

The Humpback Whale, *Megaptera novaeangliae*



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Introduction

The humpback whale, *Megaptera novaeangliae* (Borowski, 1781), is a medium-sized baleen whale of the Balaenopteridae family, which includes all the rorquals and is found in all oceans of the world (Fig. 1). At maturity, the humpback reaches a

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length of about 15.6 m (51 feet) and weighs about 34 metric tons (t). The body is relatively short and rotund and is characterized by exceptionally long flippers. The flippers, which are one-fourth to one-third the total body length, are knobbed on the anterior edges. The span of its symmetrical flukes is one-third the total body length.

Although generally recognized by a pear-shaped blow about 1.8 m (6 feet) high, it is most specifically identified as it breaches, displaying its unique body contours. The whale may occasionally leap clear of the water and

spin partially as it falls with a re-sounding smack. Sometimes it rolls on the surface, slapping the water with its flukes or flippers. Occasionally it holds one flipper in the air while lying on one side or both.

The humpback has a rich, varied vocabulary and a wide range through the tonal scale. Its "song," a long series of varied phrases repeated in sequence over intervals of more than a half hour, is varied slightly from year to year, and may be identified in a group over a number of years. Different stocks of whales have regional "dialects."

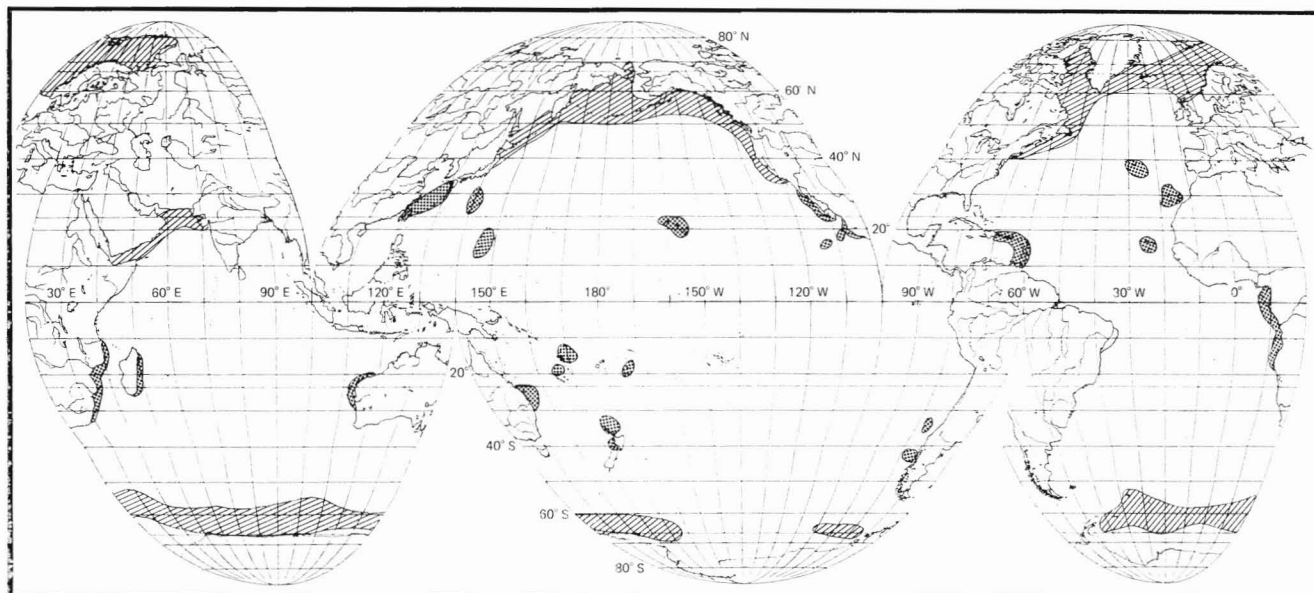


Figure 1.—Geographical distribution of the humpback whale. Simple hatching indicates the summer feeding grounds. Stippling indicates the winter grounds. Migration routes between summer and winter grounds are not shown because they are poorly known.

Like most species of baleen whales, the humpback spends the summer on high-latitude feeding grounds and migrates long distances to low-latitude winter grounds (Fig. 1) where mating and calving take place. Since the reproductive cycles of the Northern and Southern Hemisphere stocks are 6 months out of phase, whales from the two hemispheres do not interbreed. The species is divided into three reproductively and geographically isolated populations, one each in the North Pacific, the North Atlantic, and the Southern Ocean.

During the winter, the humpback is mostly confined to shallow waters along coasts and around oceanic islands. This restriction further divides each of the three major populations into several largely discrete breeding stocks which may broadly overlap on their summer grounds, except for the western North Atlantic, where the situation is opposite. Its coastal habitat has made

the humpback whale one of the most vulnerable species to modern whaling methods. The history of humpback whaling worldwide has been one of repeated episodes of overexploitation which result in depletion of the local stocks.

Although humpbacks are now protected from commercial whaling by the International Whaling Commission (IWC), the wintering grounds of some stocks lie within the territorial waters of nonmember nations. A few animals are taken each year in aboriginal hunting. Further, as a coastal species they are increasingly subject to nearshore pollution, boat traffic, mineral and industrial development, and other human activity.

Distribution and Migration

Humpback whales are found in all seas between the Arctic and Antarctic, with local changes in distribution according to fairly distinct migration patterns. The Northern and Southern

Hemisphere populations are regarded as separate. They do not go into the polar pack ice zones (Chittleborough, 1965; Dawbin, 1966).

The first documented information on migratory movement of humpback whales came from recovery of whales marked with discovery-type marks. Migration information on humpbacks and other cetaceans is now coming from photographic identification techniques that use distinctive scars, fin shapes, external growths, and patterns of pigmentation (Glockner-Ferrari, 1982; Katona et al., 1982; Payne, 1972; Bigg et al.¹; Jurasz and Jurasz²)

North Pacific

Humpback whales range widely across the North Pacific during the summer. On the Asian side they range south to the Sanriku coast of Honshu Island, Japan, and on the U.S. side they range south to about Point Conception, Calif. They range north through most of the Bering Sea, and a few enter the Chukchi Sea.

There are three major wintering areas for humpbacks in the North Pacific:

1) The Mexican stock ranges along the west coast of Baja California, chiefly from Isla Cedros south to Cabo San Lucas, and around the cape at least as far north as Isla San Jose in the Gulf of California; along the mainland coast from southern Sonora to Jalisco; and around the far offshore Islas Revillagigedo (Rice³).



A humpback whale on its wintering grounds near Maui, Hawaii. Note the extremely long flippers. Photo by J. Hudnall.

¹Bigg, M. A., I. B. MacAskie, and G. Ellis. 1976. Abundance and movements of killer whales off Vancouver Island with comments on management. Unpubl. manuscript, 19 p. Arct. Biol. Sta., Dep. Fish. Oceans, 555 St. Pierre Blvd., Ste. Anne de Bellevue, Quebec, H9X 3L6, Can.

²Jurasz, C. M., and V. Jurasz. 1977. Censusing of humpback whales, *Megaptera novaeangliae*, by body characteristics. (Abstr.) In Proceedings of the 2nd Conference on the Biology of Marine Mammals, San Diego, California, 12-15 December 1977, p. 54. (Avail. from first author, Sea Search, P.O. Box 93, Auke Bay, AK 99821.)

³Rice, D. W. 1966. Status of humpback whales on their wintering grounds in the southeastern North Pacific. Unpubl. manuscript, 11 p. Natl. Mar. Mammal Lab., Northwest Alaska Fish. Cent., NMFS, NOAA, 7600 Sand Point Way N.E., Seattle, WA 98115.

2) The Hawaiian stock ranges around all the main Hawaiian Islands from Kauai to Hawaii (Wolman and Jurasz, 1977; Baker and Herman, 1981).

3) The Asian stock ranges around the Mariana Islands, the Bonin Islands, the Ryukyu Islands, and Taiwan (Nishiwaki, 1959; Townsend, 1935).

Recovery of discovery-type marks prior to protection of humpbacks from commercial whaling demonstrated migratory movement in the western North Pacific as follows (Ivashin and Rovnin, 1967; Ohsumi and Masaki, 1975):

Winter ground	Summer ground	Number of recoveries
Ryukyu Islands	E. Bering Sea	5
Ryukyu Islands	S. of E. Aleutians	1
Bonin Islands	N.E. Honshu	1
Bonin Islands	E. Bering Sea	2

In the eastern North Pacific, a number of linkages have been made of individual whales between summer feeding grounds and winter calving and breeding grounds, based on photograph matches (Baker et al.⁴). The picture emerging appears to be one of discrete regional feeding grounds off Alaska, with thus far no detectable exchange between regions, but a general mixing together on the winter grounds of animals from different feeding areas. In addition, a small degree of yearly exchange between Hawaii and Baja California winter grounds has been noted (Darling and Jurasz, 1983). While humpbacks may range widely within a given feeding region, e.g., southeast Alaska (Baker et al.⁵), site fidelity is evidenc-

ed by individual whales that returned to southeastern Alaska's Glacier Bay for at least 12 years (Jurasz and Palmer⁶).

North Atlantic

In the eastern North Atlantic, humpbacks are found in the summer from Iceland, Scotland, Spitsbergen, and Norway, to Novaya Zemlya in the Barents Sea. These animals winter as far south as the Cape Verde Islands, off west Africa (Kellogg, 1929).

In the western North Atlantic, summer feeding grounds of humpbacks are found in the Denmark Strait west of Iceland, off southwestern Greenland, southern Labrador, eastern Newfoundland, in the Gulf of St. Lawrence, and in the Gulf of Maine/Nova Scotia.

During winter, humpbacks inhabit the relatively shallow waters of islands and offshore banks along the Antillean chain in the West Indies, with large concentrations on Silver and Navidad Banks, north of the Dominican Republic, and along the coast of Puerto Rico (Balcomb and Nichols, 1982; Whitehead et al., 1982).

As in the North Pacific, humpbacks tend to return each year to the same summer feeding grounds (Katona et al., 1982; Mitchell, 1974; Whitehead, 1982; Cetacean and Turtle Assessment Program⁷; Perkins et al.⁸). Recently, humpbacks from both the Gulf of Maine and Newfoundland have been found in the Gulf of St. Lawrence (Whitehead⁹). Also analogous to North Pacific migratory

patterns, animals from feeding grounds off New England, Canada, west Greenland, and Iceland all intermingle in winter on breeding/calving grounds in the West Indies (Katona et al., 1982; Martin et al.¹⁰).

The only recent sightings in the Gulf of Mexico are two in the north central area in 1952 and 1957, and one off Tampa Bay in 1962 (Schmidley, 1981).

Northern Indian Ocean

In the northern part of the Arabian Sea, humpbacks in numbers from tens to hundreds were reported by Slijper et al. (1964) during both winter and summer months. It is most likely a separate stock.

Southern Hemisphere

In the Southern Hemisphere, humpbacks concentrate every winter in six distinct breeding grounds: Along the tropical western sides of each continent, to a lesser extent along eastern coastlines, and around island groups. In spring, the whales move more or less directly south from the breeding grounds, resulting in six general feeding areas in the Antarctic. Summer concentrations occur around South Georgia and the South Shetland Islands, and south of the west and east coasts of Africa, Australia, and South America (Dawbin, 1966). Reports of a number of mark recoveries (Brown, 1957; Dawbin, 1956, 1966) indicate that there is at least some intermingling on the feeding grounds of animals from different breeding areas.

⁴Baker, C. S., L. M. Herman, B. G. Bays, and W. F. Stifel. 1982. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska. Unpubl. manuscript, 78 p. Kewalo Basin Mar. Mammal Lab., Univ. Hawaii, 1129 Ala Moana, Honolulu, HI 96814. Prep. for Nat. Mar. Mammal Lab., NMFS, NOAA, Seattle, WA 98115, under Contr. 81-ABC-00114.

⁵Baker, C. S., L. M. Herman, B. G. Bays, and G. B. Bauer. 1983. The impact of vessel traffic on the behavior of humpback whales in southeast Alaska: 1982 season. Unpubl. manuscript, 81 p. Kewalo Basin Mar. Mammal Lab., Univ. Hawaii, 1129 Ala Moana, Honolulu, HI 96814. (Prep. for Natl. Mar. Mammal Lab., NMFS, NOAA, Seattle, WA

98115, under Contr. 81-ABC-00199.)

⁶Jurasz, C. M., and V. Palmer. 1981. Censusing and establishing age composition of humpback whales, *Megaptera novaeangliae*, employing photodocumentation in Glacier Bay National Monument, Alaska. Unpubl. manuscript, Sea Search, P.O. Box 93, Auke Bay, AK 99821.

⁷Cetacean and Turtle Assessment Program. 1982. A characterization of marine mammals and turtles in the mid- and North Atlantic areas of the U.S. outer continental shelf. Unpubl. manuscript, 450 p. Graduate School Oceanogr., Univ. Rhode Island, Kingston, RI 02881. (Prep. for U.S. Dep. Inter., Bur. Land Manage., under Contr. AA551-CT8-48.)

⁸Perkins, J. S., K. C. Balcomb, III, and

G. Nichols, Jr. 1983. West Greenland humpbacks, update to 1983. (Abstr.) In Proceedings of the 5th Biennial Conference on the Biology of Marine Mammal, November 27-December 1, 1983, Boston, Massachusetts, p. 80. (Avail. from first author, Ocean Res. Educ. Soc., 19 Harbor Loop, Gloucester, MA 01930.)

⁹H. Whitehead, Newfoundland Inst. for Cold Ocean Science, Mem. Univ. Newfoundland, St. John's A1B 3X7. Pers. commun.

¹⁰Martin, A. R., S. Katona, D. Mattila, D. Hembree, and T. Waters. 1984. Humpback whales from eastern and western North Atlantic feeding grounds share a common breeding area. Unpubl. manuscript. Avail. from S. Katona, Coll. Atl., Bar Harbor, ME 04609.



A group of eight humpback whales engage in coordinated feeding behavior in Frederick Sound, southeastern Alaska. Photo by C. D'Vincent.

Life History and Ecology

Feeding

The diet of humpbacks in the Northern Hemisphere consists of both benthic and pelagic-layer organisms of the coastal zone (Tomilin, 1957). These include krill (euphausiids), copepods and other crustacean zooplankton; herring, Clupeidae; sand lance, *Ammodytes* sp.; capelin, *Mallotus villosus*; juvenile salmonids, *Oncorhynchus* spp.; Arctic cod, *Boreogadus saida*; walleye pollock, *Theragra chalcogramma*; pollock, *Pollachius virens*; and pteropod and some cephalopod mollusks. In the Antarctic the diet is restricted almost exclusively to krill (Nemoto, 1959; Gaskin, 1972).

Humpback distributions are heavi-

ly clumped in areas of food abundance. On the Newfoundland coast, for example, spawning capelin coincide with the humpback migratory return, while off New England and west Greenland, sand lance and capelin are the major prey items, with krill and other plankton playing a minor part (Kapel, 1979; Perkins et al., footnote 7). In Alaskan waters, the main prey appear to be krill, herring, and capelin (Bryant et al., 1981; Dolphin and McSweeney, 1983).

Humpbacks feed either at or below the surface. Subsurface feeding (although probably more often employed than surface feeding, at least in the Northern Hemisphere) is unobservable after the whale dives and thus has not been described. Surface feeding, on the other hand, is observable and exciting to behold. The techniques are numerous, and most

may be used by a single whale or by a number of animals feeding together. Techniques by which the whale remains largely at the surface include horizontal lunging, circular swimming, and thrashing (Edel and Winn, 1978; Watkins and Schevill, 1979), "flick feeding," in which the fluke is used to stun or concentrate prey (Jurasz and Jurasz, 1979), and a similar technique, termed "inside loop," also using fluke slaps (Hain et al., 1982). The humpback varies these techniques as it disappears for brief periods beneath the surface and probably does not dive very deep.

Bubble feeding is generally considered the most intriguing feeding behavior of all, and was first described by Ingebrigtsen (1929). The submerged whale releases a single large bubble or clouds of bubbles, or bubbles in patterns ranging from a

Aerial view of a bubble-net blown by a feeding humpback whale in Stephens Passage, southeastern Alaska. The whale is beginning to surface just outside the upper right edge of the spiral. Photo by J. M. Olsen.

line to partial or complete circles, with or without "tails." In each case the whale comes up open-mouthed through the circle or clouds of bubbles, which apparently concentrate or corral schools of zooplankton or small fishes. Presumably, the feeding technique or variation used is dictated by the available prey species and density. D'Vincent et al.¹¹ noted evidence for coordinated feeding behavior.

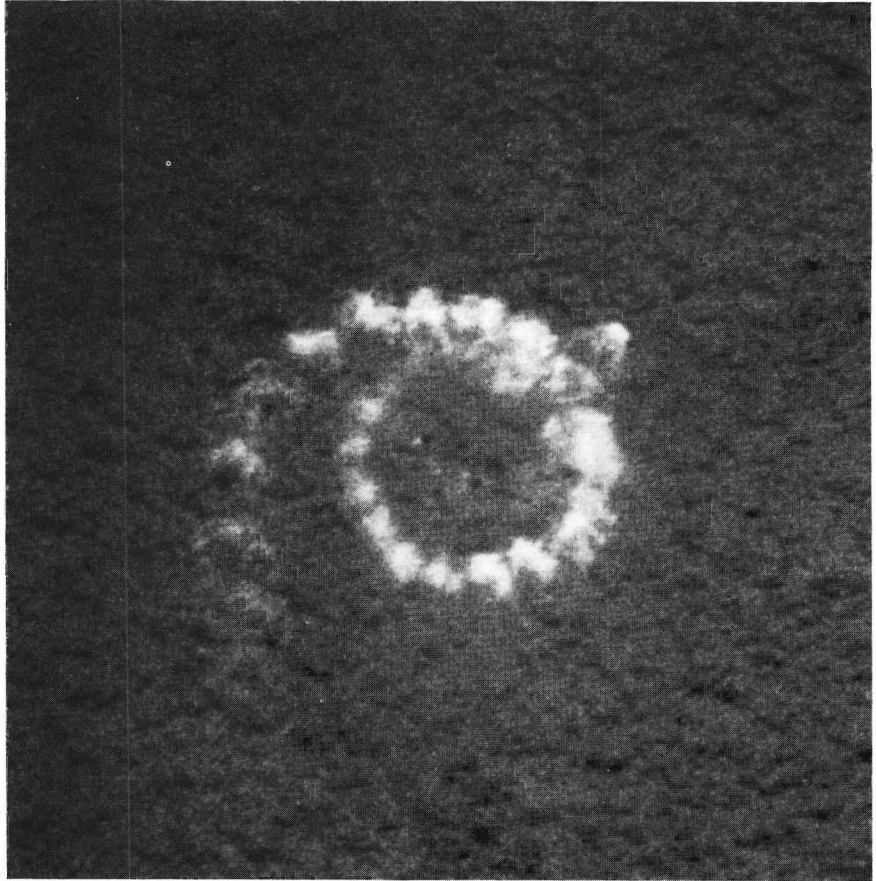
Like other rorquals, humpbacks fast mainly, if not entirely, during the winter and feed during the summer. A few spend the winter in Alaskan waters and presumably continue feeding. According to Chittleborough (1965), from four to five times more oil was recovered from northbound humpbacks in the southern ocean than from those on their way south.

Reproduction and Recruitment

Both male and female humpbacks begin to mature sexually at about 9 years of age. Chittleborough (1965), Nishiwaki (1959), and others placed sexual maturity at only 5 years, but their determinations erroneously assumed the laying down of two laminae per year in the ear plug, instead of only one (Roe, 1967).

Births occur between January and March in the Northern Hemisphere. Gestation lasts about 12 months, and lactation close to a year (Rice, 1967).

¹¹D'Vincent, C. G., R. M. Nilson, and R. E. Hanna. 1984. Vocalization and coordinated feeding behavior of the humpback whale (*Megaptera novaeangliae*) in southeastern Alaska. Unpubl. manuscr. Ocean Res. Under Sail, P.O. Box 1167, Monterey, CA 93942.



Chittleborough (1958) reported that, while 8.5 percent of the sexually mature female humpbacks he examined were both pregnant and lactating and so must have mated soon after giving birth, most wait 1 or more years between giving birth and becoming pregnant again. Glockner-Ferrari¹² reported three females with newborn calves in consecutive years; one was seen with a new calf 4 years in a row. However, the usual reproductive cycle for humpbacks appears to be 2 or more years.

Rate of recruitment to maturity may range from 3.9 to 11.8 percent for the western North Atlantic stock (Whitehead, 1982), and from 10.3 to 13.1 percent for the Antarctic Group

¹²D. A. Glockner-Ferrari, P.O. Box 1539, Lahaina, Maui, Hawaii 96767-1539. Pers. commun.

IV population (Chittleborough, 1965), although Chittleborough's figures are uncorrected for the aging problem.

Natural Mortality

Sharks and killer whales, *Orcinus orca*, may be the greatest causes of natural mortality among calves (Gaskin, 1972). Gilmore (1959) reported seeing a humpback missing one fluke but which swam normally. The killer whale is the only known marine predator which could inflict such damage, and probably only to a young humpback.

Dead humpbacks are occasionally beached, and because they are highly eurythermal animals and may frequent the edge of ice fields, one is sometimes trapped in the ice (Tomilin, 1957). Various parasites and commensals infest humpback

whales, but they rarely appear to have a pathologically debilitating effect on the hosts (Matthews, 1978; Tomilin, 1957).

Humpbacks are subject to skin damage caused by lampreys and by various species of the small tropical shark *Isistius* sp. (Jones, 1971). Competing male humpbacks on the breeding grounds also have been observed inflicting cutting wounds on one another, using their flukes.

Exploitation and Population Size

History of Exploitation

Eastern North Atlantic

Modern whaling began in Norway in the 1860's, spread to Iceland, the Faroe Islands and Spitsbergen, and reached the British Isles in 1903. From 1868 to 1955, at least 1,579 humpbacks were taken in the eastern North Atlantic and Arctic. An unknown number were taken in the Faroe Islands between 1894 and 1909. Commercial whaling for humpbacks in this area ended when the IWC, with no objections, listed the stock as protected in 1955. From 1955 to 1967, 11 animals were taken for local consumption in Norway, the Faroe Islands, and Madiera (Brown, 1976; Committee for Whaling Statistics, 1930-80). No data are available from Spain or Portugal.

Western North Atlantic

From 1886 to 1976, 522 humpbacks were taken off west Greenland (Kapel, 1979), and 1,397 were caught in Nova Scotia, Newfoundland, and Labrador waters from 1903 to 1970 (Mitchell, 1974). In addition, about 170 were taken in the West Indies in 1925 and 1926 (Committee for Whaling Statistics, 1930-80) and about 53 from the Bequia area in the Windward Islands between 1950 and 1982 (Price, In press). A subsistence catch exceeding the IWC-recommended 10 per year (10 in 1977; 21 in 1978; 14 in 1979; 13 in 1980; 11 in 1981; 12 in 1982) has been taken in Greenland in recent years (IWC, 1980; In press).

North Pacific

Aboriginal whaling and early commercial hunting on the high seas, using hand harpoons, took an unknown number of humpbacks prior to 1900. From 1905 to 1960, about 23,000 humpbacks were killed in modern-style whaling, which began in 1889 in the western Pacific and in 1905 in the eastern Pacific. From 1960 to 1965, over 5,000 were killed, reducing the population to about 1,000 (Rice, 1978).

Southern Hemisphere

Before becoming one of the mainstays of the modern whaling industry, a large population of humpbacks inhabited the Southern Hemisphere. Between 1904 and 1966, when commercial humpback whaling was banned, over 68,000 animals were killed in the Antarctic (Bonner, 1982). Chittleborough (1965) reported 18,180 captures between 1949 and 1962. In 1978, the last year of aboriginal whaling in Tonga (western South Pacific), 12 animals, including 3 calves, were taken.

Current and Initial Stock Sizes

From a pre-exploitation world population of over 120,000, only about 10,000 remain.

Eastern North Atlantic

Although population data are lacking, the eastern North Atlantic humpback population is probably no larger than a few hundred whales.

Western North Atlantic

The current estimate of the western North Atlantic population is 5,773 \pm 516 (IWC, In press). Whitehead (1982) estimates between 1,535 and 2,720 humpbacks summering in the area of northeast Newfoundland and southern Labrador; Perkins et al. (footnote 7) estimate a present west Greenland stock of 282 animals, based on photoidentification of 143 individuals.

Mitchell and Reeves (1983) recalculated catch figures for the region and now estimate an original popula-

tion size of at least 4,400 whales in 1865, and an even larger one before whaling began in the West Indies and Gulf of St. Lawrence during the second half of the 18th century.

North Pacific

The pre-1905 humpback population of the North Pacific was probably about 15,000 (Rice, 1978), and is now about 1,200. Of these, Rice and Wolman¹³ estimate that 550-790 winter in Hawaiian waters. Most of the remainder winter off Mexico since probably fewer than 100 humpbacks now migrate to the Asian winter grounds.

Southern Hemisphere

In the Southern Hemisphere, the humpback has gone from a pre-exploitation population of about 100,000 to recent estimates ranging from about 2,500 (Masaki¹⁴) to 3,000 (Gambell, 1976).

Management

The IWC declared a ban on commercial killing of humpback whales in the North Atlantic in 1955, the North Pacific in 1965, and in the Southern Hemisphere in 1966. An annual aboriginal subsistence harvest is allowed in Greenland, as noted. Otherwise, protection of the species is nearly total.

Because the humpback whale inhabits shallow coastal areas, it is increasingly exposed to human activity. Environmental problems for coastal-dwelling whales either already exist or can be expected to result from offshore petroleum exploration and production, ocean dumping, coastal logging, mining and manufacturing, fishing, resort development, and increasing pleasure boat and cruise ship

¹³Rice, D. W., and A. A. Wolman. 1984. Census of humpback whales wintering around the Hawaiian Islands, 1976-1979. Unpubl. manusc. 22 p. Nat. Mar. Mammal Lab., Northwest Alaska Fish. Cent., NMFS NOAA, 7600 Sand Point Way N.E., Seattle, WA 98115.

¹⁴Masaki, Y. 1975. Japanese pelagic whaling and sighting in the Antarctic 1974/75. Unpubl. manusc., Nansei Reg. Fish. Res. Lab., Fish. Agency Jpn., Ohno-cho, Saeki-gun, Hiroshima-ken, 739-04, Jpn.

traffic. Each activity has potential for either direct, confrontational disturbance of whales or an indirect affect through damage to habitat or, in some cases, both.

Paradoxically, the need for such protection of whales in the United States grew partly out of increased public interest in and concern for marine mammals and the desire to see them in the wild. To protect the humpback whale from a growing harassment problem in Hawaiian waters—a problem mainly related to whale watching, though not limited to it—the National Marine Fisheries Service (NMFS) in 1979 augmented its enforcement efforts in that area and also successfully increased public awareness of the consequences of disturbance. A National Oceanic and Atmospheric Administration (NOAA) proposal to establish a humpback whale sanctuary in Hawaii is currently under study by the various State and Federal agencies and public interest groups that would be involved or affected by its establishment.

Environmentalists have urged establishment of another such sanctuary in Alaska waters, which they maintain would provide additional needed protection to a major portion of the North Pacific humpback population on both its winter and summer grounds. Opponents of the proposals in both states argue that the Marine Mammal Protection Act and the Endangered Species Act provide adequate protection for the humpback whale, and that sanctuaries would only impose additional and unnecessarily burdensome regulations on fishermen and other local interest groups.

In Glacier Bay National Park in southeast Alaska, the number of vessel entries, their date of entry, and length of stay are all regulated, except for commercial fishing boats, under a National Park Service permit system to achieve compatibility between the humpback whales that feed there and tourism. The system, which includes enforcement of vessel traffic regulations, was established following a dramatic drop in 1978 in the number

of whales occupying Glacier Bay.

In the West Indies, the Dominican Republic is considering the establishment of a humpback whale sanctuary on Silver Bank, although territorial rights to the bank itself are in dispute. No similar protective proposals for humpbacks are known to be under consideration in the Southern Hemisphere.

The current world population of humpback whales, about 10,000 animals, is probably only about 8 percent of its estimated pre-exploitation size. The Southern Hemisphere population, at an estimated 3.7 percent of its former size, is the most depleted. The North Pacific population is currently estimated to be 8 percent of its former size, and the North Atlantic population at about 50 percent of its former size. Stocks closest to extinction are those in the eastern North Atlantic and western North Pacific. Due to uncertainties of population sizes at the time commercial whaling of humpbacks ended, plus questionable validity of past census techniques, it cannot yet be shown with certainty that humpback populations are recovering. Although recovery probably is taking place, it is doing so at a rate slower than expected.

Habitat Protection

Degradation of coastal habitat results from numerous human activities, including landfill, dredging, construction, drilling, mining, logging, and from toxic chemical pollution, the last being generally viewed as one of the most widespread and potentially serious threats faced by coastal whales and their would-be protectors. Since whales are long-lived and at or near the top of the food chain, questions arise about cumulative effects and what constitutes threatening levels of toxic contamination (DeLong et al., 1973; Gaskin, 1982; Sergeant¹⁵). To date,

¹⁵Sergeant, D. E. 1980. Levels of mercury and organochlorine residues in tissues of sea mammals from the St. Lawrence estuary. Unpubl. manuscr. Arct. Biol. Sta., Dep. Fish. Oceans, 555 St. Pierre Blvd., Ste. Anne de Bellevue, Quebec, H9X 3R4, Can.

most of those questions remain unanswered. Regulatory protection of coastal waters in the United States is provided under the Federal Marine Protection, Research and Sanctuaries Act; National Environmental Policy Act, Clean Water Act, and River and Harbor Act, among others, and their state counterparts. Government agencies regularly involved in regulation of activities affecting coastal habitat include the U.S. Army Corps of Engineers, Environmental Protection Agency, Forest Service, Coast Guard, and advisory agencies such as the NMFS, U.S. Fish and Wildlife Service, and their state counterparts.

Accidental Mortality

Humpback whales are sometimes wounded and killed by being hit by ships, but this happens so seldom as not to be considered a serious problem. More serious is the frequency with which they become entangled in commercial fishing nets, particularly on the east coast of Canada and, to a lesser extent, the United States. Coincident with the near collapse of the offshore capelin stocks in that area in the late 1970's, humpbacks moved closer inshore and the number of entanglements increased alarmingly (Lien and McLeod¹⁶). Of 64 humpbacks entangled in 1979, at least 24 died (Mitchell, 1979). Since then, as the fishery has recovered, entanglements have fallen off sharply, but it remains a problem which could reescalate at any time.

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¹⁶Lien, J., and P. McLeod. 1982. Humpback collisions with fishing gear in Newfoundland: arbitration and education in a whale-fisherman dispute. In P. Wray (editor), Northeast endangered species conference, p. 50-64. Cent. Action Endangered Species, 175 W. Main Street, Ayer, MA 01432.

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