

The Status of Endangered Whales: An Overview

HOWARD W. BRAHAM

Introduction

The Marine Mammal Protection Act (MMPA) of 1972 is the principal U.S. statute for conserving and protecting marine mammals. Under it, the National Marine Fisheries Service (NMFS) of the Department of Commerce's National Oceanic and Atmospheric Administration is responsible for research on and management of all whales, dolphins, and porpoises (collectively called cetaceans) within the U.S. 200-mile Fishery Conservation Zone.

Of the 45 species of cetaceans found in U.S. waters, eight are considered so depleted that the special protection of the Endangered Species Act (ESA) of 1973 is needed beyond the MMPA. These eight, among the world's nine largest cetaceans, are collectively called the "great whales." Listed as "endangered" under the ESA, they include the gray whale, *Eschrichtius robustus* (Lilljeborg, 1861); blue whale, *Balaenoptera musculus* (Linnaeus, 1758); fin whale, *B. physalus* (Linnaeus, 1758); sei whale, *B. borealis* Lesson, 1828; humpback whale, *Megaptera novaeangliae* (Borowski, 1781); right whale, *Balaena glacialis* (Muller, 1776); bowhead whale, *B. mysticetus* Linnaeus, 1758; and sperm whale, *Physeter macrocephalus* (Linnaeus, 1758)¹ (Fig. 1). The ninth great whale, Bryde's whale, *Balaenoptera edeni*, is not listed as either endangered or threatened.

Endangered Species Act

On 10 November 1978, the U.S. Congress passed Public Law 95-632

¹Listed as *Physeter catodon* in the 1973 version of the ESA.

(Section 4(c)), amending the Endangered Species Act of 1973. One of the changes required the Secretaries of Commerce and Interior to review the status and degree of endangerment of all species listed in the Act at least once each 5 years to determine whether any listed species should be 1) removed from the list, 2) changed from "endangered" to "threatened," or 3) changed from "threatened" to "endangered."

In November 1982, the NMFS began a status review of the 19 endangered and threatened species under its jurisdiction, including the eight endangered great whales. The papers in this special section of the *Marine Fisheries Review* summarize the status reviews of those eight species and provide the biological basis for any final management decisions. Full NMFS status reviews will be made available separately, and will include management conclusions and recommendations for any changes in the listing of any species under the ESA.

These eight papers thus review current knowledge of distribution, migration, stock identity, life history and ecology, exploitation (principally commercial whaling), population abundance, and management concerns of the endangered great whales. We do not present a comprehensive review of the literature, but rather provide summaries of the most accurate and current data. No new analyses were conducted of population trends. The coeditors sought to

assemble and publish these papers to achieve the widest dissemination of the information to the public and to the scientific and academic communities.

This introductory paper gives a brief overview of the status review process, summarizes estimates of abundance and general status of stocks, and acknowledges the help of many individuals in conducting the reviews and preparing the succeeding eight papers.

Listing Factors

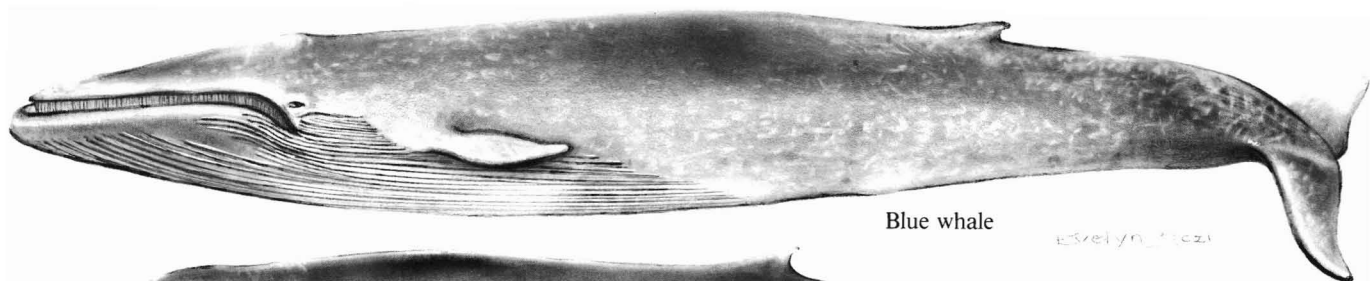
Under the Endangered Species Act of 1973, a species is considered "endangered" if it is in danger of extinction throughout all or a significant portion of its range, as a result of any one of the five factors specified in Section 4(a)(1) (Table 1). A species is considered "threatened" if it is likely to become endangered in the foreseeable future due to any of those same factors.

Historically, most of the great whales qualified as "endangered" as a result of overexploitation during commercial whaling (listing factor number 2). The results of that exploitation, reflected in the change from initial

Table 1.—Factors for listing a species as "threatened" or "endangered" under the Endangered Species Act of 1973 (Section 4(a)(1)(A-E), 1982 amendment). Only one listing factor need apply to list a species in either category.

Factors
1. The present or threatened destruction, modification, or curtailment of its habitat or range.
2. Overutilization for commercial, recreational, scientific, or educational purposes.
3. Disease or predation.
4. The inadequacy of existing regulatory mechanisms.
5. Other natural or manmade factors affecting its continued existence.

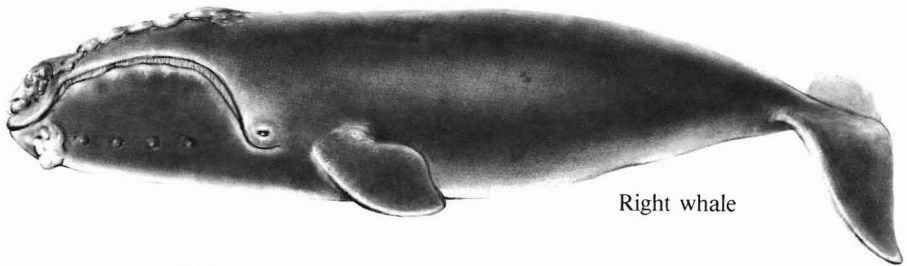
Howard W. Braham is Director, National Marine Mammal Laboratory, Northwest and Alaska Fisheries Center, National Marine Fisheries Service, NOAA, 7600 Sand Point Way N.E., Bin C15700, Seattle, WA 98115.



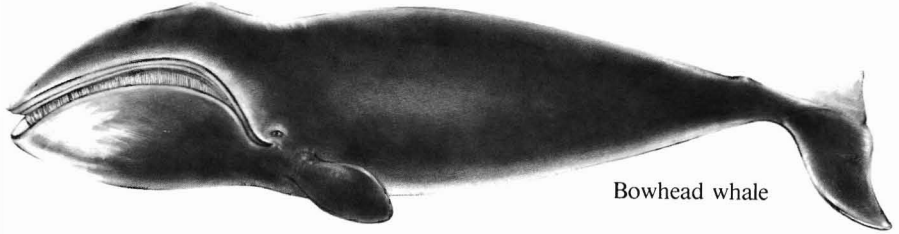
Blue whale *Evelyn Mezi*



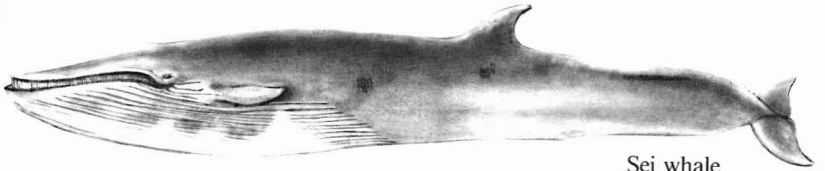
Fin whale



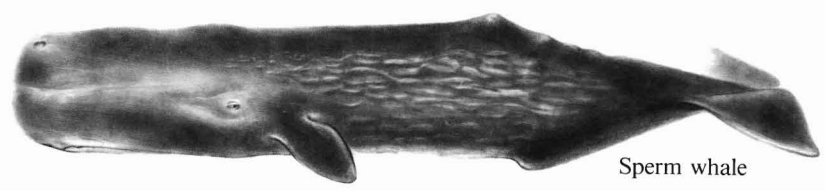
Right whale



Bowhead whale



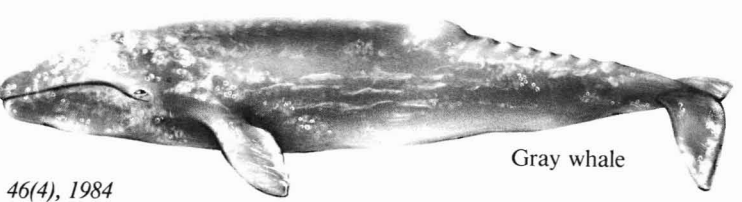
Sei whale



Sperm whale



Humpback whale



Gray whale

Figure 1. — The eight endangered great whales.

Table 2.—Initial (precommercial whaling) and current population size estimates of large whales currently listed as “endangered” under the ESA. Stock or regional group estimates are those summarized in the following eight papers in this special section of the *Marine Fisheries Review* 46(4):7-64 (n.e. = no published estimate).

Species, stocks, or reporting area(s)	Population sizes		Approximate percent of initial	Species, stocks, or reporting area(s)	Population sizes		Approximate percent of initial
	Initial	Current			Initial	Current	
Gray whale				Humpback whale			
Eastern North Pacific	15,000-20,000	13,450-19,210	Recovered	E. North Atlantic	n.e.	n.e.	n.e.
Western North Pacific	n.e.	n.e. ¹	n.e.	W. North Atlantic	> 4,400	5,257-6,289	Recovered?
Blue whale				Northern Indian Ocean	n.e.	n.e.	n.e.
North Atlantic	1,100-1,500	100	6-9%	North Pacific	15,000	< 1,200	8%
North Pacific	4,900	1,400-1,900	29-39%	Southern Hemisphere	100,000	2,500-3,000	2-3%
North Indian Ocean	n.e.	n.e.	n.e.	Bowhead whale			
Antarctic ²	150,000-210,000	1,000-8,000	< 1-5%	E. Greenland-			
Subantarctic Indian Ocean ³	10,000	5,000	50%	Spitsbergen	25,000	n.e. ¹	< 1%?
Fin whale				Davis Strait	11,000	n.e. ⁴	< 5%?
North Norway	Several thousand	n.e.	n.e.	Hudson Bay	680	n.e. ⁴	n.e.
West Norway/Faeroe Isl.	> 2,700	n.e. ⁴	10%?	Western Arctic	18,000	3,617-4,125	20-23%
Spain, Portugal, British Isles	> 5,000	n.e.	n.e.	Sea of Okhotsk	n.e. ⁵	n.e. ⁴	5-10%?
Denmark Strait	n.e.	1,791-11,584	n.e.	Right whale ⁶			
W. North Atlantic	n.e.	3,590-6,300	n.e.	North Atlantic	n.e.	n.e. ⁴	n.e.
North Pacific	42,000-45,000	14,620-18,630	32-44%	North Pacific	n.e.	n.e. ⁴	n.e.
Antarctic ²	400,000	85,200	21%	Southern Hemisphere	n.e.	3,000?	n.e.
Sei whale				Sperm whale ⁷			
North Atlantic	n.e.	4,957	n.e.	North Atlantic	166,000	99,500	60%
North Pacific	45,000	22,000-37,000	49-82%	Eastern North Pacific	311,000	274,000	88%
Southern Hemisphere ²	> 63,100-64,400	> 9,800-11,760	15-19%	Western North Pacific	309,400	198,100	64%
				Southern Hemisphere	590,600	410,700	70%

¹Thought to be nearing extinction or extremely low.

²Six stock units or areas of all oceans in the Southern Hemisphere. For population estimates and status see Masaki and Yamamura (1978), Gulland (1981), and Butterworth (In press).

³Pygmy blue whales.

⁴Perhaps in the low hundreds.

⁵Perhaps 6,500-10,000.

⁶Stocks are reported here by general area only. See Braham and Rice (1984) for stock boundaries.

⁷Exploitable population size, and includes males and females (from Tables 4-6 in Goshko et al., 1984); all estimates of initial and current abundance are considered provisional. No estimates are available for the number of immature animals.

(precommercial whaling) population size to current population size are presented in Table 2 for each species.

Listing a species in the ESA is based on the best available scientific data. In the absence of specific data, such as population growth rate, abundance, or known affect on these parameters, other potentially limiting factors to recovery (e.g., habitat destruction, disease, and predation), provided broad coverage for protection under the Act.

A discussion of the criteria used for listing certain species as endangered is not the intent of this paper. Considerable thought has gone into this for noncetacean species (e.g., Sparrowe and Wight, 1975; Landry et al., 1979; Anonymous, 1983). However, understanding the general nature and criteria of endangerment is important when evaluating the listing factors for reclassification (as required by Section 4(c)). This necessitates knowing whether the species or population is declining or nearing extinction, and whether the quantity and quality of its habitat is declining as well (Anony-

mous, 1983). These and other population attributes are central to determining current status, vulnerability, and recovery potential (Sparrowe and Wight, 1975). For certain management goals, it may also be important to consider regional uniqueness and sociological and ecological factors as well (Landry et al., 1979).

Endangered Great Whales

Seven of the endangered cetaceans are baleen whales, which filter their food between fringed baleen plates arranged in a row along each side of the palate. The eighth is the sperm whale, largest of the odontocetes, or toothed whales.

By any standards, the great whales are enormous (Fig. 1). The blue whale is the largest animal known to have lived on earth, some reaching lengths of 98 feet (about 30 m) or more. Reports of blue whales well in excess of 100 feet have not been adequately documented in the literature and may be exaggerated.

It is because of their great size and the large volume of commercial grade

oil in the blubber, the valued baleen or whale bone (in some species), and their predictable seasonal occurrence, that these great whales fell victim to commercial whalers. As a result, the populations of these species were severely reduced in most of the world's oceans within the past 200 years. Most stocks were reduced so fast as to be commercially unprofitable within a few decades of fishing.

Although few reliable data exist on the sizes of most stocks at the low point of their fisheries, a comparison of current population size estimates to available estimates just prior to commercial whaling is instructive, especially when considering whether a species or stock fits the criteria for listing under the ESA. But in reviewing the abundance estimates and general status of stocks, I caution the reader to remember that many stock estimates are fraught with sampling and statistical biases which may cause over- or underestimation of the true value. I therefore recommend reading the following papers and the literature

for a more in-depth appreciation of the estimates currently in use.

Status of Stocks: Population Abundance

Frequent reference is made in the following papers to certain terms, perhaps new to the reader, such as "stock" or "population." Generally speaking, populations are geographically isolated breeding units, i.e., two populations of the same species, one in the North Atlantic Ocean and the other in the North Pacific Ocean. A stock is a geographic subdivision of a larger population, and is usually thought of as having some special attribute which sets it apart from others of its kind or is also geographically separated, but not necessarily isolated. For example, a local group, or "stock," may be harvested at one time of the year, such as on its summer feeding ground, but on the winter breeding grounds animals in this group may intermingle with others of the same species. Humpback whales in the North Atlantic, for example, summer in a number of separate "stock" areas, but most winter together in the West Indies. Another definition of stock also includes the attributes of isolation, in which regional groups are apparently isolated from one another year-round, but may reside nearby. An example of this is the geographic separation of the Sea of Okhotsk and western Arctic bowhead whales. Among the eight endangered great whales, there are many stocks (Table 2 does not list all the stocks separately). No species is so isolated as to be represented by only one stock or population and there are the usual disagreements among scientists about certain stock designations or boundaries.

The Endangered Species Act specifically concerns itself with the continued existence of species. However, it has become convenient, and certainly practical, to evaluate the status of populations or stocks of whales, rather than just the species. This is because more information is often available for isolated groups



The late Jim Johnson uses a crossbow to affix a plastic streamer-tag to a gray whale in Laguna Ojo de Liebre in Baja California. Photo by C. Goebel.

than for either entire populations or the species itself. This imbalance of knowledge has, by necessity, led us into a stratified decision-making process wherein possibly no conclusion could be reached on a species (e.g., if deciding whether to reclassify) but a subdivision of the species, i.e., a population or stock, might be reclassified. The net effect could then be to have an "endangered" species with one or more stocks recovered.

On the basis of population abundance, as one criterion, a species (or stock) might be considered depleted if its population size is below the lower bound of the optimum sustainable population size (operationally considered by some to be the maximum sustainable yield level), currently defined (e.g., Tillman and Chapman, 1981) as that level yielding maximum net productivity which occurs at or above 60 percent of initial population size. Although reliable quantitative data are not available for all species, a large number of stocks or species can be considered "endangered" if one chooses to use this criterion (Table 2).²

Based on population size alone, most stocks of large whales clearly fall within the definition of "endangered," as defined in the ESA on the basis of the listing factors in Table 1. The great whales were listed as endangered

²"Depleted" was likely the concept applied to the term "endangered" in 1973. I use the concept of "degree of endangerment" as percent depleted, or current vs. initial stock size.

as a result of commercial exploitation, as discussed in this volume on a species-by-species basis, or using other criteria in the original documentation published in 1973 (Sec. 15 U.S.C. 1531). These listings were made despite a relatively sparse data base. The purpose of this paper, however, is not to evaluate and recommend whether each species remain classified as endangered, nor whether certain stocks should be reclassified, although some implications of this are presented in the following discussion.

Discussion

From data presented in the following eight papers, and summarized in Table 2, an estimate of the approximate percent of current to initial population size for some great whale stocks is made. In Table 3 an evaluation is made of the possible level of recovery for each stock or species' group.

Only the eastern North Pacific gray whale and perhaps the western North Atlantic humpback whale may have recovered to a population level similar to what it was prior to commercial whaling. On the basis of population size alone, these two stocks plus most sperm whale stocks seem likely candidates for reclassification.

However, population size is not the only criteria to be considered in deciding whether a stock warrants continued protection under the ESA. And, some doubts exist about the accuracy or completeness of data used

to estimate initial stock sizes, especially for humpback and sperm whales (Table 2). In the case of the gray whale, serious consideration must be given to coastal habitat protection as human activities increase. In addition, about 170-190 gray whales from this stock are killed each year by the Soviet Union, and usually less than 5 are killed annually by Alaska Eskimos.

Western North Atlantic humpback whales, as well, are subject to a small annual subsistence harvest in west Greenland and Bequia (Lesser Antilles), and several are entangled each year in fishing gear along the east coast of the United States and Canada. Sperm whales appear to be abundant relative to their presumed initial population sizes (when com-

pared with most stocks of baleen whales reported in Tables 2 and 3).

Three stocks of great whales may be nearing extinction: Western North Pacific gray whale, east Greenland-Spitsbergen bowhead whale, and North Pacific right whale. Several recent unpublished sightings of gray whales in the western North Pacific and Sea of Okhotsk, of 11 bowheads off Frans Josef Land in the eastern North Atlantic (Braham, 1984), and 2 right whales in the southeastern Bering Sea (Braham and Rice, 1984) suggest that at least a few individuals remain. Unfortunately, there is little direct evidence to indicate that these stocks are either further declining or recovering. The simplest explanation for the increased sightings is increased research.

Further consideration of the status of stocks of all large whales awaits renewed dedication to research on sightings and, perhaps, stranding information.

Acknowledgments

Many individuals gave of their time to provide valuable comments, advice, and assistance during preparation of the papers in this special section of the *Marine Fisheries Review* on endangered whales. The authors and I wish to extend our sincere appreciation to the following scientists located around the world who served as reviewers: An Overview, Charles Karnella (United States); gray whale, Robert Brownell, Jr., Stephen Reilly, and Steven Swartz (all United States); blue whale, Alfred Berzin (Soviet Union) and Sidney Brown (England); fin whale, Christina Lockyer (England), Edward Mitchell (Canada), and Carl Rørvik (Norway); humpback whale, Kenneth Balcomb III and Deborah Glockner-Ferrari (both United States) and Hal Whitehead (Canada); right whale, David Gaskin (Canada); bowhead whale, Mark Fraker (United States) and Randall Reeves and Giles Ross (Canada); sperm whale, Geoffrey Kirkwood (Australia) and Edward Mitchell (Canada).

We are also grateful to several present and past employees of the Na-

tional Marine Mammal Laboratory and the Northwest and Alaska Fisheries Center who either reviewed the papers or helped with preparing the material for them: Sandi Bohlenstiel, Marilyn Dahlheim, Charles Fowler, Sharon Giese, Carol Hastings, Leola Hietala, Linda Jones, Bruce Krogman, Betty Lander, Willman Marquette, R. V. Miller, Mary Nerini, Jessie Page, James Peacock, Roger Pearson, David Rugh, Laura Rutledge, Mike Seamans, Ronald Sonntag, Michael Tillman, Joanne Wejak, Pamela Wilder, David Withrow, Allan Wolman, and Muriel Wood. Dale Rice was especially helpful with reviewing the papers he did not coauthor. A special vote of confidence and appreciation is extended to Charles Karnella and Patricia Montanio of the NMFS headquarters office in Washington, D.C., who had the unenviable job of putting together the entire ESA review for the NMFS.

This special section on endangered whales is respectfully dedicated to the memory of James H. Johnson who passed away on 9 December 1983.

Literature Cited

- Anonymous. 1983. Final listing and recovery priority guidelines approved. U.S. Fish Wildl. Serv., Endangered Species Tech. Bull. 8(10):6-7.
- Braham, H. W. 1984. The bowhead whale. *Mar. Fish. Rev.* 46(4):45-53.
- _____, and D. W. Rice. 1984. The right whale, *Balaena glacialis*. *Mar. Fish. Rev.* 46(4):38-44.
- Butterworth, D. In press. An estimate of Antarctic blue whale population from sightings data from the IWC/IDCR cruises. *Rep. Int. Whaling Comm.*
- Gosho, M. E., D. W. Rice, and J. M. Breiwick. 1984. The sperm whale, *Physeter macrocephalus*. *Mar. Fish. Rev.* 46(4):54-64.
- Gulland, J. 1981. A note on the abundance of Antarctic blue whales. *In Mammals in the seas, volume 3, general papers and large cetaceans, p. 219-228. Food Agric. Organ. U. N., FAO Fish. Ser. 5, Vol. 3.*
- Landry, J. L., L. P. Hirsch, and E. R. McCaffrey. 1979. A rating system for threatened and endangered species of wildlife. *N.Y. Fish Game J.* 26(1):11-21.
- Masaki, Y., and K. Yamamura. 1978. Japanese pelagic whaling and whale sightings in the 1976/77 Antarctic season. *Rep. Int. Whaling Comm.* 28:251-261.
- Sparrowe, R. D., and H. M. Wight. 1975. Setting priorities for the Endangered Species Program. *Trans. N. Am. Wildl. Nat. Resour. Conf.* 40:142-156.
- Tillman, M. E., and D. Chapman. 1981. Further considerations of reasons for a more conservative approach to whale management. *Rep. Int. Whaling Comm.* 31:601-604.

Table 3.—A generalized evaluation of the possible recovery of endangered whales by stock(s) or regional groupings.

Status
Perhaps recovered ¹
Eastern North Pacific gray whale
Western North Atlantic humpback whale
Status uncertain ²
North Pacific sei whale
North Atlantic sperm whale(s)
North Pacific sperm whale(s)
Southern Hemisphere sperm whale
Depleted ³
All stocks of blue whales
Davis Strait bowhead whale
Sea of Okhotsk bowhead whale
Western Arctic bowhead whale
North Pacific humpback whale(s)
Southern Hemisphere humpback whale(s)
Antarctic fin whale
North Pacific fin whale
Western North Atlantic fin whale
Western Norway/Faeroe Islands fin whale
Southern Hemisphere right whale(s)
Southern Hemisphere sei whale(s)
Nearing extinction
East Greenland-Spitsbergen bowhead whale
Western North Pacific gray whale
North Pacific right whale(s)
Insufficient data for judgement
Hudson Bay bowhead whale
Denmark Strait fin whale
North Norway fin whale
Spain-Portugal-British Isles fin whale
Eastern North Atlantic humpback whale
Northern Indian Ocean humpback whale
North Atlantic sei whale
North Atlantic right whale

¹To estimated population size prior to commercial whaling.

²Possibly above or near 60 percent of estimated initial population size.

³Well below initial population size estimates, but may include low populations which have shown some increase (e.g., Southern Hemisphere right whales and western Arctic bowhead whale).