.5
Baird's	≤39 M ≤42 F	43 L	39 M, L 42 F, L	≤39 M ≤42 F	35.1–38.7 M 36.1–42.0 F
Cuvier's	18–20 M 20–26 F	—	23 L	19–23	22.0 M 23.0 F
Shepherd's	22	—	23 M, L 22 F, L	19.7–23.0	19.7–23.0
Northern bottlenose	32 M 25 F	30 L	32 M <32 F	32 L	29.5–31.2 M 23.0–27.9 F
Southern bottlenose	32 M 24 F	—	32 M 24.5 F	23.0–29.5 M 19.7–23.0 F	19.7–21.3 M 23.0–24.6 F
Hector's	14.5	—	—	14.5 L	12.1–14.8
True's	16–17	—	17	17	16.1–18.0
Gervais'	22	—	16.5	22	14.8–16.4
Ginkgo-toothed	18	—	18	17	17.1
Gray's	≤20	—	18–20	11.5–16.4	18.0–19.7
Hubbs'	17	—	17	17	16.4–17.4
Longman's[c]	—	—	23	23	23.0
Stejneger's	17	—	17.3	16.5–19.7	16.4–19.7
Andrews'	15	—	15	14–17	14.4–14.8
Sowerby's	16	—	16.5 M 16 F	18.3	16.4
Strap-toothed	16–20	—	20	16.4–19.7	16.4–19.7
Blainville's	17	—	17	13–17	15.4–17.1

Table 2.2 (continued)

	Baker	Burton	Minasian	Tinker	Evans
Pygmy killer	8 M	—	7–8	7.2–8.8	7.2–8.2
	7 F				
Short-finned pilot	19 M	20 L	19.5 M	20 L	14.8–16.4 M
	15 F		13 F		10.8–11.8 F
Long-finned pilot	≤20 M	23 L	20 M	19.7–26.0 M	18.0–20.3 M
	18 F		18 F	16.4–19.7 F	12.5–17.7 F
Killer	27 M, A	33 L	31.5 M	31 M, L	22.0–23.0 M
	23 F, A		27 F	20–27 F	18.0–21.3 F
Melon-headed	9 M	—	8	6.6–8.2	7.5–8.9
False killer	18–20 M	—	20 M	19.7 M, L	13.1–18.0
	16 F		16 F	16.4 F, L	

Sources: Baker 1987; Burton 1983, 20; Minasian, Balcomb, and Foster 1984; Tinker 1988; Evans 1987.

Notes: The length of a whale is measured from the tip of the upper jaw to the deepest notch of the tail. *A* = average; *F* = female; *L* = largest; *M* = male.

[a]"Two centuries ago, blue whales in the Antarctic reached an awesome length of 100 feet .... Today, they are smaller, averaging 75 to 82 feet" (Baker 1987, 192). "The largest blue captured reportedly measured 33.5 m (110 ft), although the average prewhaling, full-grown adult more likely measured 26 to 27.5 m (85 to 90 ft) long. Large blue whales have been so severely reduced in numbers by commercial whaling that the average size today is between 23 to 24.5 m (75 to 80 ft)" (Minasian, Balcomb, and Foster 1984, 40).

[b]"Reports of much greater lengths [than 65 feet] in the last century are probably exaggerated by measurement along the curve of the body" (Watson 1985, 71).

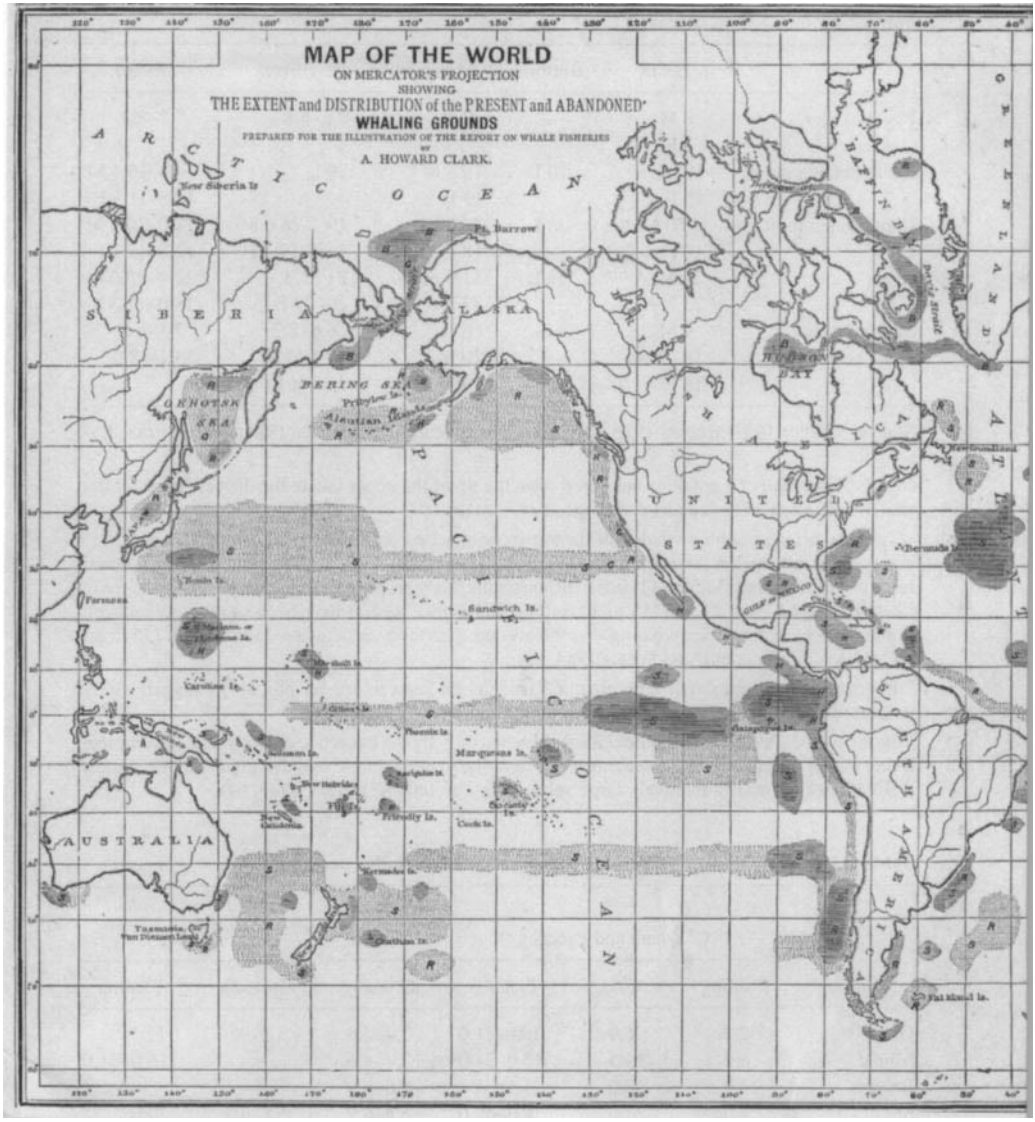
[c]Since Longman's (*Indopacetus pacificus*) is known only by the existence of two skulls (a complete living or, for that matter, dead specimen has never been seen), these lengths are clearly estimates. "[S]kull size suggests a relatively large animal of c. 7m length" (Evans 1987, 64).

Table 2.3 **Top Swimming Speeds of Whales (miles per hour)**

	Cousteau and Paccalet			Mörzer Bruyns	Alaska	
	Feeding	Cruising	Fleeing	Cruising	Cruising	Fleeing
Gray	2.5	6.0	10.0–11.0	2.4–4.6	5.2	12.7
Minke	6.0	15.5	18.0–21.0	2.4–4.6	—	16.0–21.0
Bryde's	4.0	18.0	25.5	5.8–6.9	—	—
Sei	4.0	22.0	36.0–40.0	5.8–6.9	5.8–9.2	39.0
Fin	4.0	22.0	25.0–33.0	11.5–13.8	5.8–6.9	23.0
Blue	4.0	20.0	24.0–30.0	11.5–16.1	16.0–17.3	23.0
Humpback	2.5	9.0	15.0–16.5	3.5–4.6	2.0–5.0	9.0–10.0
Right	2.5	6.5	7.0–11.0	3.5–4.6	—	—
Bowhead	2.5	6.5	10.0–12.0	2.4–3.5	4.6	—
Pygmy right	2.5[a]	6.0[a]	—	—	—	—
Sperm	3.5	9.0	21.0–27.0	3.5–4.6	3.5–4.6	30.0

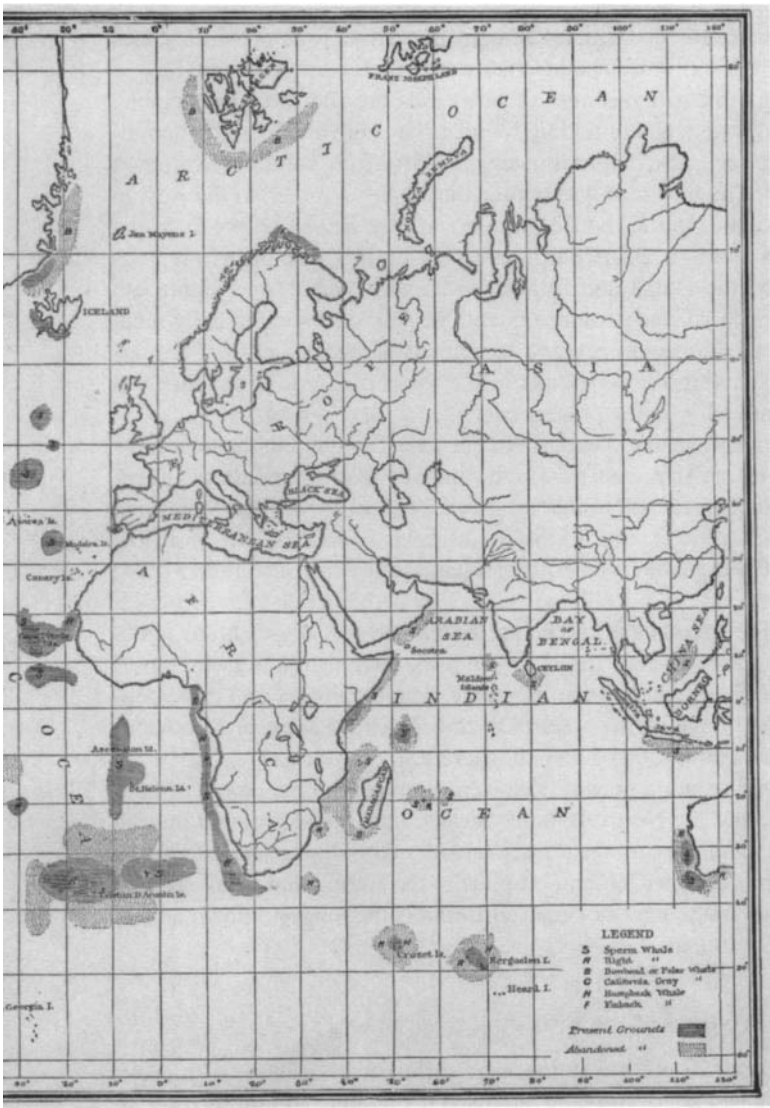
Sources: Cousteau and Paccalet 1988, 126; Mörzer Bruyns 1971; "Alaska Whales and Whaling" 1978.

[a]The source has marked these figures with question marks.



Map of the world showing nineteenth-century whaling grounds, by A. Howard Clark. The map illustrated a report, *The Fisheries and Fishery Industries of the United States,* compiled by George Brown Goode and published by the U.S. Commission of Fish and Fisheries in 1887. The more heavily shaded areas represent "present grounds," the less heavily shaded, "abandoned grounds." Grounds are marked *S* for sperm whale, *R* for right whale, *B* for "bowhead or polar whale," *C* for California gray whale, *H* for humpback whale, and *F* for finback whale.

Reproduced courtesy of the Old Dartmouth Historical Society–New Bedford Whaling Museum.


ARCTIC OCEAN
ASIA
ICELAND
Jan Mayen I.
FRANZ JOSEPH LAND
NOVAYA ZEMLYA
BLACK SEA
MEDITERRANEAN SEA
Azores Is.
Madeira Is.
Canary Is.
ARABIAN SEA
Socotra
BAY OF BENGAL
CEYLON
Maldive Islands
Laccadive Islands
CHINA SEA
JAPAN
INDIAN OCEAN
Ascension I.
St. Helena I.
Tristan D'Acunha Is.
MADAGASCAR
Crozet Is.
Kerguelen I.
Heard I.
Georgia I.
LEGEND
S Sperm Whale
N Right "
B Bowhead, or Polar Whale
G California Gray "
H Humpback Whale
F Finback "
Present Grounds
Abandoned "

sperm whales are different (females remain in warmer waters while males roam into colder waters), it was males that were killed in the Antarctic.[7]

Among baleens, the whereabouts of bowheads are the most predictable. They prefer frigid water and are seldom found as far south as the winter boundary of the Arctic ice pack, approximately the fifty-fifth parallel (Scammon [1874] 1968, 58). The bowhead was hunted during the summer, to the west in the North Pacific, the Arctic, the Bering Sea, and the Sea of Okhotsk, to the east in the Greenland Sea, Davis Strait, and Hudson Bay. The eastern regions were exploited by the Dutch and English in the seventeenth and eighteenth centuries, by the English and, to some extent, the Americans in the early nineteenth. Later in the nineteenth century, Americans hunted the eastern regions more regularly. Whaling for bowheads in the Western Arctic began in 1848 and continued until early in the present century.

The habitat of right whales is extensive. They can be found in the temperate waters of the Northern Hemisphere—in the Atlantic from Bermuda to Greenland, in the Pacific from Japan to the northwest coast of the United States and as far north as the Arctic Ocean. To the south, rights were hunted from Brazil in the east and Chile in the west to the Antarctic Ocean (Scammon [1874] 1968, 66).

Humpbacks, like sperms and rights, prefer temperate waters but are sometimes found along the edges of the polar ice packs. They tend to swim closer to shore, however, particularly when breeding. There appear to be three geographically isolated populations—North Pacific, North Atlantic, and Southern Hemisphere—each composed of several discrete stocks.

In the eighteenth century, gray whales were found along the coasts of both the North Pacific and the North Atlantic Oceans; now they are found only in the North Pacific, and only on the American side. Grays are inshore animals. Their passage from summer feeding grounds in the Bering and Chukchi Seas to calving grounds in the bays of Baja California is the longest known annual migration of any mammal.

2.2 Economic Products of the Fishery

The products of premodern whaling were different from those of modern whaling. In the nineteenth century, oil was used for lighting and lubrication. In the twentieth, it has been used for margarine and in the production of chemicals. Whale meat, bones, and entrails were seldom exploited in the nineteenth century; in the twentieth, they have been used in fertilizers and animal feed.[8]

7. Frost 1979, 17. "[T]here was no danger of killing too many sperm whales in the Antarctic. . . . [O]nly male sperm whales were found there. The animal is polygamous, and old bulls ousted from their harems and young ones who never acquired one apparently used the Antarctic as a bachelors' retreat" (Small 1971, 96). See also chapter 4 below.

8. *The Whale Manual* lists more than seventy "past and present commercial uses of the whale," ranging from baleen in hooped skirts to "cetyl alcohol converted to cetyl pyridinium bromide for

The whales hunted in the nineteenth century yielded five commercial products: ambergris, spermaceti, and sperm oil from sperm whales, whale oil and whalebone from baleens.

In both quantity and total value, sperm oil was much more important than ambergris. Sperm oil is a very high quality lubricant; it is noncorrosive and does not film over. Unlike most of its competitors, it retains its consistency at extreme temperatures, and became increasingly valuable as the manufacturing sector serviced more and more machines operating at faster and faster speeds. As a lubricant it continued in demand into the twentieth century. As an illuminant sperm oil produces a bright, clean light. Its cost tended to price it out of the household market, but it was widely used in public buildings. Almost all lighthouses, for example, used sperm oil.

The purest was found in a cavity in the head (the *case*). Once the animal had been decapitated, the oil was easily removed from this reservoir and, because of its purity, could be barrelled without processing. For the rest the blubber had first to be stripped from the carcass, or *flensed*—a long and dangerous procedure—and then the oil extracted and processed so that it would not spoil before it was brought home. Extraction, called *trying out,* was both labor-intensive and risky. The blubber was cut up and boiled, which meant keeping a fire going on deck twenty-four hours a day. When the liquid oil had cooled, it was poured into hogsheads and stored. At the end of the voyage, both types of oil (that drawn from the head and that extracted from the blubber) were sold to refineries for further processing. The processing resulted in several grades of sperm oil and the solid product spermaceti, from which candles were made.[9]

Although it was of only marginal economic importance because of its scarcity, on a price-per-ounce basis the most valuable product of the sperm whale was ambergris.[10] The origin of this fatty substance, found in the intestines of

cationic surface-active agents and germicides." The most surprising may be "sperm oil . . . contained in the lubricant used by some bakeries on the blades which cut dough into loaf sizes" (Friends of the Earth 1978, 116–19).

9. See chapter 9. See also Hohman 1928, 334–35. "John Adams, in his 'Diary,' records the substance of a conversation with William Pitt, in which he remarked to the English statesman that 'the fat of the spermaceti-whale gives the clearest and most beautiful flame of any substance that is known in nature, and we are surprised that you prefer darkness, and consequent robberies, burglaries, and murders in your streets, to the receiving, as a remittance, our spermaceti oil'" (Dow [1925] 1985, 35, quoting from *The Works of John Adams* 8:308–9).

10. "[A]mbergris was so rare that from 1836 to 1880 the entire American whaling fleet found less than a ton of the stuff" (Whipple 1979, 38). "[Ambergris] sold [for] from $200 to $600 a pound" (Decker 1973, 27). "Ambergris once fetched a price of $400 per ounce" (Sanderson 1956, 212). "[Ambergris] fetched an extremely high price, once as high as £5 per ounce, and in 1912 a whaling company was saved from liquidation by the discovery of a 450 kilogram lump of ambergris which was sold for £23,000" (Burton 1983, 121). "In 1878 the *Adeline Gibbs,* of New Bedford, secured a fabulous catch of 136 pounds [of ambergris], worth $23,000" (Hohman 1928, 148). In 1912 the U.S. Department of Commerce and Labor (table 59) reported the amount of ambergris "taken by American vessels and fishermen" over the previous twelve years as a total of sixty pounds, valued at $12,700 (the price per ounce varying from $18.75 in 1900 to $6.25 in 1907 and averaging $13.23).

only a few sperm whales, is unclear. Ambergris can unite, permanently and thoroughly, the various ingredients used in the manufacture of perfume.[11]

The oil of baleen whales could be obtained only by the trying-out process. In the nineteenth century, whale oil was used as a heavy-duty lubricant and as a fuel for "the old-fashioned vile-smelling, 'whale oil' lamp" (Tower 1907, 94). Until the middle of the century, despite its aesthetic drawbacks, its low price made whale oil the standard illuminant for many Americans. It was used also in leather tanning, in soap manufacture, and in paints and varnishes.

Whalebone was the plastic of its day. Little-used before 1830, it had become, by century's end, the most important source of revenue of the American whaling industry. Despite the claim that whalemen never killed a whale for bone alone, there is plentiful evidence that, after 1870 at least, the high prices of baleen induced some to cut out the whale's plates without trying out its blubber.[12] Whalebone prices continued to rise long after the demand for the industry's other products had declined. By the early twentieth century, however, spring steel proved a superior and cheaper substitute.

The major twentieth-century demand was for oil, but not for illumination. Techniques for hydrogenating whale oil were developed about the turn of the century, when margarine was being introduced into Europe (see chapter 13). Given the large and efficient dairy industry and competition from traditional vegetable oils such as cottonseed, soybean, sesame, sunflower, and peanut, margarine based on whale oil was rejected in America. Not so in Europe. By the 1930s 40 percent of the margarine and 30 percent of the lard produced in the United Kingdom were made from whale oil; in Germany, the combined figure for margarine and lard was 54 percent (Small 1971, 97).

In this century the whaling industry discovered an important secondary

11. "Ambergris is not so much an actual perfume substance as, like musk and civet, [used] to fix and improve other perfumes which are delicate and fugitive" (Durvelle 1923, 34). Ambergris is variously described as the result either of persistent indigestion or of unrelieved constipation. In addition to being manually removed from dead sperm whales, ambergris is found floating in the ocean or cast up on shore—presumably voided by living whales. The word means gray amber: "The English word *amber* was taken over from the French and the French got it from the late Latin *ambrum*, which derived from an Arabic word *anbar*. But that word also means 'whale.' The result was confusion between two products of the sea, which the French solved to some extent by speaking about *ambre jaune* (yellow amber) and *ambre gris*, the latter getting into English with only a slight change of spelling" (Ley 1951, 18).

12. Brandt 1940, 29. "The bark 'Andrew Hicks' of this port is reported at Montevideo from a successful cruise of four months on the Coast of Patagonia, having secured 7,000 lbs. of whalebone. The blubber of the whales secured was not rendered into oil" (*WSL* 28 December 1909). Changes in the ratio of whale oil to whalebone returned by American whalers indicate that this practice was not uncommon. "By 1908, petroleum had taken over from whale oil and whalers depended on the sale of whale bone. They would kill the whale, remove the head and discard the rest of the huge mammal" (Fulton 1988, 153–54). But see *A Year with a Whaler*, describing a voyage by the brig *Alexander* to the Western Arctic in 1890–91. Four whales were taken and three were tryed out (Burns 1919, 247).

The observed rise in the bone/oil ratio was also partly accounted for by a decline in gray whaling (baleen from gray whales was rarely taken) and a marked increase in the fraction of baleen whales taken that were bowheads, the premier bone whales.

source of income: the sale of meat, bones, and offal. Whale meat never figured prominently in the diets of most countries, but it was a source of protein for the Japanese—so important that at the end of World War II General Douglas MacArthur, in order to save U.S. taxpayers the cost of supplementing the Japanese diet, allowed the rebuilding of Japan's whaling fleet (Small 1971, 32). Until the Japanese economy recovered sufficiently to support a major flow of foreign imports, European hunters sold meat as well as bones and offal to the fertilizer and animal-feed industries. Thereafter, they too profited from the Japanese taste for whale meat.[13]

2.3 Hunting Whales: The Early Years

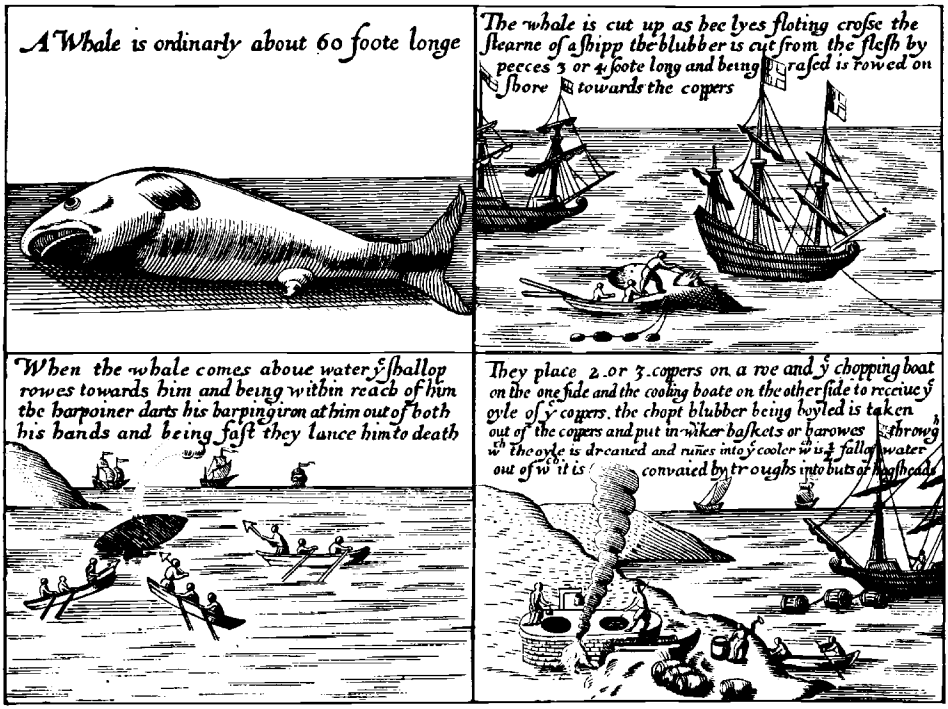
The history of whaling can be divided into three somewhat overlapping technological periods: (1) sail-powered whaling (both land-based and pelagic) from the twelfth through the nineteenth century; (2) modern land-based whaling from the late 1860s to the mid-1920s; and (3) modern pelagic whaling from 1926 to the present. Whaling's history can also be written in terms of the nations holding dominant positions: in the seventeenth century the Dutch, in the eighteenth century the British, in the nineteenth century the Americans, in the late nineteenth and early twentieth centuries the Norwegians, subsequently the Russians, and then the Japanese.

The Basques were whaling as early as the eighth century and "had by the fifteenth century developed something approaching a modern 'industry,' as local fishermen went out to attack whales breeding in the Bay of Biscay."[14] Major European efforts date from 1607 when Henry Hudson, searching for a northern route to China on behalf of the Muscovy Company, chanced upon the rich whaling grounds off the Spitsbergen Islands.[15] His report of vast numbers of whales (probably bowheads) in the bays of a region that is now called the *Greenland fishery* touched a responsive economic chord and brought British and Dutch whaling vessels north. In 1577 Queen Elizabeth had granted the Muscovy Company a charter that gave it a monopoly on the whale fishery worldwide, but, not surprisingly, many refused to recognize the charter. "[T]he

13. "By 1960 total Japanese production of whale meat exceeded 155,000 tons and was greater than her domestic production of beef . . . . Most of this production was frozen and sold as a competitor and substitute for beef, but at one-third the price. Tail flukes, for example, were considered a delicacy and eaten raw . . . . Thin belly blubber was sold as 'whale bacon' since it so closely resembled pork bacon. Even jaw cartilage was pickled and found a ready market. To anyone with culinary courage all this is not surprising because whale meat closely resembles beef both in color and texture" (Small 1971, 101). See also Cousteau and Paccalet 1988, 46.

14. Jackson 1978, 3. See also Scoresby [1820] 1969, 3–6. Spitsbergen had been visited in 1596 by two Dutch vessels, which explored the islands for almost two weeks. Hudson did little exploring, but his account of the whales led to the development of the whaling grounds (Conway 1904, 1, 2).

15. Ellis 1991, 98. Gordon Jackson (1978, 6), relying on Hudson's account of the voyage, says crewmen "also saw a 'mermaid'—long-haired, white and human-breasted at one end, and mackerel-speckled at the other—but it was the whales that excited most interest."



Whaling at Spitsbergen in 1611, from engravings in Hans Egede's *Beschryving van Oud-Groenland*, reengraved for *Churchill's Voyages* (London, 1745). Note that in these drawings Dutch crewmen are shown flensing a carcass on the water; in contrast, British crewmen towed the carcass to shore, and flensed it on dry land. The whale pictured here, "ordinarly about 60 foote longe," is *Balaena mysticetus*, the bowhead or Greenland right, although this representation isn't very accurate.

Reproduced courtesy of the Old Dartmouth Historical Society–New Bedford Whaling Museum.

British strove harder to exclude the Dutch . . . than they did to catch whales. Whalers sailed in battle-fleets until their extraordinary profits were swallowed up in extraordinary costs. A tacit agreement [in 1619] then gave the Dutch the north of Spitsbergen, while the British, by right of discovery, kept their original 'best' bays in the south—which soon proved to be the worst" (Jackson 1976, 47).

Spitsbergen whaling was shore-based. Ships established land bases there or on nearby Bear Island. When whales were seen or heard, small boats were rowed to the area. If an animal surfaced, a harpoon was thrown, and the animal was secured by a rope line. In order to add weight, other boats were hooked to the original boat, and thus to the whale. When the whale finally tired, it was killed with a lance. The carcass was towed to shore, where the blubber was

reduced to oil. When impurities had been removed, the oil was poured into casks and carried to a transport vessel (Jackson 1978, 9–11).

For 130 years, until the mid-eighteenth century, the Dutch dominated world whaling. Between 1699 and 1708, for example, the British dispatched only a handful of vessels, while the Dutch made 1,652 voyages to the whaling grounds (and caught 8,537 whales) (Scoresby [1820] 1969, 105). The Dutch advantage began with the favorable 1619 division, and was maintained because Dutch costs were low. Over decades of fishing for herring, the Dutch had developed skills needed to sail and hunt in northern waters, and their vessels were more suited to whaling than were those of the British. Despite the added transport costs, the Dutch could supply the British market with oil at prices below the domestic break-even point. Also, they were more aggressive in seeking out new hunting grounds. At a time when it should have been clear that the "Spitsbergen bay fishing phase of European whaling must give way to the Greenland pelagic phase," the British stuck resolutely to Spitsbergen (Jackson 1978, 26). The Dutch had already begun to exploit the resources of Greenland and Davis Strait.

In pelagic whaling, vessels provided homes for the men and bases for the whaleboats. The assault on the whale was similar to that of shore-based whaleboats, but the carcass was towed to the whaler. Given the size of a whale and the existing technology, it was impossible to lift the whale aboard; instead it was made fast to the vessel and flensed alongside. Once the blubber had been stripped, it was possible simply to cut it up and store it, rather than having to try it out (Jackson 1978, 32–33). Spoilage was not a crucial problem in far northern waters.

The British sent out only a few voyages in the early 1700s, but at midcentury the prospects of the industry brightened. Domestic demand for whale oil rose, as the textile industry grew and as urbanization pushed up the demand for street lighting.[16] Complementing the increase in demand, the government adopted policies to encourage the trade. Although the government had been paying a bounty to vessels that went to the Greenland fishery, the payment was small and had little effect. In 1750 the bounty was doubled; this step was at least partly responsible for a more than tenfold increase in the size of Britain's whaling fleet.

As the century wore on, political troubles between England and the Continental countries reduced Dutch access to British markets. The Dutch shifted away from whaling into other maritime pursuits, and the British industry benefitted. During the American Revolution, the Royal Navy crippled the colonial whaling fleet; at war's end, a protective tariff proved as effective as the navy at keeping American imports out of British markets. Protection, the final demise of Dutch efforts, and the British fleet's entry into pelagic whaling in Davis

16. The increased textile demand reflected both a substitution for rapeseed oil in cleaning the wool used in the manufacture of coarse fabrics, and a general increase in textile production.

Strait all nurtured the British industry. Continued prosperity, supported by increasing catches, marked British efforts until the first years of the nineteenth century's second decade.

2.4 Hunting Whales: The Early American Experience

Commercial whaling in North America dates from the first colonial settlements in the Northeast. Early American whalemen almost certainly inherited knowledge of Dutch and British methods. They may also have benefitted from the whaling techniques of Native Americans.[17]

Their first commercial ventures, however, did not require a working knowledge of either European or Indian practices. Settlers were introduced to the commerce of whaling by discovering dead whales that were washed ashore. A valuable property without a defined property right is an open invitation to a dispute—and disputes there were. They became so intense that legislators found it necessary to govern the disposal of so-called *drift whales*. Early in the seventeenth century, both the Plymouth and Massachusetts Bay colonies directed that proceeds from the sale of drift whales be divided into thirds: one-third to the colonial government, one-third to the town within whose jurisdiction the whale had come ashore, and one-third to the finder (Starbuck 1878, 6–7). In 1644 the Long Island town of Southampton adopted a more egalitarian plan. By law the men of the town were divided into four eleven-man teams. When a whale was found within town boundaries, two men were sent from each team to cut it up. The pieces were then divided equally among the residents of the town (the cutters getting double shares).[18]

In the last quarter of the century, colonists adopted a more active approach to the northern right-whale fishery. Instead of waiting for whales to wash ashore, residents of both Nantucket and Long Island began to search them out. At first they employed a technique that came to be called *inshore whaling*, involving cooperative effort by two sets of whalemen. Some were stationed on spars erected along the coast; their task was to spot whales. Others stood ready to man small boats and to pursue and kill whales. If the hunters were successful, they towed their catch to shore, where both groups worked together to process the carcass. It appears that inshore whaling remained profitable even after off-

17. "Although the Indian probably taught the white settlers the art of harassing a stranded whale, it does not follow that his primitive methods were always used thereafter. . . . Scammon's belief that the colonists followed the Indian method up to the early 1700's cannot be sustained as *Purchas* gives an account of English lines being used on 'harping irons' as early as 1613. It is possible, however, that the use of drags or 'droges'—thick boards or blocks of wood bent on the whale lines and tossed into the sea to serve as a check to the whale's progress—were adapted from the Indians" (Stackpole 1953, 16).

18. Tower 1907, 22. Church (1938, 14) says that "profits were shared by 'Every inhabitant with his child or servant that is above sixteen years of age,' those performing the labor receiving an extra share." The Church book contains an excellent collection of photographs of whaling vessels—at sea, in port, being refitted, and being broken up. There are pictures of various details of these vessels, and of the processes by which whales were converted to oil and bone.

shore whaling began, since the men of Nantucket and Sag Harbor employed the technique until at least 1760.[19]

The late seventeenth and early eighteenth centuries also saw the widespread innovation of *boat whaling*. Whalemen dispensed with shore-based lookouts and remained at sea for what were, by the standards of the day, extended periods. They outfitted their small boats with provisions to last a few weeks and with hogsheads to hold the blubber of one whale. When a whale was taken, it was towed to the nearest land and cut up, and the blubber was packed in barrels. The men then returned to port, unloaded, restocked the boat, and resumed the hunt. Gradually larger vessels (some as large as thirty tons) replaced the small whaleboats, and the length of unsuccessful voyages increased from two weeks to six weeks. The vessels still returned to port after each successful kill, and trying out remained an onshore activity. "In 1715 Nantucket had six sloops engaged in this fishery, producing oil to the value of £1,100 sterling" (Starbuck 1878, 20). Boat whaling continued throughout the eighteenth century.

Ultimately, however, both inshore and boat whaling gave way to *offshore whaling*. It began by accident. In 1712 Nantucketer Christopher Hussey "was cruising near the shore for Right whales, and was blown off some distance from the land by a strong northerly wind, where he fell in with a school of that species of whales [i.e., sperm], and killed one and brought it home. . . . This event gave new life to the business, for they immediately began with vessels of about thirty tons to whale out in the 'deep.'"[20] Hussey's vessel had been blown farther to sea than the routes sailed by most boat whalers, and his was the first American vessel to take a sperm whale.[21]

In offshore whaling the small boats were replaced by much larger vessels: sloops, schooners, and brigs. Whales continued to be hunted from the decks of sloops. Schooners and brigs, manned by crews of upwards of thirteen men, carried two whaleboats for the actual attack.[22] By the 1770s the hunting area had been extended from the North Atlantic to the Cape Verde Islands, the Ca-

19. Macy [1835] 1970, 31. On eastern Long Island inshore whaling continued into the present century: "Pop got his last whale in 1907, on George Washington's birthday, when he was seventy-seven years of age. He whaled after that, but he never fastened again. Uncle Gabe was his boat steerer that day, and there were four boats went off—three from 'Gansett and one from East Hampton" (Everett Joshua Edwards, quoted in Roueché [1953], 177). North Carolina whaling, which continued throughout the nineteenth century and into the twentieth, was exclusively a shore operation. It was also very small scale. See Simpson and Simpson 1990.

20. Macy [1835] 1970, 36. But see also Nelson 1959, 6. Nelson suggests that either it wasn't Christopher Hussey who made the first sperm-whale kill or the first kill took place before 1686, when the only local Christopher Hussey who would have been over the age of eight in 1712 died.

21. "Nantucketers were not entirely unfamiliar with the sperm whale. One had washed up on the island's southwest shore some years earlier, and the islanders had been agreeably surprised at the richness of its blubber. It produced an oil far superior to that of the right whale . . . . They had assumed, however, that this odd type of whale was extremely rare, if not some type of mutation. Hussey's discovery proved that the sperm whale was not rare; it was simply pelagic" (Whipple 1979, 49).

22. Crèvecoeur [1782] 1912, 121. For a distinguished treatment of labor in the colonial Massachusetts whale fishery, see Vickers 1981.

ribbean, and the Brazil Banks. Soon thereafter, New England vessels reached the South Atlantic, hunting the area between the Falkland Islands and Patagonia. In 1791 the ship *Rebecca* rounded Cape Horn and hunted the Pacific. "She measured 175 67/95 tons, which . . . was at that time considered so large that people came from Taunton and other surrounding towns to see 'the big ship.' . . . The command of so large a ship was deemed a great responsibility at this time" (Pease and Hough 1889, 69).

The extension of the hunting area depended on two innovations. The first was not revolutionary. It merely shifted the task of cutting up the whale from shore to the vessel itself. Crewmen removed the blubber at sea and stored it in barrels for the duration of the voyage. Upon the vessel's return to port, the blubber was taken to a refinery for processing. The revolutionary innovation was the transfer of the tryworks from the shore to the deck of the whaler. As long as the hunt was short and confined to the North Atlantic, there was no compelling reason to transfer trying out from shore to sea; when whalers began to hunt in warmer climates and to stay at sea for several years, spoilage became a problem. By the late eighteenth century, brick tryworks had been installed on most offshore whalers and on all whalers that operated in equatorial regions.

The economic considerations dictating the slow diffusion of shipboard trying out in the northern fleet are not well understood. There was always a race to strip the whale's carcass before it broke loose from the vessel or was devoured by sharks. The bowhead whale is relatively large, and often yielded seventy to ninety barrels of oil. Mounting a tryworks large enough to process a bowhead quickly would make a small vessel structurally unstable. Of course, the carcass could have been stripped, and the blubber temporarily stored and then tryed out in a small works over a longer period. Alternatively, larger vessels could have been introduced. The fact that neither happened suggests that short voyages yielding unprocessed blubber were more profitable than longer voyages employing either intermediate storage or larger vessels. Given the state of shipbuilding technology, cost considerations may well have limited vessel size and thus precluded a large tryworks, but a smaller tryworks with intermediate storage should have been affordable. Nonetheless, onboard tryworks diffused only slowly in the northern fleet. It is possible that, as long as vessel size was constrained, there were few benefits from multiyear hunting, and the extra cost of adding a small tryworks and intermediate storage facilities outweighed the potential benefits. The technique spread rapidly farther south, where spoilage was more of a problem. The smaller sperm whales hunted in the southern grounds could be processed quickly in a tryworks that did not destabilize a thirty-ton vessel (Credland 1982, 6).

By the time of the American Revolution, the tryworks had moved afloat also in the northern grounds. Vessel size had nearly doubled, and the actual attack had shifted to a whaleboat. Only one further step was necessary to complete the transition to the new technology. In early ocean whaling the harpoon was attached to log floats, designed to tire the whale as it swam away. The whale was large and the floats small; the oarsmen had to row hard and long to keep

up with the fleeing animal. All too often they tired before the whale did. In the 1760s floats were junked, and the harpoon was fastened to the whaleboat itself. Since a sperm whale can swim at more than twenty-five miles an hour and can dive to a depth of three thousand feet, whalemen—for obvious reasons—resisted the change, but with it the probability of capture rose substantially. There were to be a great many technical and institutional innovations over the ensuing 125 years, but the general outlines of *American-style whaling* were in place by the Revolutionary War.

Blessed with an expanding market in Great Britain, the colonial industry had grown rapidly in the two decades after 1750, but it suffered as a result of the war. In the 1775 Restraining Act, Parliament forbade colonial trade with any ports except those of the British Isles and the British West Indies, and embargoed colonial fishing along the entire Atlantic coast of North America. Neutral Nantucket was the only colonial port that continued to send out whaling vessels during the war; its citizens paid dearly. At the end of hostilities only two of the island's 151 whaling vessels remained. Fifteen had been lost at sea, and 134 had been destroyed by the British (Tower 1907, 40).

In an attempt to stimulate recovery, the Massachusetts legislature offered a bounty on whale products returned by vessels owned and operated by state residents. The measure was largely ineffective because the demand for whale products had declined; during the war, the supply of sperm candles had been effectively cut off, and consumers had found tallow candles an adequate substitute (Starbuck 1878, 78–79). Eventually the wealthy returned to sperm candles and the poor found whale oil lamps a better source of light than tallow candles, but readjustment was not instantaneous. Moreover, a prohibitive British tariff closed off the American whalemen's largest prewar market. Given the decline in both domestic and foreign demand, even the state bounty was insufficient to attract new entrants.

2.5 Nineteenth-Century American Whaling

Between 1794 and 1799 the entire American whaling fleet averaged about three thousand tons. By 1803 that figure had quadrupled, but the Embargo Act of 1807 and the War of 1812 proved as devastating as had the Revolution. In 1814 the fleet totaled only 562 tons (Tower 1907, 121); it had been reduced to "[s]everal small vessels from Nantucket . . . whaling on the shoals" (Starbuck 1878, 216). The effect of the embargo was indirect. Whaling vessels were not prohibited from leaving port, so long as they did not enter foreign ports, but the act did prohibit the export of American products, including whale products.[23] The effect of the war was direct. Of the ten whaling vessels that sailed

23. An Act Laying an Embargo on All Ships and Vessels in the Ports and Harbors of the United States, 1807, *Stats. at Large of USA* 2:451–53. "[T]he Embargo . . . again eclipsed the fortunes of the whalemen. Returning vessels, instead of being discharged, overhauled, provisioned, and sent back to sea within a few weeks, remained restless at anchor or tied up to their wharves for indefinite periods" (Hohman 1928, 38).

from Nantucket in 1812 and the two that sailed in 1813, the British fleet sank or captured three. Three others returned to port on hearing of the war (Starbuck 1878, 214–17).

Peace brought a dramatic reversal. Following a brief period of reconstruction, American whaling entered a four-decade period of such growth and prosperity that it is known as the *Golden Age*. Demand for whale products grew as the populations of Europe and America increased and industrialization quickened. At the same time, supply rose as a new generation of whalemen discovered, opened, explored, and exploited a series of hunting grounds ranging from the South Pacific to the Seychelles and from Japan to the Western Arctic. Between 1815–19 and 1855–59 American output of sperm oil increased almost fivefold, of whale oil more than elevenfold, and of whalebone more than fortyfold. Over a similar period, the real value of the industry's output rose by more than a factor of eleven.[24]

Although never as important as, for example, brewing or cotton textiles, the whale fishery had a substantial commercial stature in the decades before the Civil War. In 1860 it was on a par with such endeavors as calico printing, carpet weaving, and hosiery knitting (U.S. Census Office 1865, 734–35, 737; 1866, 550). Ten years later, the fishery had declined in both absolute and relative terms, but it still constituted an important part of the economies of Massachusetts and New York, and it bulked large in the economic life of a number of southern New England ports.

In addition to the increased numbers of whalers and whalemen, the industry's growth during the Golden Age had three other dimensions: the size of whaling vessels increased, more grounds were hunted, and more towns sent out whaling vessels. During the eighteenth century, whalemen had relied primarily on sloops, schooners, and brigs; as captains ventured farther from their New England bases, larger and stauncher vessels were needed. Among whalers based in New Bedford, for example, the last sloop cleared port in 1817. Brigs and schooners continued to operate, and even became significant again toward the end of the nineteenth century, but together they represented only 5.6 percent of the New Bedford vessels sailing between 1820 and 1860.

The smaller vessels were initially replaced by ships; after a few decades ships were, in turn, replaced by barks. The whaling ship was introduced to New Bedford in 1791; adoption was immediate and widespread. The first whaling voyage by a bark dates from 1806, but widespread innovation was delayed nearly forty years.[25] It wasn't until the 1850s that the bark became common. While a part of the increase in average vessel size can be traced to the shift to ships and barks, the average size of each class of vessel increased

24. The change in real value of output is measured between 1816–20 and 1856–60. See chapters 1 and 9.

25. The *Hero*, built as a 162-ton brig in Westport, Massachusetts, in 1801, was rerigged and sailed from New Bedford as a bark in 1806 and 1808. She was broken up in Chile in 1813 (Work Projects Administration 1940, 1:144).

as well. The tonnage of New Bedford ships increased by almost exactly one-third, between 1816–25 and 1886–95, and that of barks by almost one-half, between 1826–35 and 1896–05.

The new vessels made it possible to undertake longer voyages, and major whaling grounds were explored. In 1818 the abundant sperm-whale grounds in the central Pacific were discovered; whalemen were quick to abandon the onshore grounds near the coast of Chile for the new offshore grounds a thousand miles to the west (Stackpole 1953, 266). Productive sperm-whale grounds were also discovered off the coast of Japan in 1820 and in the Indian Ocean between Madagascar and the Persian Gulf in 1823.[26]

The 1835 discovery of the Kodiak grounds in the Gulf of Alaska opened the right and bowhead grounds of the North Pacific. Both the size and the productivity of the North Pacific grounds increased with the discovery of large groups of whales near Kamchatka in 1843 and the penetration of the Sea of Okhotsk in 1845. Three years later American whalemen sailed through the Aleutian barrier and into the Bering Strait and the Western Arctic Ocean (Ellis 1991, 223–27; Bockstoce 1986, 29).

Three developments invigorated whaling in the Eastern Arctic at midcentury. The first was the discovery in 1840 of Cumberland Inlet, a bay at the southeastern corner of Baffin Island in which whales congregated. The second was the introduction in 1851 of *wintering*. Americans began to remain through the winter, in order to have an early start at whaling in the spring. In this stage connections with the Inuit became intimate; the whites and the Inuit lived together through the winter, with the Inuit providing a substantial fraction of whaling crews and the whalemen augmenting their income by participating in the fur trade with them. Some permanent bases were set up, and there was a return, in part, to inshore whaling. Most important, whalemen eventually found their way into Hudson Bay, where in 1860 they opened Roes Welcome Sound, one of the last great eastern whaling grounds (Eber 1989, 22–23).

The Pacific Ocean was the most frequent destination of New Bedford whaling vessels (see table 2.4). Over the ninety-year period 1816–1905, almost one-half of all voyages set out for the Pacific, and in seven of the period's eighteen five-year intervals the Pacific drew more than one-half. The Atlantic was second in popularity, with more than one-quarter of all New Bedford voyages and five five-year periods in which more than one-half went there. Notice, however, that the Atlantic was more important early in the period than later. In 1846–55, for instance, the Atlantic drew only 6.3 percent of New Bedford voyages, to the Pacific's 58.5.

Along with the increase in the number of grounds, there was an expansion in the number of ports that whaling vessels called home (see table 2.5). At the turn of the century, only Nantucket and New Bedford regularly sent out whal-

26. Stackpole 1953, 268. The Indian Ocean was first explored by the American whaler *Asia* in 1792.

"The Artic Elephant," from a sketchbook kept on the bark *Orray Taft* of New Bedford, circa 1865. To pass the time during the long nights, whalemen wintering in the Arctic held dances and performed plays of various kinds, to which neighboring Inuit—collaborators in their whaling and sealing ventures—were invited. "Crew members of five vessels wintering at Marble Island, 1864–65, formed the Hudson Bay Minstrels, a troupe that performed a repertoire ranging from tragedy to rollicking skits" (Martin 1983, 46).

ers. In 1820 there were sixteen such ports, in 1835 thirty-two, in 1841 thirty-eight, of which the principal were New Bedford, Nantucket, New London, Fairhaven, and Sag Harbor (Starbuck 1878, 196, 230–36, 314–22, 372–86). From the early 1820s until almost the end of American whaling, New Bedford was home to the largest portion of the fleet; about one-half of all American whalers listed it as their home port.

The industry began to decline in the mid-1850s; the Civil War drew the final curtain on the Golden Age.[27] Forty-six slow-sailing whalers were captured or destroyed by new, fast Confederate cruisers. Another forty, whose owners were afraid to risk whaling voyages, were sold to the federal government, filled with stones, and sunk in a futile attempt to block southern ports.[28] During both the Revolutionary War and the War of 1812 the industry had been laid waste. The damage wrought by the *Alabama* and *Shenandoah* was probably no greater, in relative terms, than that by the British in 1775 and in 1812, but this time there was a major difference in what ensued. In both of the previous periods, the fleet was rebuilt at war's end; after Appomattox, the contraction continued. The average tonnage of the fleet in the war years 1861–65 was 47 percent below the level of the previous quinquennium. That rate of decline was not again reached until the interval 1891–95 to 1896–1900, but the downward slide was persistent (see table 1.1). By 1901–5 the annual average tonnage of the American whaling fleet—more than 208,000 tons in 1846–50—was only 10,462. The decline proceeded almost twice as quickly as the previous expansion. By 1876–80 average annual tonnage had fallen by 78 percent from its peak in 1846–50, and the industry was no larger than it had been fifty years earlier.

Revenue figures also show an industry in decline, but the fiscal regression was less rapid. The average annual real value of the industry's output reached $9,630,201 in 1851–55, and still stood at $8,752,811 in 1856–60 (see table 1.2). Not surprisingly, the war's impact on revenues was almost as devastating as its impact on men and vessels. Between 1861 and 1865 proceeds from the sale of oil and bone averaged only $4,623,194 per year—a decline over the previous quinquennium of 47 percent. Thereafter, however, the fall in revenue was, on average, less than the fall in tonnage. In the three succeeding quinquennia the ratios of the percentage decline in revenue to the percentage decline in tonnage were 0.55, 1.10, and 0.06, respectively.

That relatively rosy picture reflects an increase in revenue per ton from a low of $44.73 in the last five peacetime years to a high of $87.48 in 1891–95. Two factors were at work. At the more fundamental level, productivity in whaling increased—a reflection of rapid technical and institutional innovation. The fiscal effects of productivity increases were magnified by continued strength in the demand for whalebone, which, given declines in output, led to an escala-

27. The size of the American fleet reached its peak in the quinquennium 1846–50, but the peak in the real value of the catch was not reached until 1851–55. See tables 1.1 and 1.2.

28. The Eastern Arctic fleet continued to operate. "The vessels that were wintering in Hudson Bay had no need to fear Confederate raiders" (Stackpole 1969, 20).

Table 2.4 **Destinations of New Bedford Whaling Voyages, Sailing Years 1816–1905 (percentages)**

	Atlantic	Eastern Arctic	Indian	Pacific	Western Arctic[a]
Five-year period					
1816–20	62.3	1.9	0.9	34.9	0
1821–25	47.7	1.3	0	51.0	0
1826–30	53.2	0.5	3.2	43.2	0
1831–35	50.2	0	3.4	45.2	0
1836–40	32.4	0	17.9	46.2	0
1841–45	7.9	0	22.6	53.8	0
1846–50	3.0	0	15.8	62.8	6.8
1851–55	8.7	0	12.6	55.5	19.0
1856–60	5.5	1.0	15.6	57.0	14.6
1861–65	32.3	7.1	8.3	27.4	19.2
1866–70	30.7	4.6	17.6	34.0	11.8
1871–75	39.1	4.1	17.2	31.4	8.3
1876–80	58.0	5.4	3.6	23.7	9.4
1881–85	34.0	3.8	0	48.8	12.0
1886–90	21.0	3.5	4.2	71.3	0
1891–95	33.0	6.4	0	59.6	1.1
1896–1900	50.0	9.7	0	40.3	0
1901–5	49.2	3.2	4.8	41.3	1.6
Ten-year period					
1816–25	53.7	1.5	0.4	44.4	0
1826–35	51.4	0.2	3.3	44.4	0
1836–45	19.3	0	20.4	50.3	0
1846–55	6.3	0	13.9	58.5	13.9
1856–65	16.3	3.5	12.7	45.2	16.4
1866–75	34.2	4.4	17.4	32.9	10.3
1876–85	46.4	4.6	1.8	35.8	10.6
1886–95	25.7	4.6	2.5	66.7	0.4
1896–1905	49.6	6.7	2.2	40.7	0.7
Twenty-year period					
1816–35	52.1	0.6	2.4	44.4	0
1836–55	12.4	0	17.0	54.6	7.4
1856–75	23.1	3.8	14.5	40.5	14.1
1876–95	39.1	4.6	2.1	46.7	7.0
Twenty-five-year period					
1816–40	46.0	0.4	7.2	44.9	0
1841–65	10.0	1.2	15.3	53.0	11.8
1866–90	37.6	4.4	8.6	39.8	9.0
Ninety-year period					
1816–1905	27.6	2.0	10.9	47.6	7.4
The last sixty years					
1846–1905	22.9	2.6	10.7	48.1	11.7
The last forty-five years					
1861–1905	37.5	4.7	7.4	39.4	9.5

Source: Voyages Data Set (see chapter 3).

Notes: The grouping of specific destinations into general hunting grounds is reflected in the variable GROUND. For a list of specific and grouped destinations, see appendix 3A. Percentages of voyages to "mixed" grounds (e.g., Atlantic and Indian) are omitted from the table; this is why some rows do not sum to 100 percent. Voyages for which destinations are unknown are omitted from the totals on which percentages are computed. For annual numbers of voyages to the various grounds, see table 3.5.

[a]The Western Arctic was opened to whaling in 1848.

Table 2.5 **Whaling Voyages from American Ports in the Nineteenth Century, Sailing Years 1800–1899**

	1800s	1810s	1820s	1830s	1840s	1850s	1860s	1870s	1880s	1890s	Total
California											
San Francisco	0	0	0	0	0	46	7	18	348	269	688
Connecticut											
Bridgeport	0	0	0	13	10	0	0	0	0	0	23
East Haddam	0	0	0	3	0	0	0	0	0	0	3
Groton	0	0	0	0	0	0	2	0	0	0	2
Mystic	0	0	0	21	52	30	2	0	0	0	105
New Haven	0	0	3	0	0	1	0	0	0	0	4
New London	11	1	59	175	255	182	86	68	28	4	869
Norwich	1	0	0	2	0	0	0	0	0	0	3
Stonington	0	0	5	37	82	36	1	1	8	1	171
Delaware											
Wilmington	0	0	0	10	3	0	0	0	0	0	13
Maine											
Bucksport	0	0	0	0	1	0	0	0	0	0	1
Portland	0	0	0	2	0	0	0	0	0	0	2
Wiscasset	0	0	0	2	0	0	0	0	0	0	2
Massachusetts											
Barnstable	0	0	0	0	1	0	0	0	0	0	1
Beverly	0	0	0	0	1	20	10	2	0	0	33
Boston	1	5	18	4	15	6	34	27	16	7	133
Chilmark	0	0	0	0	1	0	0	0	0	0	1
Dartmouth	0	1	6	15	4	26	11	4	0	0	67
Dorchester	0	0	0	8	0	0	0	0	0	0	8
Duxbury	0	0	0	0	1	0	0	0	0	0	1
Edgartown	0	3	24	25	34	43	17	8	25	3	182
Fairhaven	0	11	52	154	144	118	51	10	0	0	540
Fall River	0	0	0	21	28	11	1	0	0	0	61
Falmouth	0	0	6	26	16	6	0	0	0	0	54
Freetown	0	0	0	0	3	0	0	0	0	0	3
Gloucester	0	0	0	3	1	1	0	0	0	0	5
Holmes Hole	0	1	0	8	12	14	1	0	0	0	36
Lynn	0	0	0	24	9	2	0	0	0	0	35
Marblehead	0	0	1	1	0	0	0	0	0	0	2
Mattapoisett	0	0	0	0	48	69	9	0	0	0	126
Nantucket	182	269	280	251	190	114	26	0	0	0	1,312
New Bedford	104	92	354	672	760	915	529	368	209	91	4,094
Newburyport	0	0	0	7	3	0	6	0	0	0	16
Orleans	0	0	0	0	0	26	3	0	0	0	29
Plymouth	0	0	6	14	24	0	0	0	0	0	44
Provincetown	0	0	29	11	111	211	253	144	96	51	906
Quincy	0	0	0	0	1	0	0	0	0	0	1
Rochester	0	1	9	58	10	0	0	0	0	0	78
Salem	0	1	3	51	13	5	11	0	0	0	84
Sandwich	0	0	0	0	0	12	1	0	0	0	13
Sippican	0	0	0	0	19	21	37	16	6	0	99
Somerset	0	0	0	1	8	0	0	0	0	0	9

(continued)

Table 2.5 (continued)

	1800s	1810s	1820s	1830s	1840s	1850s	1860s	1870s	1880s	1890s	Total
Tisbury	0	0	0	0	0	0	2	0	0	0	2
Truro	0	0	0	0	0	4	0	0	0	0	4
Wareham	0	1	0	5	19	3	0	0	0	0	28
Wellfleet	0	0	0	0	0	0	2	0	0	0	2
Westport	0	5	35	42	70	77	37	15	0	0	281
Yarmouth	0	0	0	0	2	0	0	0	0	0	2
New Hampshire											
Portsmouth	0	0	0	10	2	0	0	0	0	0	12
New Jersey											
Newark	0	0	0	4	1	0	0	0	0	0	5
Perth Amboy	0	0	1	0	0	0	0	0	0	0	1
New York											
Cold Spring	0	0	0	3	23	12	0	0	0	0	38
Greenport	0	0	0	25	43	25	0	0	0	0	93
Hudson	4	5	0	36	3	0	0	0	0	0	48
Newburgh	0	0	0	10	0	0	0	0	0	0	10
New Suffolk	0	0	0	2	6	1	0	0	0	0	9
New York	0	2	25	27	5	0	7	4	0	0	70
Poughkeepsie	0	0	0	14	5	0	0	0	0	0	19
Sag Harbor	18	21	82	183	186	67	25	1	0	0	583
North Carolina											
Edenton	0	0	0	1	0	0	0	0	0	0	1
Pennsylvania											
Philadelphia	0	1	1	0	0	0	0	0	0	0	2
Rhode Island											
Bristol	0	0	8	52	21	0	0	0	0	0	81
Greenwich	3	1	0	0	0	0	0	0	0	0	4
Newport	0	1	15	31	31	10	0	0	0	0	88
Portsmouth	0	0	1	0	0	0	0	0	0	0	1
Providence	0	0	2	9	20	2	0	0	0	0	33
Tiverton	0	0	1	0	0	0	0	0	0	0	1
Warren	0	0	6	66	66	38	2	0	0	0	178
Total	324	422	1,032	2,139	2,363	2,157	1,173	686	736	426	11,455

Sources: The table is compiled from voyage records in Starbuck 1878; Hegarty 1959.

tion in the real price of a pound of whalebone from $0.79 in 1866 to $6.03 in 1903.[29]

The industry was in sharp decline, but not yet moribund; two important structural changes marked its last decades. In 1869 the transcontinental railroad was completed, with a major impact on the remnants of the industry. With the link-up of the Central Pacific and the Union Pacific, a number of vessels chose San Francisco as their permanent base of operations. In 1881–85 San

29. See table 9A.3. Between 1871–75 and 1901–5 annual whalebone output fell by 72 percent, on average. Whale oil output fell even farther, by 93 percent. Hunters were concentrating on bone. See table 9B.1.

Francisco was home to about 10 percent of total American whaling tonnage; its share almost quadrupled by 1901–5. Also, from the early 1870s San Francisco became an ever more important transshipment and refitting station for the declining number of New England vessels operating in the western grounds (Tower 1907, 121, 129).

As the San Francisco fleet expanded, many of the vessels managed from New Bedford concentrated their activities in the Atlantic, in particular in Hudson Bay and Davis Strait. Others were based in San Francisco, making repeated voyages to the Western Arctic without being recalled to New Bedford. Given the improvements in transportation and communications, by the 1880s it was possible for agents to operate from New Bedford with their vessels based three thousand miles away.

At the same time that San Francisco was becoming an important whaling port, wind-driven whalers were coming under competitive pressure from steam-powered whalers. The British had been using them since 1857, but the Americans were slow to adopt the new technology (Jenkins 1921, 239). When steam was finally introduced to the American fleet in 1880, it produced a technical revolution in the Western Arctic. Steam barks cruised at nine, rather than six, knots and, since they didn't have to wait for the vagaries of nature, could call on those nine knots at any time. In addition, steam-powered vessels were much more maneuverable (Jenkins 1921, 246). No longer was the sudden freeze a deadly threat. The new vessels could remain in the Arctic for longer periods; if a freeze threatened, it took them less time to run to safety, and they could maneuver between icebergs and ice packs. It is said that it took a sailing vessel "a month to sixty days" to traverse the ice of Davis Strait; a steamer plowed through it "in as many hours" (Jenkins 1921, 259).

Although steamers had their advantages, they did not immediately replace sailing vessels. The average steam bark cost three times as much as the average sailing bark. Since coal was expensive and the wages of skilled mechanics high, operating costs were steep as well. Consequently, steamers accounted for only three-tenths of the voyages that were made from San Francisco between 1885 and 1905.[30] Over time, however, they became more important. In 1890 there were three and one-half times as many voyages by sailing barks as by steam barks; in 1897 steamers accounted for one-half the annual voyages. In a comparison based on tonnage, steamers did even better. They were, on average, two hundred tons larger than sailing barks. In 1890 the total San Francisco tonnage accounted for by sailing barks was equal to that of steam barks; in 1905 the tonnage of steamers was two-thirds again as great.

The structure of the voyage changed as well. Unlike New Bedford voyages that, after 1880, lasted an average of three years, those departing from San Francisco lasted initially less than one. In the 1880s San Francisco vessels left

30. The San Francisco returns were compiled from Hegarty 1959. The count includes four gasoline schooners, which had the same advantages over sail as did the steamers.

port in November or December. For three months they cruised the North Pacific waiting for the ice to clear. For eight months they hunted in the Western Arctic, returning in late October to offload and restock. In the early 1890s steamers began to winter in the Arctic. At the end of a season they sent their cargoes back to San Francisco, presumably by tender,[31] and anchored in the mouth of the Mackenzie River. Since facilities there were very limited, most returned home after just one winter.

The San Francisco fleet was directed almost exclusively to the Arctic. Of the 753 whaling voyages that left San Francisco from 1880 through 1910, 650 (more than 86 percent) were recorded as sailing to the North Pacific; this almost surely meant they would hunt the Arctic.[32] It remained a very productive and profitable hunting area throughout the nineteenth century. These vessels were primarily hunting bowheads in the Western Arctic, and their northern courses seldom intersected sperm whales' migratory paths. After 1896, however, as more voyages went to the Japanese and Okhotsk grounds, vessels moved closer to sperm-whaling grounds, and the quantity of sperm oil returned to San Francisco increased.

As San Francisco grew, New Bedford declined. The Arctic, Pacific, and Indian grounds were all but abandoned by vessels berthed there, which concentrated in the Atlantic and Hudson Bay. A fleet that had traditionally committed roughly the same fraction of its vessels to the right- as to the sperm-whale fishery became an Atlantic sperm-whaling enterprise, although some rights were returned when captains began to hunt the Hudson Bay grounds.

Steamers were introduced into the New Bedford fleet in 1880, but were never profitable in the Atlantic; within five years none was left. As the New Bedford fleet shrank, the smaller vessels that had dominated East Coast whaling in the eighteenth century reemerged. In 1900 schooners made five of the six New Bedford voyages. By concentrating in the Atlantic and employing smaller vessels, the New Bedford fleet remained profitable. Of course, total profits are equal to the profit rate times the amount invested, and the city's fleet at the turn of the century was less than one-fiftieth its former size.

Nor would the San Francisco effort last much longer. From 1905 until World War I, on average only seven vessels left that port each year. Both San Francisco and New Bedford continued to send out the occasional whaler until the third decade of the century, but when *Down to the Sea in Ships*—a motion picture filmed aboard the New Bedford whaler *Gaspe*—was released in 1922, it was an historical narrative, not a newsreel (Hegarty 1959, 46).

31. "The first regular use of tenders in the Arctic may well have been made by the New Bedford firms of Ivory H. Bartlett and Son and William Phillips and Son. They sent north the barks *Legal Tender* and *Jenny Pitts*, in 1877. . . . The experiment was successful. The *Legal Tender*'s responsibilities increased each year until in 1881 she was carrying cargo south for the entire whaling fleet" (Bockstoce 1986, 223).

32. For this period there is one recorded voyage to the Atlantic, two to the South Pacific, twelve to the Pacific, eighty to Japan and the Okhotsk grounds, one to Bristol Bay, and seven with unknown destinations (Hegarty 1959, 11–41).

2.6 Life on a Nineteenth-Century American Whaler

Life on a nineteenth-century whaler depended on the type and size of the vessel, the hunting grounds visited, the length of the voyage, and the characters of the agent and captain. Still, there were some constants.

First was the question of space. Whalers were typically stout and square, but the space aboard was taken up by supplies, spare sails and other elements of outfits, and of course oil and bone. Not much room was left for the men, and it was not shared out equally. Forward in the triangular-shaped forecastle were the sleeping quarters of the seamen and greenhands. In many whalers the vertical space was so limited that only the smallest crewmen could stand upright. Secured to the bulkheads were wooden bunks, double-decked, and before each pair of bunks lay the sea chests of their occupants. Light came exclusively from a single hatch, which had to be closed during storms, and even when open let in little light. The forecastle was dark and malodorous.

The boatsteerers—who were farther astern—were better off, but still had little space. Here is Ellsworth West's account of his quarters aboard the *James Arnold* (1965, 10).

> The quarters were tight, measuring twelve by six with double-tiered bunks built along two sides. What air and light we got came through the booby hatch which was set on top of the after hatch on deck, and was only open in fair weather. The only added conveniences were a table, a cupboard for dishes, and an oil lamp suspended from a beam over the table that smoked and smelled to high heaven. . . . And that was the way six of us, four boatsteerers, the cooper and ship's boy, lived for nearly four years.

The description suggests that there were four bunks for six crewmen. Since two were always on watch, four bunks could handle six.

Farther astern were the quarters of the mates, and, under the poop, the stateroom of the captain. These staterooms were often roomy. At least it is true that a captain sometimes brought his wife and children with him, and at least one wife brought a parlor organ.[33] Whether the presence of the captain's wife cheered or disgruntled the crew doubtless depended on her personality; some are reported to have darned socks for seamen, others, to have interfered with their husbands' orders and earned the crews' contempt.

33. Whiting and Hough (1953, vi-vii) list thirty-six wives who went whaling, and their list is not complete. *Whaling Logbooks and Journals* (Sherman 1986) cites at least forty-nine voyage diaries kept by wives or daughters of whaling captains. Pages 4–6 of Whiting and Hough give a good description of the captain's quarters. See also Williams 1964. The book contains, inter alia, the journal of Eliza Azelia Williams. Here is how she describes the birth of her first child: "The 10th of January we had a gale of wind that lasted till the 12th, the heaviest gale we have had since we left home. On the 11th the foresail was carried away. . . . We have a fine healthy Boy, born on the 12th, five days before we got into port" (38). This is the first mention in the journal of her pregnancy. The child was probably delivered by her husband. See also Lawrence, *The Captain's Best Mate: The Journal of Mary Chipman Lawrence on the Whaler Addison, 1856–1860* (1966)—a delightful book.

"The Devil Carrying Off Old Coon," from a journal kept by R. G. N. Swift on the ship *Contest* of New Bedford, circa 1867. James Coon was the captain of the *Contest.*

Reproduced courtesy of The Kendall Whaling Museum, Sharon, Massachusetts, U.S.A.

The crew's food seems to have been almost uniformly bad and, when the agent or captain was mean, in short supply. Its main elements were hardtack, potatoes (to fight off scurvy), and salt pork or beef. Sometimes soups were served, and often, on Sunday, plum duff, a kind of flour pudding. Molasses also figured in the diet, another element intended to preserve good health.

Fresh fruits, vegetables, and meats were brought aboard whenever port was made, and some whalers carried poultry, pigs, or goats for fresh meat. Fish were sometimes caught, porpoises harpooned, whale steaks cut from captured whales; in the Arctic, seals were hunted for their meat and skins. The extent to which these sources of better food supplied the forecastle, as well as the officers' quarters, varied from vessel to vessel.

Few men were needed to work the vessel, but the rest could be kept busy by a captain obsessed with cleanliness: decks could be constantly washed down, brass polished, paint scraped and renewed. Still, the elaborate scrimshaw articles produced by whalemen and the complaints of tedium indicate that there was generally too little to fill the days of the seamen, and boredom was their bitter enemy. When whalers met at sea, they often stopped to visit—to hold a

gam, as whalemen put it.[34] Half of each vessel's crewmen would row to the other vessels; news was exchanged, stories told, songs sung, and dances danced exuberantly—a change in the daily routine.

Boredom made whalemen look forward to the hunt, but then their labor increased to a scarcely bearable pitch.

> A whaleman's life is one either of dull monotony, or of thrilling excitement, and of hard labour. . . . I have often felt so desirous of obtaining a whale, that I have pulled at the oar until I could not see: and yet the moment after the whale was dead, I would have rejoiced to see him sink, that I might not be obliged to perform the labour of taking care of him. . . . I have left the ship at ten o'clock in the morning, and rowed hard in the boat until four o'clock in the afternoon; and then have worked at the windlass in cutting in the whale until three o'clock the next morning. (Ely 1971, 48, 59)

In the Arctic the monotony characteristic of whaling voyages was enhanced by the "grim knowledge that [the whalemen] were in for six months of the same without relief" (West 1965, 58). "The same," in this case, was—in addition to boredom—bone-chilling cold, short, gray days, and constant winds. "On board all of these vessels the amusements usually gotten up by Arctic voyagers for maintaining the cheerfulness and health of their crews were at this time in full play, and were generally of a theatrical character, varied by masked balls and by several forms of the dance" (Eber 1989, 27).

One of the leading complaints of whalemen was that the outfits with which they were provided wore out so quickly that they were obliged to resort to the captain's slop chest—that is, they were obliged to buy clothing on credit, and at premium prices, so that when they returned home some of them were paid off with what they called the iron dollar: their debts cancelled their earnings. The scale of the slop chest of the ship *Florida* (table 2.6) suggests the extent to which men had to be reoutfitted on the voyage.

Even more extensive reoutfitting was required on Arctic ventures. By Burns's account (1919, 119–20):

> As soon as we struck the ice the captain's slop-chest was broken open and skin clothes were dealt out to the men. Accoutred for cold weather, I wore woolen underwear and yarn socks next my flesh; an outer shirt of squirrel skin with hood or parka; pants and vest of hair seal of the color and sheen of newly minted silver; a coat of dogskin that reached almost to my knees; a dogskin cap; deerskin socks with the hair inside over my yarn socks; walrus-hide boots and walrus-hide mittens over yarn mittens. The walrus-boots were fastened by a gathering string just below the knees and by thongs of tanned skin about the ankle. Some of the men wore heavy reindeer-skin coats. The skin clothes worn by the officers and boat-steerers were of finer quality and more pretentious. Perhaps the handsomest costume was that of

34. *Gam* also means a gathering of whales.

Table 2.6 Contents of the Slop Chest of the Ship *Florida*, 1858

20 heavy Bay State jackets	20 guernsey frocks
14 reefing jackets	48 denim frocks
12 monkey jackets	24 neck comforters
30 pair woolen trousers	24 sou'westers
30 pair heavy satinet trousers	24 round top hats
12 pair duck trousers	72 palm-leaf hats
75 pair best denim trousers	8 tarred hats
18 red flannel shirts	36 Russian caps
60 St. Kersey shirts	72 spools of linen thread
40 cotton shirts	500 needles
60 fancy calico shirts	1 bundle yarn
74 pair thick boots	24 sheaths and belts
50 pair hip brogans	36 sheath knives (coca handles)
100 pair pegged pumps	96 knives
40 pair slippers	15 pair blankets
75 St. Kersey undershirts	15 bed comforters
36 pair blue mixed socks	48 pots and pans
36 pair Nova Scotia socks	48 iron spoons
90 pair Falmouth stockings	8 boxes no. 1 tobacco
75 pair St. Kersey drawers	11 boxes no. 2 tobacco
4 pair red flannel drawers	10,000 Cuba sixes
74 pair mittens	1,000 Spanish cigars

Source: Adapted from Williams 1964, 212–14.

Little Johnny. It consisted of coat, vest, and trousers of silvery hair-seal, with the edges of the coat trimmed with the snowwhite fur of fur-seal pups. With this he wore a black dogskin cap and walrus-hide boots.

Cramped quarters, bad food, tropical heat and Arctic cold, boredom, the slop chest—it is no wonder that desertion was a major problem in the whaling fleet.

2.7 Modern Whaling

The era of *modern whaling* began in the late 1860s, when Svend Foyn, an experienced Norwegian sealing captain, introduced to the whale fishery steam-driven catcher vessels, armed with guns that launched harpoons with explosive heads. This pair of innovations allowed whalemen to kill the faster rorquals. The catcher's engine drove a winch powerful enough to raise a whale that sank after it was killed—guaranteeing that, if the whale could be killed, its carcass could be saved. Once recovered, the carcass was towed to a land station for processing. Foyn and his compatriots began hunting fin whales in Norwegian waters. From there they moved on to Iceland, North America, Japan, and Russia.

Early in the twentieth century the last great whaling ground, the Antarctic, was opened, and virtually the entire industry shifted south. Whales were hunted by small motor-powered vessels, but the blubber was processed ashore.

The reintroduction of the factory ship by the Norwegians in the 1920s severed, once and for all, the cord that had tied the catcher vessel to its shore station. The crucial development was the invention of a stern slipway that permitted the carcass of even a blue whale to be winched aboard.[35] This made it possible to complete the entire rendering process—the extraction of the oil and the treatment of the flesh, bones, and entrails—on board the ship.

The move from shore to ship opened the entire Antarctic to whaling. Within a few years the technology was widely adopted, and almost the entire industry was again afloat. Factory ships were very productive; because whalemen could follow whales to their feeding grounds, the size of the catch increased dramatically. The floating processing plants, at thirteen to twenty thousand tons with crews of up to four hundred men, dwarfed the vessels of the Golden Age. The catcher boats (counterparts of nineteenth-century whaleboats), at three to seven hundred tons, were roughly the size of the largest whalers of the previous century. New Bedford vessels had carried from two to six oar-powered whaleboats; modern factory ships mothered ten to fourteen steam-powered catchers, capable of over twenty knots (Small 1971, 79, 94; Frost 1979, 95).

Although the rorquals that have been chiefly hunted inhabit every ocean, during the summer months they can be found in heavy concentrations in the Antarctic. Krill, their primary food, grow best in polar waters and are more abundant near the South Pole than near the North. As the krill multiply during Antarctic summers, rorquals migrate south; in February they migrate north again to breed and give birth in warmer waters.

Sperm whales also feed in the Antarctic, and many have been taken in modern times. On average, over the decade of the 1950s, more than nine thousand sperm whales were killed each year, over the next twenty years, more than eleven thousand (Frost 1979, 106–7, table 6.1). Both figures far exceed those of Melville's day. In 1835, the most productive year in the nineteenth century, fewer than six thousand sperm whales were taken; the annual average over the next decade was fewer than four thousand (see chapter 4 for further discussion of these issues).

Similarly, many fewer baleens were caught during the nineteenth century than during the twentieth. Between 1934 and 1966 an average of more than twenty thousand baleens were killed each year, and the number often exceeded thirty thousand (Small 1971, 75, fig. 9). During the heyday of American whaling, between 1835 and 1872, it is probable that no more than sixty-six hundred baleen whales were killed in any single year; on average, the figure was thirty-five hundred.[36]

As early as the 1920s it was generally recognized that the supply of whales was not inexhaustible and that, without enforceable rules to prevent overhunt-

35. Efforts to bring whales aboard ship date to the nineteenth century, but the first truly successful slipway invention was patented in 1922 (Tønnessen and Johnsen 1982, 264–66).

36. Scammon [1874] 1968, 243–44. But see chapter 4 below for a discussion and appraisal of Scammon's estimates.

ing, the industry was doomed. As economists have long recognized, voluntary collusive arrangements are impossible to enforce. A first unsuccessful attempt was made by the League of Nations in 1924 (Frost 1979, 28). The 1931 Convention for the Regulation of Whaling committed the signatories to protect right whales, immature whales, and female whales with calves (Small 1971, 172). Since both Japan and Germany refused to sign the agreement, the effort was not a success. A similar fate greeted a 1935 attempt to limit the length of the Antarctic hunting season, a 1937 attempt to extend the 1935 hunting limitation and to grant complete protection to the humpback whale, and several further endeavors during World War II. It was only after the war that, with the creation of the International Whaling Commission, a partially effective international regulatory structure was put in place.

Whaling has now come virtually to a halt, by international agreement. The Japanese continue to take a number of sei whales each year, and the Inuit hunt belugas, narwhals, and bowheads. The Norwegians have recently begun hunting again, but will confine themselves to the relatively abundant minke whales. Otherwise, whales are not at present hunted. Some groups—the California grays—have fully recovered from hunting, and others—the sperms—were never endangered. The blue and bowhead populations have apparently begun to increase, but how far their recovery will proceed and whether they will be joined by the endangered rights remains to be seen.

Appendix 2A
Kinds of Whales

Whales belong to the phylum Chordata, the subphylum Vertebrata, the class Mammalia, and the order Cetacea. Table 2A.1 contains a widely accepted classification of the whales currently known. Special care has been exercised in seeking out the various common names of whales.

Table 2A.1 Taxonomy of Whales

Family	Genus	Species	Common Names
		Suborder: Mysticeti (baleen whales)	
Eschrichtiidae	*Eschrichtius*	*robustus*[a]	gray whale, hard head,[b] devilfish, mussel digger, grayback, rip-sack, California gray, California whale, mossback, Pacific gray whale, scrag whale
Balaenopteridae	*Balaenoptera*[c]	*acutorostrata*[d]	minke whale,[e] little piked whale, lesser rorqual, little finner, summer whale, bay whale, sharp-headed finner, young finback, piked whale, pikehead, little mink
		edeni	Bryde's whale,[f] tropical whale
		borealis	sei whale,[g] sei, Rudolphi's rorqual, sardine whale, coalfish whale, Japan finner, pollack whale
		physalus[h]	fin whale, finner whale, common rorqual, razorback, finback, herring whale, tall-spout, fin, finfish
		musculus[i]	blue whale, great blue whale, sulphurbottom,[j] Sibbald's rorqual, silverbottom
	Megaptera[k]	*novaeangliae*	humpback whale, hunchback, bunch whale, knucklehead, hump whale
Balaenidae	*Eubalaena*	*glacialis*	right whale,[l] black right whale, Biscayan right whale, scrag whale, great right whale, nordcaper
		australis	right whale, black right whale, southern right whale, scrag whale, great right whale
	Balaena	*mysticetus*	bowhead whale,[m] Greenland whale, Greenland right whale, northern right whale, common right whale, Arctic right whale, polar whale, great polar whale, steeple-top, ice whale
Neobalaenidae	*Caperea*	*marginata*	pygmy right whale, dwarf right whale
		Suborder: Odontoceti (toothed whales)	
Monodontidae	*Delphinapterus*[n]	*leucas*	white whale, beluga,[o] belukha, sea canary, whitefish, white porpoise
	Monodon[p]	*monoceros*	narwhal,[q] unicorn whale, sea-unicorn, tusked whale, horned whale
Physeteridae	*Physeter*	*macrocephalus*	sperm whale,[r] cachalot,[s] great sperm whale, pot whale, anvil-headed whale, trumpet whale, physeter whale
Kogiidae	*Kogia*	*breviceps*	pygmy sperm whale, lesser sperm whale, short-headed sperm whale, lesser cachalot
		simius[t]	dwarf sperm whale, rat porpoise, Owen's pygmy whale

(continued)

Table 2A.1 (continued)

Family	Genus	Species	Common Names
Ziphiidae	*Berardius*	*arnuxii*[u]	Arnoux's beaked whale, southern giant bottlenose whale, southern four-toothed whale, southern beaked whale, southern porpoise whale, smaller ziphid whale, New Zealand beaked whale
		bairdi[v]	Baird's beaked whale, northern giant bottlenose whale, North Pacific bottlenose whale, giant bottlenose whale, Japanese porpoise whale, northern four-toothed whale
	Ziphius[w]	*cavirostris*	Cuvier's beaked whale, goose-beak whale, two-toothed whale
	Tasmacetus	*shepherdi*	Shepherd's beaked whale, Tasmanian beaked whale, Tasman whale
	Hyperoodon	*ampullatus*[x]	northern bottlenose whale, northern Atlantic bottlenose whale, Arctic bottlenose whale, bottlenose, bottlehead
		planifrons	southern bottlenose whale, flat-headed bottlenose whale, flathead whale, Antarctic bottlenose whale, Flower's bottlenose whale, flatfront bottlenose
	Mesoplodon[y]	*hectori*	Hector's beaked whale, New Zealand beaked whale, skew-beaked whale
		mirus[z]	True's beaked whale, wonderful beaked whale
		europaeus	Gervais' beaked whale, Gulf Stream beaked whale, Antillean beaked whale, European beaked whale
		ginkgodens[aa]	ginkgo-toothed beaked whale, Japanese beaked whale, ginkgo whale
		grayi	Gray's beaked whale, scamperdown whale, camperdown whale, southern beaked whale, New Zealand scamperdown whale, von Haast's scamperdown beaked whale
		carlhubbsi	Hubbs' beaked whale, archbeak whale, arch beaked whale
		pacificus	Indo-Pacific beaked whale, Longman's beaked whale, Pacific beaked whale
		stejnegeri	Stejneger's beaked whale, saber-toothed beaked whale, Bering Sea beaked whale, North Pacific beaked whale
		bowdoini	Andrews' beaked whale, deep-crested whale, Bowdoin's beaked whale, splay-toothed beaked whale
		bidens	Sowerby's beaked whale, North Sea beaked whale
		layardi	strap-toothed whale, strap-toothed beaked whale, Layard's beaked whale

Table 2A.1 (continued)

Family	Genus	Species	Common Names
		densirostris	Blainville's beaked whale, dense-beaked whale, tropical beaked whale, de Blainville's Atlantic beaked whale
Delphinidae[bb]	*Feresa*	*attenuata*	pygmy killer whale, slender pilot whale, slender blackfish
	Globicephala	*macrorhyncha*	short-finned pilot whale, Pacific pilot whale, blackfish
		melas	long-finned pilot whale, pothead, blackfish, bagfin, Atlantic pilot whale, common pilot whale, northern pilot whale, calling whale, caa'ing whale
	Orcinus	*orca*	killer whale, great killer whale, orca, swordfish, thrasher
	Peponocephala	*electra*	melon-headed whale, little killer whale, broad-backed dolphin, many-toothed blackfish, Hawaiian blackfish
	Pseudorca	*crassidens*	false killer whale, thicktooth grampus, lesser killer whale, false pilot whale

Sources: Baker 1987; Bonner 1989; Burton 1983; Cousteau and Paccalet 1988; Crisp 1954; *Dolphins, Porpoises, and Whales* 1991; Ellis 1985; Evans 1987; Gardner 1984; Gilders 1995; Heintzelman 1981; Minasian, Balcomb, and Foster 1984; Scammon [1874] 1968; Small 1971; Tinker 1988; Watson 1985.

[a]*Robustus* is Latin for strong.

[b]*Hard head* "arose from the fact of the animals having a great propensity to root the boats when coming in contact with them, in the same manner that hogs upset their empty troughs" (Scammon [1874] 1968, 24).

[c]*Balaena* is Latin for whale; *pteron* is Greek for wing, referring to the dorsal fin.

[d]*Acutus* is Latin for sharp, *rostrum*, for snout.

[e]It is said that *minke* derives from Meincke, "a German laborer working for Svend Foyn, [the Norwegian] inventor of the grenade harpoon, [who] 'one day mistook a school of this whale species for blue whales'" (Ellis 1985, 32).

[f]*Bryde's* is pronounced "breuder's." Johann Bryde was a Norwegian consul in South Africa in the early twentieth century, and built the first whaling factory in Durban in 1909 (Watson 1985, 93).

[g]*Sei* is pronounced "sigh" and derives from the Norwegian *seje*, the pollack or coalfish; the whale and the fish appear in Norwegian waters at the same season.

[h]*Physa* is Greek for bellows.

[i]"*Musculus* in Latin is the diminutive form of *mouse*, meaning therefore 'little mouse,' and has nothing to do with muscle. The only plausible explanation for the choice of the term is that Linnaeus must have been in a jocular mood at the time" (Small 1971, 21).

[j]"The blue whale was called the 'sulphur-bottom' by whalers because the blue-grey of its belly is sometimes coloured yellow by a film of diatoms [minute planktonic algae]" (Burton 1983, 22).

[k]*Megas* is Greek for large, *pteron*, for wing, referring to the humpback whale's long flippers.

[l]*Right* means the right whale to hunt—a slow-swimming animal, with plentiful oil and baleen, that did not sink when killed.

[m]"The origins of common names of some animals are hazy, but one assumes that the name 'bowhead' comes from the bow of the huge, arched mouth" (Ellis 1985, 79).

(continued)

Table 2A.1 (continued)

[n]*Delphin* is Greek for dolphin; *apterus* comes from *a-*, "without," and *pteron*, "wing." The name thus means wingless (i.e., finless) dolphin.

[o]*Beluga* derives from the Russian *belii*, meaning white; the species name, *leucas*, means white in Greek.

[p]*Monos* is Greek for single. The genus name, *Monodon*, means single tooth. The species name, *monoceros*, means single horn.

[q]*Narwhal* comes from the Norwegian *narhval* and means corpse whale. "It is usually assumed that this name is derived from the mottled coloration, which suggests a bloated corpse, but an alternative interpretation refers to the animals' habit of swimming belly up" (Ellis 1985, 96). Melville ([1851] 1983, 144) derives *narwhal* from *nostril whale*, "so named I suppose from his peculiar horn being originally mistaken for a peaked nose."

[r]Apparently, early whalemen mistook spermaceti (which occurs in a cavity in the sperm whale's head) for semen and gave it the logical name "seed of the whale." "Why are they called 'sperm' whales? It's a horribly embarrassing mistake!" (Achenbach 1991, 41).

[s]*Cachalot* was originally the French name for this whale, from the Gascon word *cachau*, meaning large tooth (Ellis 1985, 101).

[t]*Simus* in Latin means snub-nosed.

[u]"The name of this species is derived directly from the names of the people involved in its discovery. Captain Berard commanded the French corvette *Rhin*, on which the type specimen was transported to France . . . and Arnoux was the surgeon on board who provided a brief description of the animal, which had been collected in New Zealand. For reasons long lost to history, the *o* in Arnoux's name was omitted in the original description" (Ellis 1985, 131).

[v]*Bairdii* honors Spencer F. Baird, secretary of the Smithsonian Institution, who founded the Woods Hole Oceanographic Institution.

[w]*Ziphius (xiphias)* is Greek for sword.

[x]*Ampullatus* is Latin for flask-shaped, and describes the beak.

[y]"The genus *Mesoplodon* [was] derived from the Greek *mesos*, middle, *ploe*, floating, and *odous*, gen. *odontos*, tooth (literally 'a tooth floating somewhere in the middle of the jaw')" (Watson 1985, 126).

[z]*Mirus* is Latin for astonishing.

[aa]*Ginkgodens* means ginkgo-toothed; the shape of the teeth is triangular, like the leaf of the ginkgo tree.

[bb]The Delphinidae comprise six subfamilies; subfamily Globicephalinae has been hunted by whalers.