Historical catches of humpback whales in the North Atlantic Ocean: an overview of sources

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ABSTRACT

Humpback whales (*Megaptera novaeangliae*) have been taken in the North Atlantic since the 1600s in a variety of fisheries operating from the Arctic to the tropics. The relative importance of the humpback whale in these fisheries has varied. In some it was the main target species, while in others it was a minor component of the catch, with other large rorquals or sperm whales (*Physeter macrocephalus*) ranking ahead of it. There was an overall trend towards large catches of humpback whales, especially in tropical breeding areas, by non-mechanised fisheries during the mid to late 19th century; as these fisheries declined and modern whaling began in higher latitudes, large numbers were taken on the feeding grounds. Catches generally declined in the mid to late 20th century, with many fisheries stopping or scaling down their operations. Information describing the humpback fisheries is published in a wide variety of sources, and approximate locations and periods of operation are reasonably well known for most of the relevant fisheries. In addition, catch and production data are available in commercial records, newspapers and whaling manuscripts (e.g. voyage logbooks). This paper summarises the data sources and defines thirteen 'fisheries', based mainly on the whaling methods employed, and 20 'sub-fisheries', based mainly on the spatial distribution of the whaling operations. Catch levels are summarised, often crudely, and gaps in the catch history are identified. Where possible, suggestions are made for filling these gaps.

KEYWORDS: HUMPBACK WHALE; WHALING–HISTORICAL; NORTH ATLANTIC OCEAN; CATCH LEVELS

INTRODUCTION

Humpback whales (*Megaptera novaeangliae*) were hunted in the North Atlantic Ocean from the early 17th century or earlier. The catch history is reasonably complete for most of the 20th century but fragmented and incomplete for earlier times. Mitchell and Reeves (1983) provided an extensive account of the history of whaling for this species in the western North Atlantic, primarily a review of literature supplemented by unpublished data from a sample of American whaling logbooks and journals from the Providence Public Library (Rhode Island) and New Bedford Whaling Museum (Massachusetts). They emphasised the years 1850-1971 but cited numerous references to humpback whaling prior to 1850. These authors recognised the incompleteness of their study and recommended further historical research focussed on, for example: (1) Blue Books and other export or tax records from the West Indies and Bermuda; (2) Danish colonial records from shore stations in West Greenland; (3) improved documentation from Iceland (see their Endnote 3); and (4) American whaling logbooks covering voyages to the Cape Verde Islands, a humpback wintering area. Considerable progress has been made since 1983, stimulated in part by the need for complete catch series to assess the present status of humpback whales in the North Atlantic (IWC, 2002a, pp.39-44).

The whaling operations that exploited humpback whales in the North Atlantic were extremely diverse both spatially and temporally (Mitchell and Reeves, 1983). They also differed in terms of the killing and processing methods, vessel propulsion (hand, sail, steam, gas engine), whether they were pelagic or shore-based and the degree to which they focussed on the humpback or other whale species. This paper summarises the available evidence for humpback whaling in various parts of the North Atlantic and assesses the degree to which catch series are representative or complete. It defines distinct fisheries and sub-fisheries based on whether the operations were pelagic or land-based, and non-mechanised (e.g. sail power and hand-thrown, non-explosive harpoons) or mechanised (e.g. engine-powered vessels and gun-launched, explosive harpoons). The scale of humpback catches in each of the fisheries and sub-fisheries is estimated, the usefulness of various sources is evaluated and areas and times that need further investigation are identified.

IWC (2002b) used the sources cited in the present paper as the basis for developing a time series of removals of humpback whales throughout the North Atlantic as part of its work to assess the status of this species in the region. In addition, it used the new data on Barbados whaling (Table 2, see later) to estimate catches for that island fishery during the 19th and early 20th centuries.

OVERVIEW OF FISHERIES

Thirteen fisheries were defined and three of these were sub-divided into a total of 20 regional sub-fisheries. The suggested names for the fisheries are based on nationality or region, the degree of mechanisation (referring mainly to involvement of explosives and engine power) and whether operations were pelagic or shore-based (Table 1). The American Non-mechanised Pelagic fishery, often referred to as 'Yankee whaling', included two well-defined sub-fisheries, one in the West Indies and one in the Cape Verde Islands. A third sub-fishery was defined as encompassing opportunistic takes of humpback whales elsewhere in the North Atlantic. The West Indies Non-mechanised Shore fishery was broken down into six local sub-fisheries based in as many islands or island groups. The modern whaling methods used in the Norwegian Mechanised Shore fishery were developed late in the 19th century and eventually applied in many parts of the North Atlantic. At least 11 of this fishery's local or regional

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sub-fisheries reported humpback landings, ranging latitudinally from as far north as Svalbard to as far south as Grenada. Some of the sub-fisheries of the Norwegian Mechanised Shore fishery were short-lived and some appear to have taken only a few humpback whales.

In the following section, the sources of information are summarised for each of the fisheries and sub-fisheries.

NORWEGIAN MECHANISED SHORE WHALING

North and West Norway

Humpback whales are not known to have been hunted regularly in Norwegian waters prior to the development of transitional and modern whaling techniques. Experimental whalers operated in the Norwegian and Barents Seas from the 1850s-1870s. For example, Thomas Welcome Roys shot 26 humpback whales in the Barents Sea in the summer of 1856, killing at least 16 of them (Schmitt *et al.*, 1980; Tønnessen and Johnsen, 1982). Roys' Norwegian contemporaries, including Svend Foyn, used Varanger Fjord, Finnmark, as their base of operations beginning as early as 1857. Although it has often been stated or implied that these whalers took only blue whales (*Balaenoptera musculus*) prior to 1883, humpback and other whales were taken as well (Tønnessen and Johnsen, 1982).

As defined here, the North Norway sub-fishery encompasses the shore-based whaling in east and west Finnmark and along the Murman coast of Russia. Whaling in the latter area involved 'state-subsidised catching in the Barents Sea off the coast of Murmansk' and lasted only from 1883-89 (Tønnessen and Johnsen, 1982). Of 292 whales taken off Murmansk from 1885-87, only 25 were humpback whales (Jonsgård, 1977).

The whaling industry in Finnmark expanded dramatically in 1883 when the number of shore stations increased from seven to 16; and the number of catcher boats, from 15 to 27 (Jonsgård, 1977). It is likely that some of the 1,026 'unspecified' whales taken in 1883-84 were humpback whales. Ingebrigtsen (1929) cited Risting (1922) for a catch of 1,064 humpback whales off Finnmark from 1885-1904 and reasoned that since some of the unspecified whales reported in the catches during this period were probably humpback whales, the actual total for Finnmark and Bear Island was 'not more than' 1,500, by which he seems to have meant about 1,500. Jonsgård (1977) listed 1,075 humpback whales taken in North Norway from 1885-1904 as well as 4,511 'unspecified' whales between 1891-95, some of which must have been humpback whales. Whales taken near Bear Island during 1903-04 were towed to Finnmark for processing and therefore would have been reported in the North Norway catch (Tønnessen and Johnsen, 1982, p.49). Catches in North Norway and West Norway after 1904 were comparatively small (Jonsgård, 1977).

Svalbard

Modern shore whaling, which involved the use of land stations as well as some of the earliest floating factories, began at Svalbard in 1903 and continued sporadically until 1927, with a total reported humpback catch of 42 (Jonsgård, 1977; Tønnessen and Johnsen, 1982). Some of the 461 'unspecified' whales reported from 1906-12 (Jonsgård, 1977) also could have been humpback whales. Catches delivered to a shore station established at Bear Island in 1905 (Tønnessen and Johnsen, 1982, p.98) presumably were reported in the statistics for Svalbard.

Iceland

Mitchell and Reeves (1983) estimated that at least 26 humpback whales were killed by experimental whalers off Iceland in 1865-66 based on a known catch of 13. They doubled the known catch to estimate the total kill based on comments in the literature referring to very high loss rates. No estimates were included in their Table 1 for the years 1863-64 and 1867-72 even though they stated that the experimental whalers targeted some humpback whales around Iceland during these years.

Modern whaling was introduced to Iceland by Norwegian whalers in 1883 (Sigurjónsson, 1988). Seven stations operated on the west coast until about 1900 and five on the east coast from then until about 1915. Ingebrigtsen (1929) guessed that about 1,500 humpback whales were taken from the 1880s to early 1900s. Mitchell and Reeves (1983) listed a total catch of 902 between 1889-1915 based on data from Jonsgård (1977) for the years 1883-97 and 1903 onwards and pro-rating his data for 1898-02 on the basis of a statement in Risting (1931). Sigurjónsson (1988) estimated a total secured catch of 2,800 humpback whales by Icelandic shore whaling from 1889-1915, more than three times the estimate by Mitchell and Reeves (1983). Sigurjónsson's estimate is likely to be more accurate because he had access to data unavailable to Mitchell and Reeves.

Faroe Islands

Degerbøl (1940) summarised catch data from shore stations in the Faroe Islands between 1894-1939. The data for 1894-1902 were entirely unspecified and, in addition, a variable proportion of the catch remained unspecified until the 1930s. As in Iceland, in the early 'unspecified' years of the fishery, catches probably were of blue and humpback whales. Degerbøl implied that a large proportion of the 1,215 whales taken from 1894-1902 were these two species and that their local availability had already decreased by 1903 when, for the first time, a portion of the catch was specified. He listed a total of 189 humpback whales secured between 1903-30 and another nine between 1935-39. The sex ratio ($n = 149$) was about 1.5, favouring males. Animals ranged in body length from 33-50 Danish feet (*ca* 10.36-15.69m) and the peak months for catching humpback whales were July and August. Jonsgård (1977) indicated that only nine additional humpback whales were taken at the Faroes after World War II.

British Isles

Humpback whales were rarely taken at modern shore stations in the Shetland Islands between 1903-29 (total of 51; Brown, S.G., 1976; also see Thompson, 1928), the Outer Hebrides between 1904-28 (total of 19; Brown, S.G., 1976) and Ireland between 1908-14 (total of 6; Fairley, 1981). July and August were the peak months of occurrence off Scotland; the catch was mostly males; and the most productive area for catching humpback whales was to the north of Shetland and Rona (Thompson, 1928).

Newfoundland

Based on searches of Newfoundland newspapers and archives, Sanger and Dickinson (1989) confirmed that the Mitchell and Reeves (1983) estimate of 15 humpback whales killed at Newfoundland in 1898 was too low. Moreover, Dickinson and Sanger (1990) called attention to a miscalculation that led Mitchell and Reeves (1983) to overestimate the 1901 humpback kill, which was ten (seven at Balaena, two at Chaleur Bay, plus one to account for sinking loss) rather than 18. Further studies of primary

Table 1

North Atlantic whale fisheries in which humpback whales were taken, showing sub-fisheries, their total periods of operation (not necessarily continuous) and cumulative takes of humpback whales (unadjusted for hunting loss). Fisheries and sub-fisheries are defined according to whether they involved land stations or pelagic operations, technology used ('transitional' is indicated separately) and geographic area. Specific areas where humpbacks were caught are listed.

Fisheries	Sub-fisheries	Periods	Transitional	Humpbacks taken [1]	Humpbacks among principal target species?	Areas where humpbacks taken
Norwegian mechanised shore	N. Norway	1868-1971	No	1,146 reported; possibly 100s more unspecified	Early yes, late no	Including Murman Coast
	W. Norway	1912-69	No	43 reported	No	
	Svalbard	1903-27	No	42 reported; probably a few more unspecified	No	
	Iceland	1883-1989	No	219 reported; 2,800 estimated before 1915	Early yes, late no	
	Faroes	1894-1984	No	189 reported; at least several 100s more unspecified	Early possibly yes, late no	
	British Isles	1903-51	No	65 reported; probably a few more unspecified	No	Shetlands, Hebrides, Ireland
	Newfoundland	1898-1971	No	1,216 reported; at least 10s more unspecified	Early yes, late no	Including Strait of Belle Isle and Labrador
	Gulf of St Lawrence	1911-15	No	3 reported	No	
	Nova Scotia	1964-71	No	7 reported	No	
	Grenada	1925-26	No	174 reported	Yes	
	Spain-Portugal	1921-85	No	3 reported	No	NW Spain
Norwegian mechanised pelagic		1911-37	No	451 reported; probably at least 10s more unreported	Early yes, late no	Davis Strait, Denmark Strait, Iceland, Bear I., Spitsbergen
Greenland non-mechanised shore		1700s-1923	Yes?	<20/yr, possibly low 1,000s all told	Yes	
Greenland mechanised shore		1924-present	No	>300 reported	Yes	
Canada non-mechanised shore		Late 1700s-mid 1800s	No	?	Possibly	Newfoundland, Gulf of St Lawrence
Canada non-mechanised pelagic (Gaspé)		1804-93	Yes	100s to low 1,000s	Yes	Newfoundland, Labrador, Gulf of St Lawrence
American non-mechanised coastal		Early 1700s-mid 1800s	Yes	Probably 100s	Probably	Nantucket, New York, North Carolina
American mechanised coastal		*ca* 1850-1895	Yes	Probably 100s	Yes	Gulf of Maine
Bermuda non-mechanised shore		1600s-1941	Yes	At least 100s	Yes	
West Indies non-mechanised shore	Barbados	1868-1913	?	100s	Yes	
	St Vincent and the Grenadines	1876-present	Yes	Low 1,000s	Yes	Bequia, Frigate Rock, Canouan, Palm Island
	Grenada	Early 1900s-1924	?	14-18 reported; probably at least 10s more	Yes	Glover Island, Isle de Caille, St George's
	Trinidad	1826-1870s	No	Several 100s	Yes	
	St Lucia	Late 1800s-early 1900s?	?	?	?	
	Turks and Caicos	~1880s	?	?	?	
American non-mechanised pelagic	West Indies	1772-early 1900s	Yes	1,000s	Yes	Hispaniola to Venezuela, especially Lesser Antilles
	Cape Verde Is	Ca 1785-1901	Yes	High 100s to low 1,000s	Yes	Cape Verde Is, esp. Sal, São Nicolau and Boa Vista
	Other Areas	1730s-late 1800s	Yes	Probably at least 100s	Early yes, late no	Newfoundland, Gulf of St Lawrence, Davis Strait
Cape Verde Islands non-mechanised shore		Late 18th century-1912	No	Probably at least 100s	Probably	Brava, São Nicolau, Sal, Maio
Madeira non-mechanised shore		1941-81	No	5 reported	No	

[1] 'Reported' indicates an exact cumulative total obtained from Bureau of International Whaling Statistics or a published source; other, less precise values refer to cumulative estimates for the entire period of the fishery's operation. Reported values are negatively biased in some instances by the fact that an unknown proportion of the 'unspecified' whales landed were humpbacks.

materials in Newfoundland and Labrador (Sanger and Dickinson, 1995; Dickinson and Sanger, 1999) provide no basis for changing the 20th century estimates by Mitchell and Reeves (1983), which included 34 whales taken in 1969-71 under a special scientific permit (Mitchell, 1973).

Gulf of St Lawrence

A brief episode of modern whaling at Seven Islands (Sept-Îsles) on the north shore of the Gulf of St Lawrence took mainly blue and fin whales although in most years the catch was unspecified. At least 659 whales were taken between 1905-15, possibly including at least three humpback whales in 1911 (Mitchell and Reeves, 1983).

Nova Scotia

A whaling station at Blandford, Nova Scotia, operated from 1964-71 and took seven humpback whales under a scientific permit in 1969-71 (Mitchell, 1973).

Grenada

A modern whaling station was established on Glover Island in 1924 and began operations in 1925 (not January 1924 as indicated by Mitchell and Reeves, 1983; see Romero and Hayford, 2000). It lasted for only two years, taking 174 humpback whales, about 80% of them males (Mitchell and Reeves, 1983).

Spain – Portugal

Modern whaling on the Iberian Peninsula began in 1921 and continued until 1985 (Sanpera and Aguilar, 1992). Only two humpback whales were reported in the catches. Two more were taken by the 'pirate' whaler *Sierra* in December 1978, possibly in waters off the Iberian Peninsula or northwestern Africa (Sanpera and Aguilar, 1992).

NORWEGIAN MECHANISED PELAGIC WHALING

Modern whaling vessels from Norway, primarily associated with floating factories, took humpback whales in the North Atlantic between 1911-37. Mitchell and Reeves (1983) were interested only in the catches made in Davis Strait (i.e. the 'western North Atlantic'). These were presented in their table 1 with a loss rate factor of 1.06 applied. Norwegian vessels also took this species in Denmark Strait/Iceland and Bear Island/Spitsbergen. The catches from 1929-37 were attributed by Jonsgård (1977) and the Bureau of International Whaling Statistics to the 'Arctic' or 'North Atlantic'. Jonsgård provided Mitchell and Reeves (1983) with information from nine of 14 expedition logbooks, allowing them to assign 34 humpback whales taken between 1930-34 to Davis Strait, eight to Denmark Strait/Iceland and 37 to Bear Island/Spitsbergen.

GREENLAND: NON-MECHANISED SHORE WHALING

A shore-based fishery for humpback whales was already 'well-developed' in West Greenland by the late 1700s (Mitchell and Reeves, 1983). They were known to be taken at least occasionally by non-mechanised commercial whalers in Davis Strait (e.g. 15 by one British vessel in Disko Bay in one season between 1840-58). Nevertheless, table 1 in Mitchell and Reeves (1983) listed no catches in this area until 1866, and catches for non-mechanised and mechanised shore whaling in Greenland were combined within a single column of that table. For the Greenland shore-based hunt, Mitchell and Reeves arbitrarily assigned a value of four killed whales/year from 1866-85 based on statements in the literature (Rink, 1877) that an average of no more than two whales were secured per year and that killed whales were often lost (a loss rate factor of 2.0 was applied). It was noted that single-season catches had been as high as 13 (at Frederikshåb [Paamiut] in 1844) and possibly 22 (some time before 1841) in earlier years and that by 1877 the West Greenland humpback fishery was in decline. For 1886-1923 Mitchell and Reeves (1983) used the catches listed by Kapel (1979) multiplied by 1.5 to account for hunting loss. They considered Kapel's (1979) catch records incomplete and noted that 19th century catches were probably 'somewhat higher' than indicated in their table.

GREENLAND: MECHANISED SHORE WHALING

Mechanised whaling was introduced to West Greenland in 1924 when the catcher boat S/S *Sonja* began whaling to supply an oil plant in Copenhagen as well as provide food for Greenlanders and their dogs (Kapel, 1979). The West Greenland catches listed by Mitchell and Reeves (1983) for 1924-71 came from Kapel's (1979) tables. The numbers were not adjusted for hunting loss, although inexplicably Mitchell and Reeves listed the catch as one whale greater than the corresponding figures in Kapel's table 1B for the years 1924 and 1926-29.

CANADA: NON-MECHANISED SHORE WHALING

Large quantities of oil were exported to the United Kingdom from Newfoundland between 1696-1734. Reeves *et al.* (1999) argued that much of this production apparently was from seals. However, the occasional inclusion of whalebone (baleen) indicates that some of the oil was from mysticete whales. There was no basis for determining what proportion of it might have come from humpback whales.

Mitchell and Reeves (1983) were unable to confirm that there was any shore-based whaling for this species in eastern Canadian waters prior to 1898. They attributed most of the whaling in bays along the south and east coasts of Newfoundland and in the Strait of Belle Isle and Gulf of St Lawrence to pelagic whalers from either New England (see below) or the Gaspé Peninsula in Quebec (see below). Some humpback whales probably were included in the sporadic and poorly documented shore whaling operations in Newfoundland and Labrador but these could not be quantified from available evidence. References to a subsidy ('bounty') offered by the government of Newfoundland to encourage whaling out of St John's in 1840, and to single-season catches of up to 100 whales (apparently in the Gulf of St Lawrence), indicate considerable whaling activity at that time.

CANADA: NON-MECHANISED PELAGIC WHALING

A separate fishery for large whales existed in the Gulf of St Lawrence between 1804-93, involving as many as ten schooners in the peak years, all based on Quebec's Gaspé Peninsula (Mitchell and Reeves, 1983). Although North Atlantic right whales (*Eubalaena glacialis*) would have been welcome targets, their relatively low abundance from the

earliest years of this fishery meant that other species, probably primarily humpback whales, were the main targets. Although contemporaneous with the American and British pelagic whale fisheries, this Gaspé fishery appears to have been independent of and competitive with them.

Mitchell and Reeves (1983) produced a series of removal estimates for the Gaspé fishery for the years 1858-88. They assumed, based on published narratives describing the fishery, that humpback whales comprised half of the reported catch. Oil returns were converted to whales using average yields of 50bbl or 1,500gal[1]. For the five years with no data, they interpolated to estimate production using the midpoint of the oil returns in the immediately preceding and succeeding years. The little information available on loss rates in this fishery was deemed 'equivocal' and Mitchell and Reeves (1983) somewhat arbitrarily applied a loss rate factor of 1.2.

In table 1 of Mitchell and Reeves (1983), a guess of five whales killed per year was assigned to the period 1850-52. For the period 1853-57 they assumed a constant production level of 750bbl of oil/year (from McDougall, 1979), equivalent to nine humpback whales killed/year based on the reasoning outlined in the foregoing paragraph. For the years 1858-88, the loss-adjusted estimates from Mitchell and Reeves (1983) were used (note, however, that the catch of 14 attributed to 1888 was a transcription error and should have been four). No indication was given of catches from 1889-93 although some whaling apparently occurred in those years.

AMERICAN NON-MECHANISED COASTAL WHALING

References to humpback whaling at Nantucket and elsewhere in New England during the 1700s and 1800s, with few details, were summarised by Mitchell and Reeves (1983). Little (1988) interpreted data in a Nantucket account book for 1721-58 to mean that most of the catch consisted of either right whales or sperm whales (*Physeter macrocephalus*): 'Some humpback whales or blackfish may have been included in the catches, but were not the primary objectives of Nantucket whalers'. The whaling grounds used by the Nantucket whalers during this period included 'along-shore' at Nantucket, the nearby 'Bowbell', 'ye deep' offshore of the island, 'Cariliner' (North Carolina), 'Canso' (the Strait of Canso, separating Cape Breton Island from mainland Nova Scotia), 'Newfoundland' and 'Greenland'. Humpback whales could have been taken in any of these areas and apparently some voyages targeted them explicitly. For example, a logbook entry of the sloop *Seaflower* in 1752 reads: 'We Shall Have a good time to Newfoundland to kill Some Humps' (Reeves and Mitchell, 1986a). Macy (1835), in describing the disastrous impact of the War of Independence (1775-1783) on the Nantucket whaling fleet, noted that 'Humpback whales ... and cod fish were plenty' on the Nantucket Shoals to the east of the island, thus giving 'encouragement to many, who would otherwise have been idle, to engage in the pursuit of them'. The implication was that during the mid-1770s at least, considerable effort was directed at killing humpback whales in local waters. No quantitative documentation was available, however, on either the effort or the take. This focus on nearby humpback whales could not have lasted for long. Soon after hostilities began, most Nantucket whalers either lost their vessels or relocated so that they could operate in the South Atlantic (Stackpole, 1972).

A whale fishery based at Prospect Harbor, Maine, existed from about 1810-60 (Clark, 1887). Initially the whales were spotted from a shore lookout but by the 1820s, the whalemen had acquired large enough boats to allow them to search farther away from the coast. It is likely that this fishery was mainly for humpback whales given that: (a) the average oil yield was 25-30 bbl[2]; (b) there is no indication that whalebone was a product; and (c) the technology for catching fin whales was not yet available (see below). Also, the whales were described as coming near shore, following menhaden (*Brevoortia* sp.), about 1 June and remaining until September. The average annual catch from 1835-40, when this fishery was at its peak, was 6-7 whales, with a highest one-year catch of ten. An apparently separate, smaller operation based at Tremont, Maine, from about 1840-60 took at least three whales annually (Clark, 1887). No direct information was available on the species hunted. In 1845 a schooner (*Huzza*) cruised somewhere along the Maine coast, possibly in the general vicinity of Winter Harbor, taking seven humpback whales and one fin whale (Clark, 1887). A mounted skeleton exhibited in Boston that year was probably of a whale taken by the *Huzza* in July (Allen, 1916). According to Clark's informant, the *Huzza*'s captain did not continue his operation in subsequent years but went whaling in a different vessel from Prospect Harbor in 1870, securing one fin whale.

Shore whaling was also conducted at various points along the Massachusetts coast during the first half of the 19th century (Webb, 2001; Reeves *et al.*, 2002). The whalers at Provincetown, in particular, 'frequently captured a large number [of whales] in a season' (Clark, 1887). Some of these certainly were North Atlantic right whales (*cf.* Reeves *et al.*, 1999) but some, and possibly most by that time (right whales were badly depleted locally), probably were humpback whales. For example, in 1849 the schooner *Council* of Provincetown obtained 130-160bbl of humpback oil on a cruise between Provincetown and Mt Desert Island, Maine; in 1850 the same vessel took at least one whale in Cape Cod Bay on 31 October and continued whaling until 22 November, returning with 90bbl of humpback oil all told (Wood, no date). In early November 1861, a whale that appeared in the midst of a fleet of 200 mackerel fishing vessels off Nauset, Massachusetts, was taken by a Nantucket fisherman. It was his fifth whale since 15 July and was expected to produce 25bbl of oil. His total return from the five whales was given as 125bbl, worth $1,500 (Clark, 1887:41). The average yield of 25bbl fits the humpback and the lack of any mention of whalebone implies that none of these were right whales.

A significant transition in whaling technology took place at mid-century. The first bomb lance became available in the United States in 1846 and it was substantially improved in 1852. From that time, the bomb lance was considered to have 'in part revolutionised the process' of killing whales (Brown, J.T., 1887). The widespread use of bomb lances in American whaling clearly expanded the range of species that could be hunted and increased the loss rate. Although it has been

[1] Mitchell and Reeves (1983) considered their estimates 'so crude that it does not matter if these are Imperial or American gallons'. The use of 50bbl as an average yield on this ground, rather than the 25bbl used to estimate breeding ground catches (see Footnote 2, later), was based on those authors' expressed preference for 'conservative' (i.e. negatively biased) catch estimates and a reference in the literature to humpback whales in the Gulf of St Lawrence yielding 10-80bbl.

[2] Mitchell and Reeves (1983) estimated that humpback whales in the West Indies produced an average of 25bbl of oil. They used this value to convert production data in some, but not all, of the fisheries examined. Best (1987), using a much larger sample of catches by American pelagic 19th century whalers, estimated the average yield from humpback whales to be 24.4bbl (CV = 0.10). The barrel used in those studies contained 31.5 US gal, or 26.28 imp. gal.

assumed that the whaling described in this section was 'non-mechanised' and 'coastal', some catches in the mid-19th century could have been made from schooners using explosive projectiles.

Shore whalers at Long Island, New York, killed a humpback whale in 1852 (Reeves and Mitchell, 1986b). Although shore whaling was practised along the southeastern coast of the United States from the late 1600s to early 1900s, there is no suggestion that humpback whales were taken there regularly (Reeves and Mitchell, 1988). Simpson and Simpson (1988) quoted a 19th century source who was told by whalemen on Shackleford Banks, North Carolina, that in addition to right whales, they occasionally took humpback and possibly gray ('scrag') whales (Mead and Mitchell, 1984).

AMERICAN MECHANISED COASTAL WHALING

This fishery is not easily defined but was generally characterised by the use of steam vessels and/or explosive projectiles (although not necessarily deck-mounted). The data for this transitional fishery tabulated by Mitchell and Reeves (1983) were only illustrative. Estimated kills for some years (their table 1) were based on the assumption of an average oil yield of 25bbl/whale and it was assumed that only half of the humpback whales killed or mortally wounded were secured (loss rate factor of 2.0). Because of the non-systematic nature of reporting and the incompleteness of their literature and archival search, the estimates given by Mitchell and Reeves (1983) must have been negatively biased to a considerable degree.

During the late 1870s and early 1880s, there was a flurry of interest in catching rorquals off the New England coast. In 1879, a small Provincetown schooner, the *Brilliant*, humpbacked off Deer Isle, Maine, securing four whales producing 155bbl of oil by the end of September (Clark, 1887; Webb, 2001). This vessel carried only one whale boat and the whales were towed ashore for flensing. No information was available on catches by other vessels engaged in this fishery at the time although Clark's characterisation of the *Brilliant* as 'one of the most successful whalers out of Provincetown that season' implies that at least a few other whales were taken. In 1880, 48 whales, all or most of them fin whales, were taken at Provincetown yielding 29,925gal of oil and 8,750lb of bone (baleen) (Clark, 1887). These products (at $0.40/gal for oil and $0.15/lb for bone), together with the proceeds of two whales sold for exhibition in Boston and New York, were valued at $14,037. No information was available on how many vessels were involved.

The loss rate in this fishery was very high. Bomb lances were used to kill the whales, which typically sank for two or three days before being towed to shore for processing. One whaler noted that approximately as many whales were killed and lost as were finally secured for processing (Clark, 1887). In 1880, six fin whales that had been killed by the Provincetown whalers were later found floating in Massachusetts Bay and towed into Gloucester harbour. Three more were taken into Boston, one to Newburyport, one to Cape Porpoise, one to Portland and one to Mt Desert. Two more drifted ashore at Scituate, two at Barnstable, one at Brewster, one at Orleans, two at Wellfleet and one on 'the back of Cape Cod'. Another was found and flensed at sea by a fishing vessel and its blubber sold in Boston (Clark, 1887). Of some 100 whales estimated to have been killed by Provincetown whalers that season, only three were said to have been humpback whales, the rest fin whales (Clark, 1887). In the same year, a whale (species unspecified) was killed and tried out at Bass Harbour, Maine (Clark, 1887). The fact that it yielded only 1,200gal of oil and no bone suggests that it was not a right whale but rather a humpback or fin whale.

A Boston newspaper account published in 1881 claimed that it was only 'within the past three years' that a 'home whale-fishery' had been prosecuted at Provincetown (Clark, 1887). Participants were said to be mainly younger men as the older whalemen in the area had too low a regard for fin whales to engage in their pursuit. One young captain was said to have taken at least 250bbl of oil in 1880 in and around Cape Cod Bay and he was 'scoring fair results' in 1881, having obtained 90bbl of oil in Massachusetts Bay well before the end of the season. He was cruising off Grand Manan Island in the lower Bay of Fundy 'with a better Provincetown schooner than he had last year'; this vessel was likely the same schooner that took 100-150bbl of 'humpback oil' on the Maine coast (Clark, 1887; also see Reeves and Barto, 1985). However, as of November 1881 only 'a few' whales had been taken in Provincetown harbour. According to an article from the Oil, Paint, and Drug Reporter of 23 November 1881, quoted in Clark (1887), no other vessels took up this hunt in 1881 although a 'menhaden steamer' had cruised near Block Island 'without making a haul' (i.e. without catching any whales?). Additional information on this fishery is available in Webb (2001) and Reeves *et al.* (2002).

Reports vary as to the species composition of the catches but fin whales appear to have predominated, followed by humpback whales, perhaps with occasional blue and right whales. One newspaper source claimed that a humpback was 'much more valuable than a finback, yielding twice as much of oil for the same size of creature' (Clark, 1887).

Although it was clearly secondary in importance to oil, the baleen was frequently saved and marketed. Apparently the principal use of humpback and fin whale baleen in the 1870s-1880s was in the manufacture of corsets (Clark, 1887). At this time whale oil was used in many industries 'but chiefly by tanners in the preparation of leathers'. It was also used when mixed with lead and paraffin oil for lubricating axles and wheels.

A humpback whale was shot with a 'whale gun' off Long Island, New York, in 1913 but attempts to take the species apparently were exceptional in this area (Reeves and Mitchell, 1986b).

BERMUDA: NON-MECHANISED SHORE WHALING

Bermuda had a long history of shore whaling for humpback whales (Mitchell and Reeves, 1983). The 39 animals listed for 14 years in table 1 of Mitchell and Reeves (1983) certainly under-represent the true numbers killed, particularly prior to the 1880s. Humpback whaling at Bermuda began in the 1600s and continued, at least sporadically, for nearly three centuries.

WEST INDIES: NON-MECHANISED SHORE WHALING

The numerous small-scale whaling establishments in the West Indies, except those in Trinidad (Reeves *et al.*, 2001a), depended on open-boat, hand-harpoon techniques introduced by American pelagic whalers. Shoulder guns were employed regularly and from the early 1920s bomb lances were used as well (Adams, 1971). Like their

American counterparts, the West Indies shore whalers selectively targeted cow and calf pairs. Of 52 humpback whales killed at Bequia between 1950-84, seven were described as solitary males, 25 as mature females and 22 as calves (Price, 1985). Hunting loss was high owing not only to the technology in use, but also to the problem of shark damage to carcasses during towing and flensing (Mitchell and Reeves, 1983).

Barbados

Although one kill was reported in 1813 (Mitchell and Reeves, 1983), shore whaling appears to have been most active at Barbados from 1869-1913. Aspinall (1931) referred to Speightstown as 'the headquarters of a small whaling industry', implying that a station was active there in the 1930s. It is likely, however, that the statement was simply carried forward from an earlier edition of Aspinall's guide book, first published in 1907.

Mitchell and Reeves (1983) estimated removals from 1869-78 based on Archer's (1881) oil-production data, assuming that a tun was equivalent to 252 American gallons, a barrel contained 31.5 American gallons and the average yield of humpback whales in this fishery was 30bbl. Estimates of landings were adjusted for loss using a correction factor of 1.85. For 1879-1902, Mitchell and Reeves simply extrapolated their 1878 estimate of 20 whales, reasoning that Archer (1881) had given no indication of a decline before his catch series ended in 1878, and Brown (1942) had described the fishery as 'at its height' just before the end of the 19th century, with eight boats engaged (Archer's company employed only four). Moreover, Brown claimed that 15-20 humpback whales were caught annually up to 1902. For 1903-13, Mitchell and Reeves inferred an annual kill of six whales based on statements in the literature that although the fishery 'collapsed' around the turn of the century, some effort continued until at least 1913, with four whales secured and two killed but lost by the two boats whaling in 1912 (Sinckler, 1913).

For the present study, all Barbados Blue Books available at the Public Record Office in London were examined for whaling data (Table 2). These indicated that the shore station at Speightstown was established in 1868 or 1869, which is consistent with Archer's (1881) statement that by 1881 he had been whaling in Barbados for 14 years. The Blue Books also confirmed that the fishery continued into the 20th century and reached a peak in both effort and production around the turn of the century. The large amount of oil recorded for 1869 (300 tons) is almost certainly in error as the maximum amount reported by Archer (1881) for any year was 80 tuns in 1871. At least in some years, production data in the Blue Books may refer to amounts exported and therefore not reflect the amounts of oil and meat consumed domestically.

Catches totalling 191 whales from 1921-26 were erroneously listed in the Barbados column of table 1 in Mitchell and Reeves (1983). They should have been listed in the Grenadines column (see Grenada sections, above and below).

St Vincent and The Grenadines

Mitchell and Reeves (1983), following Adams (1971), used the term 'Grenadines' to include the entire island chain from St Vincent to Grenada, inclusive, even though the St Vincent Grenadines and the Grenada Grenadines were administratively (and are now politically) separate, the latter including the islands of Isle de Caille and Carriacou. Organised shore whaling did not begin in the Grenadines until about 1875-76. It has continued to the present in Bequia but had largely ended in the other islands by the mid-1920s (Adams, 1971; 1975).

The kills attributed by Mitchell and Reeves (1983) to the Grenadines between 1876-1920 consisted of three crude estimates. For the years 1876-79 it was inferred that the small station on Bequia, attended by three or four whaling boats, was the only site in operation (Adams, 1971). The estimated annual kill of seven whales was based on Adams' (1971) statement that the station was 'fortunate to dispatch more than six or seven whales in the season'.

For the entire period 1880-1913 Mitchell and Reeves listed 44 whales killed per year according to the following reasoning: (1) Adams (1971) stated that 'at least a score' of whaling stations, each with three to five whale boats, were established in 'the south Windward Islands and Trinidad' between 1870-1925, of which at least six were still active in the 1910s; (2) Mitchell and Reeves assumed that at least six stations were active at any given time between 1880-1913[3]; (3) if each of six stations took four humpback whales per year[4], the total secured catch would have been at least 24 per year; (4) applying a loss rate factor of 1.85 gives the annual kill of 44.

Mitchell and Reeves (1983) inferred from Adams' (1971) account that the local availability of humpback whales around St Vincent (Bequia) was declining from about 1910 onwards, so the annual kill assigned to the years 1914-20 was nine, assuming that only three stations were active and that three whales were killed at each of them. For 1922-78, Mitchell and Reeves (1983) tabulated data from various sources to generate estimates of each year's kill at Bequia. Where only oil data were available they assumed an average yield of 1,000gal/whale (per Adams, 1971). Landings were adjusted for hunting loss using a loss rate factor of 1.5. Adams (1971) explicitly stated that no whales were caught during the period 1949-57.

Mitchell and Reeves (1983) summarised data from the St Vincent colonial Blue Books but did not use them to estimate catches (see their Endnote 1). Generating a catch series from the Blue Book data would require standardisation of the volumetric units in the whale oil column. Conversion to standard units would be straightforward except in the case of casks. Although Mitchell and Reeves considered a cask equivalent to a barrel, ten different types of casks were used in the American whale fishery holding anywhere from 60-290gal (Hohman, 1928; also see Romaine, 1951).

Price (1985) examined St Vincent Blue Books in the Kingstown public library covering 16 years of the 40 years between 1898-1938. He interpolated values for the missing years and attempted to construct a complete catch series for this period using an average oil yield and a loss rate factor from Mitchell and Reeves (1983). The St Vincent Blue Book data from the Public Record Office in London, presented by Mitchell and Reeves (1983), are more detailed and comprehensive, covering all years from 1860-1920. However, Price's data make it possible to extend the St Vincent catch series forward to 1984, i.e. 13 years beyond the last year in Mitchell and Reeves' table 1 and six years beyond the last year in their table 14. IWC (2002b) used all of these data to produce annual catch estimates for this sub-fishery.

[3] The 1913 cut-off date apparently was based on Fenger (1913), who noted that at least five stations were active between St Vincent and Grenada when he visited the station at Ile de Caille in *ca* 1911-12.

[4] 'In 1900, a Grenadine whaling concern had no difficulty in dispatching four whales per season' (Adams, 1971).

Table 2

Whaling data from Barbados Blue Books, 1868-1911. Note: Blue Books for 1865-67 were examined but contained no relevant data.

Year	Effort	Catch/Oil production	Oil exported (value in £/s./d.)	Other information
1868	-	-	1820gal (Brit. vessels) and 1284gal (foreign vessels) to US; 278gal to Br. Guiana	-
1869	-	300 'Tons' oil	-	'... no fisheries with the exception of a whaling Station at Speights Town'.
1870	-	-	123bbl to Br. Guiana (£153/15/0)	a/a
1871	-	-	-	a/a
1872	-	-	£174 worth to Br. Guiana	a/a
1873	-	-	£108 worth to Br. Guiana	a/a
1874	-	-	£195 worth to Br. Guiana; £170 to 'foreign' West Indies	a/a
1875	-	-	£27 worth to Gr. Brit.; £140 worth to Br. West Indies	a/a
1876	-	-	341½bbl (Brit. vessels) and 27bbl (foreign) vessels to Br. West Indies (altogether worth £1227/12/6)	a/a
1877	-	-	43bbl to Gr. Brit. (£172), 139 to US (£556), 90 to Br. West Indies (£360), 6 to Br. Guiana (£20)	a/a
1878	-	-	684bbl to US (£1795/10), 22 to Br. West Indies (£57/15), 13 to Amer. whale ships (£34/2/6)	a/a
1879	-	8bbl (£21)	8bbl to Gr. Brit. (£21)	a/a
1880	-	[same statement as 1879 is carried forward here]	115bbl to Gr. Brit. (£301/17/6), 10 to Br. Guiana (£26/5), 10 to Br. West Indies (£26/5)	a/a
1881	-	42bbl (£110)	16bbl to Gr. Brit. (£42), 26 to Br. West Indies (£68/5)	Whaling station's location given as Hole-Town rather than Speightstown
1882	-	25bbl (£65/12/6)	25bbl to Br. West Indies (£65/12/6)	a/a
1883	-	-	-	No mention
1884	-	-	-	No mention
1885	-	-	-	No mention
1886	-	68bbl (£118/10)	64bbl to Gr. Brit., 4 to Br. Guiana	Whaling station at Hole-Town
1887	-	24bbl (£51)	24bbl to Gr. Brit.	a/a
1888	-	-	None	'There was no shipment of Whale Oil from Whales caught off the coast'.
1889	-	-	175bbl (£459/7/6)	-
1890	-	240bbl (£630)	240bbl (£630) to Gr. Brit.	'... from Whales caught off the coast of the Island'.
1891	-	74bbl (£194/5)	72bbl to Gr. Brit. (£189), 2 to Br. West Indies (£5/5)	a/a
1892	-	190bbl (£498/0/15)	165bbl to Gr. Brit. (£433/2/6), 25 to US (£65/12/6)	a/a
1893	-	359bbl (£942/7/6)	359bbl to Gr. Brit. (£942/7/6)	a/a
1894	-	175bbl (£459/7/6)	175bbl to Gr. Brit. (£459/7/6)	a/a
1895	-	189bbl (£283/10)	162bbl to Gr. Brit. (£243), 10 to Br. West Indies (£15), 17 to Br. Guiana (£25/10)	a/a
1896	4 boats, 28 men	216bbl (£324)	216bbl to Gr. Brit. (£324)	a/a
1897	5 boats, 24 men	293bbl £469)	181bbl to Gr. Brit. (£271/10), 2 to Br. Guiana (£3)	a/a
1898	4 boats, 26 men	193bbl (£238)	189bbl to Gr. Brit.	a/a
1899	4 boats, 28 men	254bbl (£397/3/1)	252bbl to Gr. Brit. (£420), 2 to US (£3/6/8)	a/a; ave. price of oil £1/13/4 per bbl
1900	4 boats, 28 men	430bbl (£448/6/8)	553bbl to Gr. Brit. (£921/13/4) (*sic*)	-
1901	Failed to read	-	-	-
1902	5 boats, 39 men	405bbl (*ca* £600)	274bbl to Gr. Brit.	-
1903	5 boats, 41 men	288bbl (£350)	164 casks to Gr. Brit. (*f*273/6/8)	£1/13/4 per cask
1904	5 boats, 41 men	12bbl (£20)	12 casks to Br. West Indies	£1/13/4 per cask
1905	6 boats, 42 men	42bbl (£70)	42bbl to Gr. Brit.	-
1906	5 boats, 33 men	250bbl (£156)	151bbl to Gr. Brit., 1 to Br. West Indies	-
1907	3 boats, 21 men	72bbl (£288)	72bbl to Gr. Brit.	-
1908	3 boats, 21 men	74bbl (£148)	74bbl to Gr. Brit.	£2/bbl
1909	2 boats, 12 men	14bbl (£28)	14bbl to Gr. Brit.	a/a
1910	2 boats, 12 men	28bbl (£58)	28bbl to Gr. Brit., 1 to Br. West Indies	a/a
1911	-	-	-	'No Whale Oil exported in 1911'.

Grenada

Non-mechanised shore whaling catches for Grenada were subsumed in the Grenadines column of table 1 in Mitchell and Reeves (1983) except for the 1921-24 period when, as mentioned earlier, they were erroneously listed in the Barbados column. Additional information from Romero and Hayford (2000) suggests that rather than a total of seven whales, as listed for 1921-24 by Mitchell and Reeves (based on published oil production data, and after applying a loss rate factor of 1.5), the Grenada secured catch was about 8-12 whales in 1920, one in 1921, no records in 1922, at least five in 1923 and one in 1924, for a total of at least 15-19 whales landed. No information was found concerning catches after closure of the Norwegian whaling station at Grenada in 1926-27 (see above).

Trinidad

The shore whaling enterprise at Trinidad, previously poorly documented (Mitchell and Reeves, 1983), is now accounted for in some detail (Reeves *et al.*, 2001a).

St Lucia

Mitchell and Reeves (1983), citing Brown (1945), listed Pigeon Island near St Lucia as the site of a shore whaling station, apparently some time in the late 19th or early 20th century. It may be useful to search the St Lucia Blue Books for more details.

Turks and Caicos

A whaling station at Whale House Bay on Salt Cay in the Turks and Caicos group remains a mystery. The supposed timing of its demise, in the 1880s (Buissert and Clark, 1974), coincides with the decline of American pelagic whaling for humpback whales in the West Indies (Mitchell and Reeves, 1983) and the closing of some shore stations (e.g. in Trinidad; Reeves *et al.*, 2001a). Reeves checked the Turks and Caicos Blue Books for 1870, 1875, 1880, 1882, 1884, 1886 and 1888 in the Public Record Office. The sections 'Returns from Agriculture' and 'Returns from Manufactures, Mines, and Fisheries' consistently emphasised that the staple export was salt, supplemented by sponge, turtle shells, guano and 'cave earth'. In 1870, 25gal of whale oil (worth £2 12s.) was exported to St Thomas and in 1882 some spermaceti (worth £14 3s. 3d.) was trans-shipped to the United States. No reference of any kind was made, however, to local whaling in the Turks and Caicos.

CAPE VERDE ISLANDS: NON-MECHANISED SHORE WHALING

Clarke (1954) found 'no reference to any shore whaling from the Cape Verdes although sperm whales certainly frequent the islands, at least in winter'. In a study focussed on American pelagic whaling around the Cape Verde Islands, Reeves *et al.* (In press) found only meagre evidence of shore whaling. However, Reiner *et al.* (1996) and Hazevoet and Wenzel (2000) cited evidence of shore whaling at the Cape Verde Islands from as early as the late 18th century and into the early 20th century. Their main Portuguese-language sources (Cardoso, 1896; Carreira, 1983) merit closer examination to establish periods and scales of these operations and to confirm that the humpback (as opposed to the sperm whale or pilot whale [most likely *Globicephala macrorhynchus* in this area]) was their primary target.

MADEIRA: NON-MECHANISED SHORE WHALING

This whaling began in 1941 as an extension of the Azores open-boat fishery for sperm whales (Clarke, 1954) and continued until 1981 (IWC, 1988). Although sperm whales were the principal targets, large mysticetes were taken at least opportunistically (e.g. two right whales in 1967 —Maul and Sergeant, 1977).

AMERICAN NON-MECHANISED PELAGIC WHALING

The American ('Yankee') whale fishery, although largely centred on sperm and right whales, involved humpback whaling in a number of winter breeding areas including the West Indies and Cape Verde Islands (Clark, 1887; Townsend, 1935; Mitchell and Reeves, 1983).

West Indies

American pelagic whaling in the West Indies was identified by Mitchell and Reeves (1983) as a major component of the overall catch history of North Atlantic humpback whales. Those authors did not, however, estimate takes by American pelagic whalers in the West Indies prior to 1850 as their summary table of catches began only with that year. Available information on pre-1850 catches is summarised below and some new post-1850 data are also presented, allowing further analyses of post-1850 catches (IWC, 2002b).

Mitchell and Reeves (1983) repeatedly emphasised that their estimation procedures were intended to give negatively biased (i.e. 'conservative') results. A major source of negative bias that affected their estimates was that they sampled only two collections of whaling logbooks and journals in the northeastern USA — Providence Public Library and Old Dartmouth Historical Society. In a subsequent, similar study of right whaling in the North Atlantic, Reeves and Mitchell (1986a) found numerous relevant 19th century manuscripts in the collections of the Kendall Whaling Museum, Dukes County Historical Society and New Bedford Free Public Library. Clearly, the search by Mitchell and Reeves (1983) of logbooks and journals available in public collections at the time of their study was far from complete (Sherman *et al.*, 1986).

New England whalers began visiting the West Indies from at least as early as 1772 but it is uncertain whether they took many humpback whales in the first few decades (Mitchell and Reeves, 1983). The schooner *Lark* of Nantucket hunted sperm, humpback and pilot whales there in 1785 (Reeves and Mitchell, 1986a). Mitchell and Reeves (1983) concluded that humpback whaling in the West Indies did not become a 'regular feature' of the American fishery until after 1836. The South Seas whale fishery occupied most of the world's large vessels during the late 18th and early 19th centuries and some of these whaleships sailed from British or French ports (Stackpole, 1972; Du Pasquier, 1982). The itineraries of most American vessels took them eastward to the Western Islands (Azores) thence southward via the Canaries and Cape Verdes into equatorial waters or the South Atlantic. If they visited the West Indies, it was most likely during the return voyage, perhaps stopping at Barbados to trans-ship oil and baleen, then pursuing sperm whales on the Bahamas, Southern, Charleston or Hatteras Grounds before arriving back in New England. A few smaller vessels, particularly those from ports such as Provincetown, Westport and Boston, stayed in the North Atlantic and sometimes visited the West Indies. For example, in 1822 the brig *Laurel*, instead of heading directly back to New England from the Azores in the autumn, spent several months in the West Indies and arrived home in March 1823 (Atwood in Clark, 1887; returning only sperm oil according to Starbuck, 1878). In 1836, four Provincetown vessels took some humpback whales in the West Indies (Atwood in Clark, 1887) although Starbuck (1878) gave the destinations of Provincetown vessels in 1835-37 as 'Cape de Verdes' or 'Atlantic' and indicated that they returned only sperm oil.

The sample of unpublished logbooks and journals studied by Mitchell and Reeves (1983) revealed a number of additional voyages in which humpback whales were pursued between 1822-49 (also see Reeves *et al.*, 2001b) but only a single catch (and one struck/lost) was documented (*Industry* of Westport, 1828). In subsequent studies, Reeves found evidence of 15 additional West Indies voyages between 1833-43 but only two more catches and one more struck/lost humpback (Table 3). If it is assumed that all of the *whale* oil

returned by these voyages (693bbl) came from humpback whales, this represents an estimated total catch of only 28 whales (i.e. less than 3/year) using 25bbl/whale for conversion. It must be emphasised, however, that searches of logbooks, newspapers and other sources were not comprehensive.

The figures attributed by Mitchell and Reeves (1983) to 'Yankee Pelagic West Indies' for 1850-65 in their table 1 came only from their 'read' sample (secured, killed/lost, orphaned calves, struck/lost carrying gear, and half of the struck/lost without gear or unspecified) and 'sighted' sample (mid-point of oil-based and vessel-season estimates; see their table 11 for the sample and table 12 for the method). No extrapolation was involved. A number of factors suggest that the catches were much higher than indicated during that period. The most obvious one is that many humpbacking voyages must have been missed simply because the logbooks were not held by either the Providence Public Library or the Old Dartmouth Historical Society. Provincetown whaling effort in the North Atlantic was roughly constant throughout the period and substantial quantities of humpback oil were landed at New Bedford (Mitchell and Reeves, 1983). Although the value of whale oil was highly variable (see Bockstoce, 1986, for the reasons), it spiked markedly from 1862-67 (Mitchell and Reeves, 1983).

For the period 1866-87, which Mitchell and Reeves (1983) considered the peak of American pelagic whaling for humpback whales in the West Indies, they added an 'extrapolated' component to account for voyages not included in their 'read' or 'sighted' samples. This component was narrowly constrained. For inclusion, a voyage had to have: (a) originated in Provincetown; (b) sailed between the years 1866-87; (c) departed home port between the months October-March, inclusive; (d) returned to home port before the following winter; (e) shown some return of whale oil; and (f) shown no return of any 'bone' (baleen). The relatively large catches for the years 1866-87 attributed to 'Yankee Pelagic West Indies' in their table 1 came directly from their table 12, where the procedures and underlying assumptions were explained.

Table 3 of the present paper lists numerous voyages that are now known to have taken humpback whales but that were not accounted for in any of the estimates by Mitchell and Reeves (1983). In addition, based on data in Starbuck (1878) and Hegarty (1959) regarding sailing and arrival dates and amounts of whale oil returned, several hundred American voyages between 1866-87 could have taken humpback whales in the West Indies (or Cape Verdes) but were not included in the 'read,' 'sighted' or 'extrapolation' samples of Mitchell and Reeves (1983). Among the possible reasons are that: (a) no logbook or journal was available in either of the two collections used by Mitchell and Reeves (i.e. it could not have been 'read'); (b) no record of the vessel's presence on the West Indies whaling grounds was found in the read logbooks and journals (i.e. it was not 'sighted'); or (c) the voyage's characteristics did not meet the narrow criteria established by Mitchell and Reeves for inclusion in their 'extrapolation' sample (see the foregoing paragraph). In a more detailed analysis, using different methods and additional logbook data, Smith and Reeves (2002) concluded that the catch estimates by Mitchell and Reeves (1983) were negatively biased but by less than expected, and that it was appropriate to stratify voyages on the assumption that those leaving from Provincetown were far more likely to humpback in the West Indies than those leaving from other American ports.

Cape Verde Islands

Some humpbacking by American whalers took place at the Cape Verde Islands as early as 1816 although a substantial increase in effort seems to have occurred in the 1830s (Reeves *et al.*, 2002). The peak appears to have been in the 1850s to mid-1860s, somewhat earlier than the peak of effort and catch in the West Indies. Although their study emphasised Yankee whaling in the West Indies, Mitchell and Reeves (1983) recorded data for five vessel-seasons of humpbacking in the Cape Verdes (1853, 1870, 1877, 1882 and 1883), accounting for a total of at least 35 whales secured, ten killed but lost, 29 struck but lost and two orphaned calves. Reeves and Mitchell (1986a) identified several additional voyages that either definitely or probably included periods of humpback whaling in the Cape Verdes; these were in the years 1857-59 and 1864-65 and usually also involved whaling for right whales in Cintra Bay, West Africa.

Reeves *et al.* (2002) examined the American humpback fishery in the Cape Verdes and provided estimates of kills and strikes based on data from logbooks and journals, the Dennis Wood Abstracts (Wood, no date) and various published sources.

Other areas

Nantucket whalers made voyages to Greenland (Davis Strait) and Newfoundland (Grand Bank or Gulf of St Lawrence) as early as the 1730s (Little, 1988) although according to Macy (1835) they did not begin whaling in Davis Strait until 1746, the Gulf of St Lawrence in 1761 and grounds east of the Grand Bank in 1765. Nantucket sent an average of 102 (range 60-125) ships on whaling voyages each year from 1762-72, returning an average total of 12,745bbl of oil (range 7,825-19,140; presumably whale oil and sperm oil combined) (Macy, 1835). A large fleet of American vessels whaled in the Gulf of St Lawrence and Strait of Belle Isle in the 1760s (Starbuck, 1878; see summary in Mitchell and Reeves, 1983).

With the decline of right whales throughout the North Atlantic by the mid-18th century, humpback whales became tolerable substitutes and their oil probably constituted an increasing proportion of the returns labelled 'whale oil' (as opposed to sperm oil). For example, the sloop *Seaflower* of Nantucket sailed to Newfoundland in June 1752 with the explicit purpose 'to kill Some Humps'. According to its logbook, the *Seaflower* and six other Nantucket sloops returned with more than 100bbl of 'Humpback oyl' aboard each of them (Reeves and Mitchell, 1986a). A simple interpretation of this information would be that close to 30 humpback whales were taken by the Nantucket fleet in Newfoundland that season (assuming 25bbl/whale). American whaling for humpback whales in eastern Canadian (and Newfoundland) waters seems to have been a substantial enterprise for roughly a century, beginning in the mid-1700s. References summarised by Mitchell and Reeves (1983) indicate that considerable numbers of this species were still being taken by American whalers around Newfoundland and in the Gulf of St Lawrence during the middle of the 19th century. In addition to the whales taken by vessels declaring these areas as their primary destination, other whales probably were taken or at least struck by whalers while *en route* to or on other grounds, particularly in the second half of the 19th century when shoulder guns and bomb lances were available. For example, the bark *Charles W. Morgan* of New Bedford (1878-81, MS) took a 28bbl humpback from a

[*text continues on p. 231*]

Table 3

Previously unpublished data on West Indies humpback whaling (i.e. not included in Mitchell and Reeves, 1983). * = logbook/journal was read some time after 1983 (see references). ** = voyage was included in 'sighted' or 'extrapolation' sample of Mitchell and Reeves (1983) but that logbook/journal has been read since 1983. *** = voyage was included in 'sighted' or 'extrapolation' sample of Mitchell and Reeves (1983) but that new data are now available as indicated. Sp = sperm oil (bbl); wh = whale oil (bbl); bone = whalebone or baleen (lb).

Vessel/year of departure	Rig/port	Season in W. Indies	Whales secured[1]	Whales killed but lost	Whales struck but lost	Published returns[2]	Comments
Harmony/1833	Schooner/Nantucket	1833-34	Uncertain			Unclear	See Reeves *et al*., 2001a
Harmony/1835	Schooner/Nantucket	1836	Uncertain			260sp, 150wh	Called at Port-of-Spain, Trinidad, 'in distress', 23 Feb. (Reeves *et al.*, 2001a)
**Annawan*/1836	Brig/Rochester	1837	1(calf)		1	178sp, 20wh	Whaled off Venezuela and Trinidad (*Annawan*, 1836-37)
Popmunnett/1837	Bark/Falmouth	1837	1(+?)			300sp	30bbl humpback oil on board as of 7 Feb.; whaled off Venezuela (*Annawan*, 1836-37) and Trinidad (Reeves *et al.,* 2001a)
Primrose/1836	Schooner/Nantucket	1837	Uncertain			100sp, 50wh	Called at Port-of-Spain, Trinidad, 'on a whaling voyage', 28 Mar. (Reeves *et al.,* 2001a)
Elizabeth/1836	Brig/Westport	1837	Uncertain			212sp, 13wh	Seen at Bequia 1 Feb. (*Annawan*, 1836-37)
Little Catherine/1836?	Bark/London	1837	Uncertain			?	Called at Port-of-Spain, Trinidad, 'with Apparatus for catching Whales', 31 Jan. (Reeves *et al.,* 2001a)
Popmunnett/1838	Bark/Falmouth	1838	Uncertain			200sp	Called at Port-of-Spain, Trinidad, 'from a whaling voyage', 14 Mar.; sailed 16 Mar. 'on a whaling voyage' (Reeves *et al.,* 2001a)
Primrose/1838	Schooner/Nantucket	1838	Uncertain			Clean	Called at Port-of-Spain, Trinidad, 'with implements for whaling', 23 Mar.; sailed 24 Mar. 'on a whaling voyage' (Reeves *et al.*, 2001a)
Harmony/1837	Schooner/Nantucket	1838	Uncertain			130sp	Called at Port-of-Spain, Trinidad, 'from a whaling voyage' with 'oil and implements for whaling', 23 Feb. (Reeves *et al.*, 2001a)
Imogene/1838	Brig/Provincetown	1838	Uncertain			400sp, 200wh	Called at Port-of-Spain, Trinidad 'on a Whaling Voyage', 25 Mar. (Reeves *et al.,* 2001a)
Imogene/1839	Brig/Provincetown	1839	Uncertain			350sp, 250wh	Called at Port-of-Spain, Trinidad 'with whaling apparatus', 4 Feb. (Reeves *et al.,* 2001a)
Sarah/1840?	Bark (Brig?)/Rochester?	1842	Uncertain			624sp?	Called at Port-of-Spain, Trinidad 'from a whaling voyage', 10 Jan. (Reeves *et al.,* 2001a)
Fairy/1842	Bark/Provincetown	1843	Uncertain			300sp, 30wh	Called at Port-of-Spain, Trinidad 'from a whaling voyage', 21 Jan.; sailed 24 Jan 'on a whaling voyage' (Reeves *et al.*, 2001a)
Edward/1842	Brig/Mattapoisett	1843	Uncertain			420sp	Called at Port-of-Spain, Trinidad, 'from a whaling voyage', 25 Feb. (Reeves *et al.*, 2001a)
Corvo/1852	Bark/Orleans	1853	Uncertain			360sp	Seen off Venezuela 4 Feb. (*Solon*, 1852-53)
**Winged Racer*/1867	Schooner/Provincetown	1867	5			Nothing	Humpbacking in Mona Passage (*Winged Racer*, 1867)
Watchman/1867	Schooner/Provincetown	1867	Uncertain			40sp	Seen in Mona Passage 15 Mar. (*Winged Racer*, 1867)
***Winged Racer*/Jan. 1868	Schooner/Provincetown	1868	1 ½ [3]			50sp, 40wh	Humpbacking in Mona Passage (*Winged Racer*, 1868)
****Ellen Rizpah*/1868	Schooner/Provincetown	1868	At least ½ [4]			77sp, 58wh	Humpbacking in Mona Passage in co. with *Winged Racer* from at least 9 Feb.-1 Apr. (*Winged Racer*, 1868)
***Winged Racer*/Dec. 1868	Schooner/Provincetown	1869	4 [7]	1	3	100wh	Humpbacking in Grenadines, landed some oil at St Vincent 16 May (*Winged Racer*, 1868-69)
***Rising Sun*/1875	Schooner/Provincetown	1875	2 [4]			159sp, 60wh	Humpbacking at Mariegalante (*Rising Sun*, 1875-83)
Gracie M. Parker/1874 or 1875	Schooner/Provincetown	1875	1-2(+?)			No report	Reported at Mariegalante 30 Apr. with 150bbl whale oil; seen at Mariegalante 11 May fast to cow/calf (*Rising Sun*, 1875-83)
****Lottie E. Cook*/1875	Schooner/Provincetown	1875	1(+?) [14]			20sp, 190wh	Reported at Mariegalante 30 Apr. with 55bbl whale oil after 6 weeks out; seen at Mariegalante 11 May processing a whale (*Rising Sun*, 1875-83)
****Ellen Rizpah*/1875	Schooner/Provincetown	1875	Some [16]			220wh	Seen at Mariegalante 30 Apr. with 150bbl HB oil after 2 months (*Rising Sun*, 1875-83)
***Rising Sun*/1876	Schooner/Provincetown	1876	3 (cows), 2 others [15]	1 cow, 1 other	1	100sp, 200wh	Humpbacking at Mariegalante (*Rising Sun*, 1875-83)
****Gracie M. Parker*/1876	Schooner/Provincetown	1876	1/2(+?) [15]			165sp, 200wh	Seen humpbacking at Mariegalante 13 Mar.-at least 3 Apr.; took a whale 23 Mar. in co. with *Arizona* (*Rising Sun*, 1875-83)
****M.E. Simmons*/1876	Schooner/Provincetown	1876	Probably some [15]			150sp, 200wh	Seen humpbacking at Mariegalante 14 Mar.-at least 3 Apr. (*Rising Sun*, 1875-83)
****Arizona*/1876	Schooner/Provincetown	1876	1/2(+?) [1]			80sp, 20wh	Seen humpbacking at Mariegalante 23 Mar.-at least 3 Apr.; took a whale 23 Mar. in co. with *G.M.Parker* (*Rising Sun*, 1875-83)
****Edward Lee*/1876	Schooner/Provincetown	1876	Some [13]			180wh	Seen humpbacking at Mariegalante 3 Apr. (*Rising Sun*, 1875-83)

cont...

Table 3 continued.

Vessel/year of departure	Rig/port	Season in W. Indies	Whales secured[1]	Whales killed but lost	Whales struck but lost	Published returns[2]	Comments
****Rising Sun*/1877	Schooner/Provincetown	1877	2 cows (40 & 70bbl), 1 other (20bbl) [10]			100sp, 130wh	Humpbacking at Mariegalante (*Rising Sun*, 1875-83)
*****M.E. Simmons*/1876	Schooner/Provincetown	1877	1+ [22]			160sp, 300wh	Took 23bbl whale at Mariegalante 26 Mar. 1877; seen chasing cow/calf 14 Apr.; took a whale 23 Apr. (*Rising Sun*, 1875-83)
*****Gracie M. Parker*/1877	Schooner/Provincetown	1877	3 cow/calf pairs, 1 other (+?) [19]			175sp, 250wh	Took cow/calf pairs at Mariegalante 31 Mar., 3 Apr., 16 Apr. (60bbl for one of these pairs), 1 other 21 Apr. (*Rising Sun*, 1875-83)
*****Ellen Rizpah*/1877	Schooner/Provincetown	1877	Probably some [15]			125sp, 200wh	Seen at Mariegalante 19 Apr. with 200bbl whale oil (*Rising Sun*, 1875-83)
*****Lottie E. Cook*/1877	Schooner/Provincetown	1877	Probably some [13]			50sp, 180wh	Seen at Mariegalante 2 May with 180bbl whale oil after 2½ months out (*Rising Sun*, 1875-83)
***Rising Sun*/1878	Schooner/Provincetown	1878	1 calf, 1 other			No report	Humpbacking in Grenadines; sold 151gal HB oil at St Vincent (*Rising Sun*, 1875-83)
Agate/1877	Schooner/Provincetown	1878	Uncertain			120sp, 100wh	Seen at Tobago 27 Feb. (*Rising Sun*, 1875-83)
Antarctic/1877	Schooner/Provincetown	1878	Uncertain			340sp, 100wh	Seen at Tobago 28 Feb. (*Rising Sun*, 1875-83)
Ellen Rizpah/1878	Schooner/Provincetown	1878	Uncertain			80sp, 170wh, 1900bone	Seen in Grenadines 7 Mar. (*Rising Sun*,1875-83)
*****Gracie M. Parker*/1878	Schooner/Provincetown	1878	Uncertain [16]			90sp, 210wh	Seen in Grenadines 7 Mar. (*Rising Sun,*1875-83)
****Rising Sun*/Feb 1879	Schooner/Provincetown	1879	[6]			330sp, 80wh	The whale oil for this voyage *did not* come from West Indies humpbacks (*Rising Sun*, 1875-83)
Edward Lee/1879	Schooner/Provincetown	1879	Uncertain			70sp, 190wh	Seen at St Bart's 15 Apr. 1879 with 70 bbl 'Black oil' after 2½ mo. out (*Rising Sun*, 1865-83)
****Rising Sun*/Nov. 1879	Schooner/Provincetown	1880	1 calf, 2 others [6]	1 cow, 3 others	2 cows, 1 other	65sp, 80wh	Humpbacking at Mariegalante (*Rising Sun*, 1875-83)
*****Agate*/1880	Schooner/Provincetown	1880	at least 1 cow/calf, 2 others [19]			70sp, 260wh	Seen humpbacking at Mariegalante 6 Mar.-at least 15 Apr. (see *Rising Sun*, 1875-83); took cow/calf 17 Mar.; another whale 8 Apr. (saved bone); seen processing a whale 1 May (see *Carrie W. Clark*, 1879-81)
*****Mary G. Curran*/1880	Schooner/Provincetown	1880	Probably some [9]			80sp, 115wh	Seen at Mariegalante, apparently humpbacking, 1 May (see *Carrie W. Clark*, 1879-81)
****Rising Sun*/1882	Schooner/Provincetown	1882	Some [12]			200sp, 160wh	Humpbacking at Mariegalante (*Rising Sun*, 1875-83)
****Rising Sun*/1883	Schooner/Provincetown	1883	5 cow/calf pairs (made 40 and 55bbl from 2 of these), 3 others (made 38bbl from 1 of these) [16]	1	1 calf	30sp, 215wh	Humpbacking at Mariegalante; saved baleen from humpbacks (*Rising Sun*, 1875-83)
**Leonidas*/1864	Bark/New Bedford	1865	1 cow (42bbl; calf also struck)	1 calf killed but not processed	3	21sp, 42wh, sent home 155sp	Humpbacking at Bequia; delivered 28bbl oil to agent at St Vincent; sold 13gal HB oil at St Vincent, 105gal at St Eustatius (*Leonidas*, 1864-65)
**Rainbow*/1866	Schooner/Dartmouth	1867	3 cows (at least struck at least 1 of the calves), 1 other	1	2	35sp, 3wh	Humpbacking off Trinidad (*Rainbow*, 1866-67); see Mitchell and Reeves (1983: table 9) for under-representation of catch for this voyage
George J. Jones/1866	Schooner/Fairhaven	1867				100sp, sent home 179sp	Seen at Trinidad 8 Feb.-at least 20 Mar.; humpbacking in co. with *Rainbow* (*Rainbow*, 1866-67)
George J. Jones/1870 (see *Thriver* 1870-71)	Schooner/Fairhaven	1871			at least 1	109sp, 135wh, sent home 30sp	Humpbacking off Venezuela; struck a whale 1 Mar. at Purata Island (*Thriver*, 1870-71)
*****Ellen Rizpah*/1883	Schooner/Provincetown	1883	[15]			75sp, 200wh	Seen at St Lucia 2 Mar. (*Union*, 1882-83)
Fanny Burns/1882	Schooner/New Bedford	1883				No returns indicated	Seen at St Lucia 19 Mar. (*Union*, 1882-83)

cont...

Table 3 continued.

Vessel/year of departure	Rig/port	Season in W. Indies	Whales secured[1]	Whales killed but lost	Whales struck but lost	Published returns[2]	Comments
**Washington*/1858	Schooner/Edgartown	1859	1½ (1 gave 22bbl)			170sp, 37wh, sent home 46sp	Humpbacking at Dominica in co. with *Orray Taft* (*Washington*, 1858-59)
Orray Taft/1858	Bark/New Bedford	1859	At least ½			600wh, 9000bone, sent home 449sp	Humpbacking in co. with *Washington* at Dominica 21 Feb. (see *Washington*, 1858-59)
**Eschol*/1871	Brig/Beverly	1872	1 cow	1 cow/calf, 1 calf killed but not processed	1 calf, 3 others	150sp, sent home149sp	Humpbacking at Mariegalante at least 9 Mar.-7 May (*Eschol*,1871-72)
****Ellen Rizpah*/1872	Schooner/Provincetown	1872	At least 2 (1 gave 20bbl) [16]			112sp, 214wh	Humpbacking at Mariegalante; took a whale 2 Apr., another 12 Apr. (*Eschol*, 1871-72)
****Arizona*/1872	Schooner/Provincetown	1872	At least 2 (1 gave 20bbl) [16]			221wh	Humpbacking at Mariegalante; took a whale 6 Apr., another 12 Apr. (*Eschol*, 1871-72)
****B.F. Sparks*/1872	Schooner/Provincetown	1872	At least 1 cow/calf [19]			75sp, 254wh	Humpbacking at Mariegalante; took a cow/calf 10 Apr. (*Eschol*, 1871-72)
****Gracie M. Parker*/1872	Schooner/Provincetown	1872	At least 1 [24]			105sp, 323wh	Humpbacking at Mariegalante; took a whale 13 Apr. (*Eschol*, 1871-72)

[1]Numbers in square brackets are catches (including loss rate factor ×1.85) for these voyages estimated by Mitchell and Reeves (1983). [2]From Starbuck (1878) or Hegarty (1959).

group of three encountered west of the Two Forties Ground (40°N, 58°20'W) in early October 1878, during the outbound portion of a three-year voyage to the South Atlantic; the Westport bark *Mattapoisett* (1871-72, MS) took a cow-calf pair on the Western Ground (34°20'N, 43°40'W) in early June 1872, during the home-bound leg of a 14 month voyage to the South Atlantic; and the New Bedford brig *A.J. Ross* (1878) chased a group of humpback whales off Hamilton Inlet, Labrador, on 21 June 1878, while heading for Hudson Bay to hunt bowhead whales (*Balaena mysticetus*). It is impossible to estimate the magnitude of the opportunistic kills of humpback whales in the North Atlantic outside the breeding grounds, although such kills appear to have been exceptional rather than common.

OTHER AREAS AND FISHERIES

Venezuela

No evidence was found of 19th century shore whaling in Venezuela. However, considering that American and British whalers hunted humpback whales in coastal and inshore waters of Venezuela during the 1830s-1870s (Reeves *et al.*, 2001a; b), it would not be surprising to learn that they introduced equipment and techniques for whaling at sites on shore. Romero *et al.* (1997) cited records of this species being hunted with harpoons in Venezuelan waters in 1960, 1990 and 1993, but Romero *et al.* (2001) noted only that in early 1960 a stranded humpback had 'three embedded harpoons of Japanese origin' and made no mention of the 1990 and 1993 events. A humpback was taken incidentally in a fishing net at Ensenada de La Guardia, Isla Margarita, in February 1990; it was one of several seen in the bay that day (M. González, Miami, FL, 12 January 1999, *in litt.*, accompanied by photographs). In addition, a 630cm male stranded at La Salina (10°34'N, 67°05'W) in May 1990 (Boher and García, 1990). This appears to be the 1990 animal cited by Romero *et al.* (1997) as having been harpooned.

Early European whaling off Newfoundland and Labrador

Considering the ratio of humpback whales to other mysticetes on the Grand Bank and in coastal waters of Newfoundland and Labrador in recent years (e.g. Hay, 1982; Whitehead and Glass, 1985; Kingsley and Reeves, 1998), it is difficult to imagine that the large fleets from Spain, Portugal, France and Great Britain who were cod fishing and whaling for bowheads and right whales during the 16th century (Lubbock, 1937) did not catch humpback whales at least occasionally. Humpback whales were clearly less desirable, however[5], and might have been largely ignored.

Some French whalers operated in the Strait of Belle Isle and along the north shore of the Gulf of St Lawrence during the first half of the 18th century. For example, one vessel reported taking 11 whales and striking 16 more in 1735 (Reeves, 1985; Reeves and Mitchell, 1986a). Although bowhead and right whales (*ballennes de grand Baye*) were clearly preferred, these whalers seem to have also pursued other mysticetes routinely. For example, nine of the 11

[5] The Muscovy Company's instructions to Thomas Edge in 1611 on how to distinguish 'the better sorts' of whales from 'the worser' referred to the 'Sedeva Negro', described as black in colour, 'with a bumpe on his back', was said to yield 'neither oyle, finnes [i.e. baleen], nor teeth, and yet he is of great bignesse'. This has been interpreted as referring to the humpback (see Lubbock, 1937; Mead and Mitchell, 1984).

caught whales and all of the struck and lost ones in the aforementioned 1735 cruise were referred to as *gibarts*, which may have included humpback whales[6].

CONCLUSIONS

The proposed definitions of fisheries and sub-fisheries in Table 1 appear to capture the scope and complexity of the humpback fishing operations in the North Atlantic. In geographic range, these operations took place from Iceland, Svalbard and northern Norway south to the Cape Verde Islands in the east, and from Greenland, Newfoundland and the Gulf of St Lawrence south to the West Indies and Venezuela in the west. While the time periods are well known for most of the fisheries and sub-fisheries, take levels (whether defined as landings alone, or as landings plus hunting loss) are only approximately known for many of them. More precise determinations of take levels will probably never be possible for some areas and times, but in most cases information on catch or production (e.g. oil) is available for at least some years.

The largest numbers of humpback whales, estimated as totalling more than 2,000 over the entire period of operation, were taken in two fisheries: the Icelandic sub-fishery of the Norwegian Mechanised Shore fishery and the West Indies sub-fishery of the American Non-mechanised Pelagic fishery. Fourteen other fisheries or sub-fisheries were each estimated to have taken hundreds but probably less than about 2,000 humpback whales. Of the other fisheries and sub-fisheries, six are thought to have taken only tens of whales and three to have taken negligible numbers (< 10). Available information was inadequate to produce meaningful estimates for five of the fisheries or sub-fisheries (see IWC, 2002b).

Further historical study is warranted for several of the fisheries or sub-fisheries that are either known or suspected to have taken substantial numbers of humpback whales. These include, in particular, two of the sub-fisheries of the American Non-Mechanised Pelagic fishery (West Indies and Cape Verde Islands; see Smith and Reeves, 2002) and the Bermuda Non-mechanised Shore, Cape Verde Islands Non-mechanised Shore and American Mechanised Coastal fisheries (see Webb, 2001; Reeves *et al.*, 2002). Also, it would be useful if Nordic scholars were to address more fully the problem of pro-rating the unspecified whale catches (on an annual basis) during the early years of Norwegian Mechanised Shore whaling in Iceland and the Faroes. Because of the likely large magnitude of humpback removals in some of these fisheries, such work should be given high priority.

ACKNOWLEDGEMENTS

Edward Mitchell introduced Reeves to the concept of using diverse sources to reconstruct the catch history of a whale population. The staffs of the museums that conserve logbooks, journals and other documents and make them available for scholarly use deserve our thanks. We are particularly grateful in this regard to Stuart Frank and Michael Dyer of the Kendall Whaling Museum (recently merged with the New Bedford Whaling Museum) and Laura Pereira of the New Bedford Whaling Museum, all of whom have cheerfully facilitated our work. Mirialba González generously shared unpublished data and provided copies of published articles on recent humpback takes and occurrences in Venezuela. Cherry Allison of the IWC Secretariat played a key role by providing data on modern whaling catches from the IWC database. This study was funded by contracts to Okapi Wildlife Associates from the US National Marine Fisheries Service, Northeast Fisheries Science Center, and the International Whaling Commission.

[6] Hershkovitz (1966) translated *gibbar* as the fin whale (*Balaenoptera physalus*) and *jubarte* as the humpback. True (1904) cited a 17th century French narrative describing the *Gibar* of the Gulf of St Lawrence as 'a kind of whale, so called on account of a protuberance that it seems to have, having the back much raised, where it carries a fin'. It is uncertain which species were included by the French whalers under the name *gibart* but the humpback could have been one of them.

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