

The Great Whales: History and Status of Six Species Listed as Endangered Under the U.S. Endangered Species Act of 1973

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The Status of Endangered Whales: An Overview

Introduction and Background

In the history of whaling from pre-historic to modern times, the large whales, sometimes called the “great whales,” were hunted most heavily owing in part to their corresponding value in oil, meat, and baleen. Regional popu-

lations of North Atlantic right whales, *Eubalaena glacialis glacialis*, were already decimated by 1700, and the North Atlantic gray whale, *Eschrichtius robustus*, was hunted to extinction by the early 1700’s (Mitchell and Mead¹).

Then, as whalers turned to modern, mechanized forms of whaling in the 1860’s, worldwide populations of gray; bowhead, *Balaena mysticetus*; humpback, *Megaptera novaeangliae*; blue, *Balaenoptera musculus*; fin, *Balaenoptera physalus*; sei, *Balaenoptera borealis*; and sperm, *Physeter macrocephalus*, whales were in some instances greatly reduced (Tønnessen and John-

sen, 1982). However, as their numbers have diminished, concern for their (and other species) well-being has increased, and has resulted in such U.S. laws as the Endangered Species Conservation Act (ESCA) of 1969, the Marine Mammal Protection Act (MMPA) of 1972, and the Endangered Species Act (ESA) of 1973. Under these laws, eight species of large whales have been added to the List of Endangered and Threatened Wildlife (the List). Smaller species of whales (e.g. minke whale, *Balaenoptera acutorostrata*), whose numbers have remained fairly constant, have not been listed as endangered.

This report reviews the history and status of six species of endangered whales: right, humpback, blue, fin, sei, and sperm whale (Fig. 1). The other two

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¹ Mitchell, E. D., and J. G. Mead. 1977. History of the gray whale in the Atlantic Ocean (Abstr.). In Proceedings of the second conference on the biology of marine mammals, San Diego, Calif., p. 12.

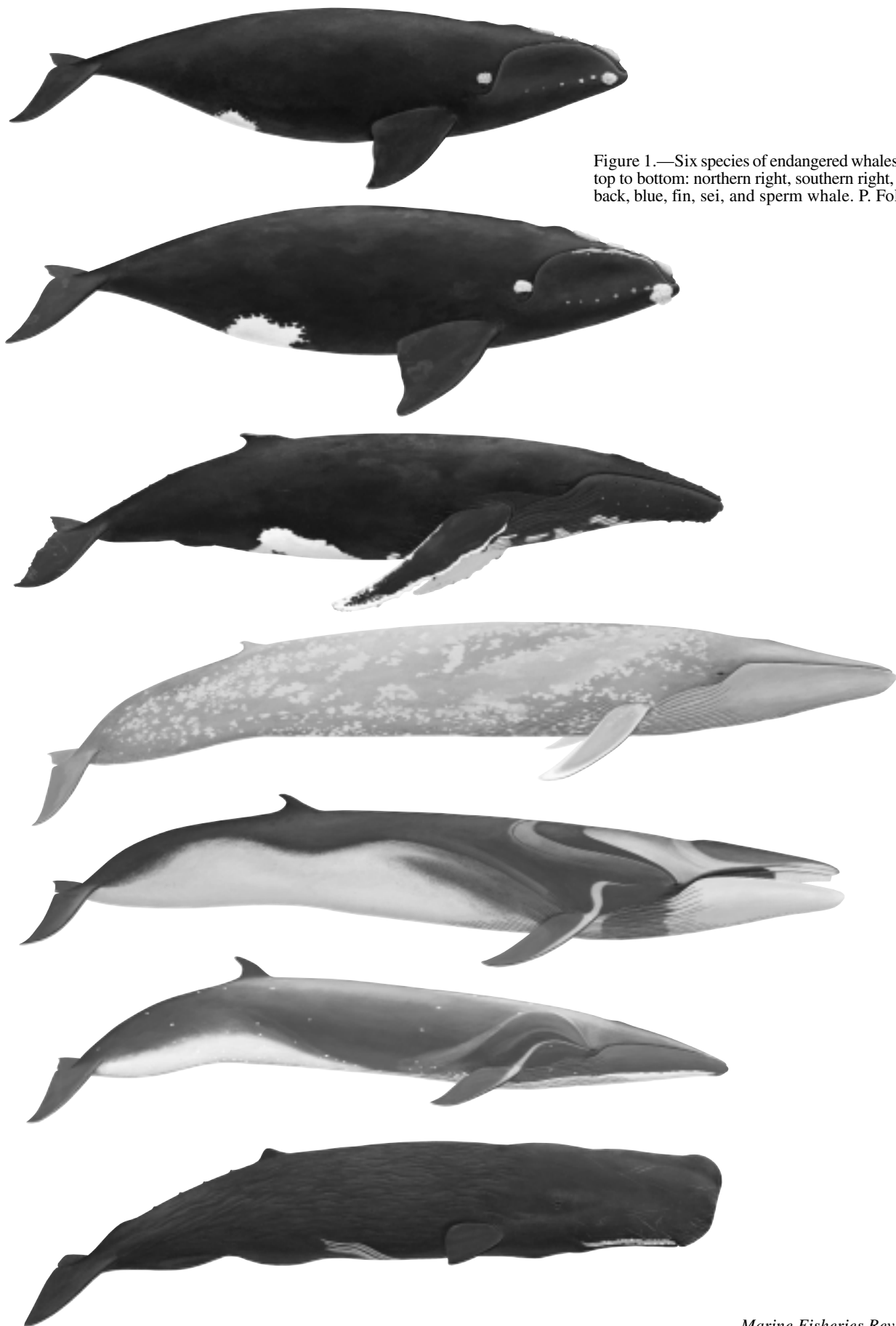


Figure 1.—Six species of endangered whales. From top to bottom: northern right, southern right, humpback, blue, fin, sei, and sperm whale. P. Folkens.

species of large whales were not included in this volume because 1) the eastern North Pacific stock of gray whale was removed from the endangered species list in June 1994 and 2) a status review of bowhead whale stocks was recently published (Shelden and Rugh, 1995).

As defined in the ESA, a species² should be classified as 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). In addition, a species should be classified as threatened if it is likely to become endangered in the foreseeable future due to any of the factors listed in Table 1.

On 10 November 1978, the U.S. Congress passed Public Law 95-632, which amended the ESA and required the Secretaries of Commerce and Interior to review the status and degree of endangerment of all species on the List at least once every 5 years. Within the 5-year status report, the results of a determination are to be reported as to whether a listed species should be 1) removed from the list, 2) reclassified from endangered to threatened, or 3) reclassified from threatened to endangered. In response to this Congressional mandate, the National Marine Mammal Laboratory of NOAA's National Marine Fisheries Service (NMFS) began its first such review in 1982, publishing the status reports jointly in the *Marine Fisheries Review* (Rice et al., 1984; Mizroch et al., 1984a, b, c; Johnson and Wolman, 1984; Braham and Rice, 1984; Braham, 1984a; and Gosho et al., 1984). Braham

(1984b) reported in a summary article that only the eastern North Pacific stock of gray whale and perhaps the western North Atlantic stock of humpback whale may have recovered to levels approaching their preexploitation population size. He further noted that "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."

In the 14 years that followed, there were no formal status reviews or publications produced similar to the 1984 issue (46(4)) of the *Marine Fisheries Review*. However, several significant actions regarding the status of endangered species of large whales took place. First, from 1984 to 1998 the International Whaling Commission (IWC) continued to review the status of all stocks of large whales and to make management recommendations when there was agreement within the Commission. For example, the IWC imposed a moratorium on commercial whaling for all stocks starting with the 1986 coastal and the 1985-86 pelagic seasons (IWC, 1995b).

Although the Government of Norway formally objected to the classification of the northeastern stock of minke whales as a "Protected Stock" (i.e. a stock for which commercial whaling was not allowed) and therefore was not bound by the IWC moratorium for this stock, there were no objections to the moratorium for any of the species listed under the ESA (IWC, 1995b). In addition, the IWC continued to manage the aboriginal subsistence harvest for the following stocks of large whales: Bering-Chukchi-Beaufort stock of bowhead whale, eastern North Pacific stock of gray whale, west Greenland and central North Atlantic stocks of minke whale, west Greenland stock of fin whale, and the North Atlantic stock of humpback whale (IWC, 1995b). Because aboriginal whaling quotas are set by the IWC for a specified time period, comprehensive status reviews for most of the stocks taken by aboriginal hunters were performed every 3-5 years.

Braham³ completed a status update of endangered whales in April 1991. While this report was never formally published, it was widely distributed. In that report, Braham noted the following: 1) the eastern North Pacific gray and sperm whale stocks were not in danger of becoming extinct and were not threatened with becoming endangered in the foreseeable future (i.e. recommendation to delist), 2) the Bering-Chukchi-Beaufort bowhead whale stock was not in danger of becoming extinct in the foreseeable future (i.e. recommendation to downlist to threatened), and 3) all other stocks of large whales were either severely depleted or the data were inconclusive to warrant changing their current listing status of endangered.

In 1991 the NMFS published Recovery Plans for two species of large whales: Final Recovery Plan for the northern right whale (Anonymous, 1991a) and Final Recovery Plan for the humpback whale (Anonymous, 1991b). In each of these Recovery Plans, the status of stocks within U.S. waters was reviewed. Further, while definitions of endangered and threatened for the western North Atlantic stock of right whale and the definition of threatened for stocks of North Pacific and North Atlantic humpback whales were provided in the Plans (Table 2), their relevance to the ESA definitions of endangered and threatened has been questioned (DeMaster and Gerber⁴; Shelden⁵).

A summary of environmental threats to baleen whales was recently completed by Clapham and Brownell⁶. In

² In the implementation of the ESA, the term species has been interpreted to mean "any distinct population segment of any species of vertebrate, fish, or wildlife, which interbreeds when mature" (ESA§3[16], as amended in 1978).

Table 1.—Summary of factors for listing a species as threatened or endangered under authority of the ESA (ESA § 4 (a)(1)). Only one factor is needed for classification.

1. The present or threatened destruction, modification, or curtailment of a species' 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 a species' continued existence.

³ Braham, H. W. 1991. Endangered whales: status update. Unpubl. doc., 56 p., on file at Natl. Mar. Mammal Lab., NMFS, NOAA, 7600 Sand Point Way N.E., Seattle, WA 98115.

⁴ DeMaster, D., and L. Gerber. 1997. A new approach to classifying the central North Pacific stock of humpback whales under the U.S. Endangered Species Act. NMFS Alaska Fisheries Science Center *Quarterly Report*, Oct.-Nov.-Dec. 1997, p. 1-4.

⁵ Shelden, K. W. 1998. The bowhead whale: a case study for development of criteria for classification on the List of Endangered and Threatened Wildlife. Master's thesis, School Mar. Affairs, Univ. Wash., Seattle, 137 p.

⁶ Clapham, P. J., and R. L. Brownell, Jr. 1999. Vulnerability of migratory baleen whales to ecosystem degradation. Convention of Migratory Species Special Publications (In press). Rep. avail. from P. J. Clapham, NEFSC, 166 Water St., Woods Hole, MA 02543-1097.

Table 2.—Summary of criteria for downlisting Northern Hemisphere right and humpback whales as reported in recovery plans for each species (Anonymous, 1991a, 1991b).

Stock	Criteria	
	Endangered	Threatened
North Pacific right whale	Not developed	Not developed
Western North Atlantic right whale	1. Population <6,000 2. Population not increasing at 2% per year over 20-year period. 3. No effective program in place to control mortality.	Population <7,000
North Pacific humpback whale	Not developed	Population <0.6 of <i>K</i>
North Atlantic humpback whale	Not developed	Population <0.6 of <i>K</i>

addition, the NMFS has completed a Recovery Plan for North Pacific and North Atlantic blue whale stocks (Anonymous, 1998), and efforts are now focused on the completion of a Recovery Plan for the North Pacific and North Atlantic stocks of fin and sei whales (Anonymous⁷). Completion of the fin and sei whale Recovery Plan is expected in 1999.

An additional action concerning the status of listed stocks of large whales involved the gray whale. In November 1991 the NMFS issued a proposed determination that the eastern North Pacific stock of gray whales be removed from the List. The NMFS issued a final determination to delist on 7 January 1993, but concurrence from the U.S. Fish and Wildlife Service (FWS) was not received until June 1994, when this stock was officially removed from the List. This delisting was the first such action for any species of marine mammal since the passage of the ESA in 1973. As a part of the delisting process, in 1993 the NMFS also developed a 5-year plan for research and monitoring⁸. The development of such a plan is a requirement of the ESA, where the agency responsible for management (i.e. U.S. Department of Commerce for cetaceans) must commit to monitor the status of the delisted stock for a period of at least 5 years following delisting. If at any time during this period the Sec-

retary of Commerce finds that the species' well-being is at risk, the ESA provides that emergency protective regulations, under Section 4(b)(7), shall be issued by the Secretary to ensure the conservation of any recently delisted species. As part of the 5-year plan for research and monitoring, the NMFS conducted three biennial surveys during southbound migrations for the purposes of estimating annual abundance and determining trends in abundance and four annual surveys during northbound migrations for the purpose of estimating calf production. Also required as part of the delisting process is a formal review of the status of a delisted stock 5 years following the action to delist. A workshop was held during the spring of 1999 to review the status of the eastern stock of North Pacific gray whale.

Shelden and Rugh (1995) published a formal status review of the bowhead whale, which included a status summary of the five recognized stocks. No specific recommendations to change the listing status of any of these bowhead whale stocks were proposed by them. However, they did report that NMFS would undertake to develop objective criteria to determine whether the current classification of one of these stocks, bowhead whales of the Bering-Chukchi-Beaufort Seas, is accurate (Shelden⁵).

The following report officially updates the status of the remainder of the stocks of endangered large whales (i.e. right, humpback, blue, fin, sei, and sperm whales). In the remainder of this overview, we summarize problems that have been identified in defining classification criteria under the ESA, discuss possible changes to the classification of endangered large whale stocks, and provide an update on the currently listed large whale species (except bowhead whales).

Problems with Marine Mammal Classification Under the Endangered Species Act

One of the most difficult problems in implementing the ESA is that objective criteria for what constitutes being in danger of extinction is not defined in the Act or elsewhere (Rohlf, 1991). As already noted by several authors (Tear et al., 1995; Easter-Pilcher, 1996; Shelden⁵) the NMFS and FWS have used an ad hoc and subjective approach to classifying individual species. This has led to considerable disparity in the type and quality of classification criteria among species that are listed. In 1988, the U.S. Congress amended the ESA to require that each Recovery Plan incorporate objective, measurable criteria for recovery (i.e. delisting). Nonetheless, these criteria have yet to be developed for species of large whales for which Recovery Plans exist. Further, the Recovery Plans currently being developed for listed species do not include such criteria (DeMaster and Gerber⁴). Finally, we believe that Congress also intended to have delisting criteria developed for those species for which Recovery Plans have not been developed.

There has been some confusion in the literature between a classification of threatened under the ESA and a classification of depleted under the Marine Mammal Protection Act (MMPA). In some cases, it has been assumed that a population sufficiently large to be classified as healthy under the MMPA (i.e. population greater than 60% of its carrying capacity (*K*)) is also sufficiently large to be removed from the List of Endangered and Threatened Wildlife of the ESA. Unfortunately, there is nothing inherent about the definition of threatened that makes such a relationship valid. To further complicate matters, the status of a population relative to its carrying capacity (*K*) is not necessarily well correlated with the probability of extinction in the foreseeable future. Obviously, populations at very low status levels (e.g. less than 10% of *K*) are often very small in number and therefore more likely to become extinct over a given period of time than a population several times larger. However,

⁷ Anonymous. 1999. Draft recovery plan for the fin whale, *Balaenoptera physalus* and sei whale *Balaenoptera borealis*, 68 p. Avail. from F/OPR, NMFS, NOAA, 1315 East-West Highway, Silver Spring, MD 20910.

⁸ Braham, H. W., and D. P. DeMaster (Editors). 1993. A 5-year plan for research and monitoring of the eastern North Pacific population of gray whale. Unpubl. doc., 54 p., prep. for the Asst. Admin. Fish., NOAA, 1315 East-West Highway, Silver Spring, MD 20910.

over a wide range of population sizes, status relative to K alone is not a good predictor as to whether extinction is imminent.

The World Conservation Union (IUCN) recently developed objective classification criteria for the purposes of identifying species that are, or may be, threatened with extinction (IUCN, 1996). As noted in Gnam (1993) and Sheldon⁵, these criteria seemed to have been developed with terrestrial species in mind, and some of the definitions or parameters used in the criteria are not easily applied to marine species. For example, one of the criteria refers to the area of occurrence, but it is not clear how to apply such a criterion to species like large whales that migrate over great distances. Nonetheless, this approach represents a significant improvement over the ad hoc system previously used by the NMFS and FWS. As noted by DeMaster and Gerber⁴, the IUCN criteria can be modified to make the criteria more pertinent to marine species, including species of large whales.

Most endangered whale species occur in geographically and, in some cases, genetically discrete populations. These populations are typically referred to as stocks, and may be designated on the basis of species' biology, management objectives, or a combination of biological and management goals. However, since biological information necessary to make reliable stock structure determinations is generally lacking for the large whales, management objectives tend to play a large role in how stocks are designated (Barlow⁹).

Two different approaches for stock designation are referred to in this document. The first of these approaches has been adopted by the NMFS in the production of annual stock assessment reports. As a default in the absence of biological data, the NMFS approach defines stock structure relative to discontinuities in the distribution of the stock in question and relative to the distribution of commercial fisheries in the North Pacific and North Atlantic Oceans

(Barlow et al., 1995a). The second approach uses stock determinations currently recognized by the IWC (Donovan, 1991). The former approach uses smaller areas to define the range of a stock than does the latter, and has been adopted in an effort to minimize the risk of adverse interactions between commercial fisheries and marine mammals. The latter approach generally uses much larger areas to designate stocks (i.e. typically an ocean basin). While detailed evaluation of the merits of these two approaches is beyond the scope of this report, we summarize the status of six endangered large whale species based on current stock designations that currently rely on these approaches (Tables 3, 4, 5).

Summary and Recommendations Regarding the Listing Status of Large Whales

As discussed above, all large whale species currently listed as endangered under the ESA were severely depleted as a result of commercial whaling. The effects of low population size and the continued threat of overexploitation were the primary reasons that the species were first listed. Because commercial overexploitation is no longer imminent, or at least is greatly diminished, the listed species could, theoretically, be delisted. However, the potential for adverse effects from human activities still exists, and the lingering effects of low population size do remain (Clapham et al. ¹⁰). For example, northern right whale stocks, which are still severely depleted, have shown no sign of recovery or at least no substantial population growth in the last two decades even though local commercial hunting ceased in 1949 (Anonymous, 1991a). Clearly, the listing classification of this species should remain (Table 5).

Stock identity of North Atlantic and North Pacific humpback whales is relatively well understood, and some humpback whale populations are showing significant increases (see the review beginning on page 24). Most notable are the western North Atlantic and the cen-

Table 3.—Available potential biological removal (PBR) levels for five species of endangered whales from Hill and DeMaster (1998); Barlow et al. (1997); Waring et al. (1998). PBR = product of N_{min} , $1/2$ maximum net productivity rate, and a specified "recovery" factor for endangered stocks, threatened stocks, or stocks of unknown status relative to OSP (Wade and Angliss, 1997). Stocks without PBR indicate that data were insufficient.

Species	Stock	PBR
Northern right whale	Western North Atlantic	0.4
Humpback whale	Western North Pacific	0.7
	Central North Pacific	7.4
	CA/OR/WA and Mexico	1.1
	CA/OR/WA (U.S. only)	0.5
Blue whale	Western North Atlantic	9.7
	CA and Mexico	2.9
	CA (U.S. only)	1.5
Fin whale	Western North Atlantic	0.6
	CA/OR/WA	2.1
Sperm whale	Western North Atlantic	3.4
	CA/OR/WA	1.8
	Northern Gulf of Mexico	0.8

tral North Pacific stocks. For example, Smith et al.¹¹ estimated there are 5,543 whales in the western North Atlantic, which may be greater than estimated preexploitation levels (Table 4). As population estimates are refined, population structure is better understood, and as mortality and serious injury from human activities are reduced, these stocks may be considered for downlisting or delisting if the appropriate long-term monitoring programs can be established (Table 5).

Blue whale stocks off the west coast of North America also show signs of growth. For example, the stock of blue whales that feed in waters off California, Oregon, and Washington, which was once thought to include fewer than 500 individuals, was recently estimated at 1,785 (CV = 0.24; Barlow et al., 1997). While additional data are still needed on stock structure, trends in abundance, and habitat requirements, this stock may be a candidate for downlisting as long as reliable monitoring programs are established and long-term research is continued (Table 5).

In contrast, for several other species there is insufficient information about stock structure and abundance to make determinations regarding changes in listing status at this time (Table 5). These

⁹ Barlow, J. 1998. Chief Scientist, Southwest Fisheries Science Center, NMFS, P.O. Box 271, La Jolla, CA 92038. Personal commun.

¹⁰ Citation updated in proof: see Clapham et al., 1999 in literature cited.

¹¹ Citation updated in proof: see Smith et al., 1999 in literature cited.

Table 4.—Estimates of pre-exploitation (“initial”) and current (“recent”) population sizes for six large whale species currently listed as “endangered” under the ESA. See text for references and estimates CV, CI, and ranges (N.e.= no published estimate).

Species	Population Estimate	
	Initial	Recent
Right Whale		
North Pacific		
Total	N.e.	N.e.
Eastern North Pacific	N.e.	100–500
Sea of Okhotsk ¹	N.e.	900
Western North Atlantic	N.e.	300–500
Eastern North Atlantic	N.e.	N.e.
Southern Hemisphere	N.e.	7,000
Humpback Whale		
North Pacific		
Total	N.e.	6,000–8,000
Western North Pacific	N.e.	394
Central North Pacific	N.e.	4,005
North Atlantic		
Total	N.e.	10,600
Western North Atlantic	N.e.	N.e.
Eastern North Atlantic	N.e.	N.e.
Southern Hemisphere	N.e.	17,000
Blue Whale		
North Pacific		
Total	N.e.	1,600
CA/OR/WA ²	N.e.	1,930
Western North Atlantic	N.e.	100–560
Northern Indian Ocean	N.e.	N.e.
Southern Indian Ocean ³	N.e.	5,000
Southern Hemisphere	N.e.	1,260
Fin Whale		
North Pacific	N.e.	14,620–18,630
Western North Atlantic	N.e.	3,590–6,300
East Greenland/Iceland	N.e.	11,560
British Isles/Spain and Portugal	N.e.	4,490–17,360
Southern Hemisphere	N.e.	85,200
Sei Whale		
North Pacific	N.e.	9,110
North Atlantic		
Total	N.e.	4,000
Iceland/Davis Strait	N.e.	1,590
Nova Scotia	N.e.	1,390–2,250
Labrador Sea	N.e.	N.e.
Southern Hemisphere	N.e.	9,720–12,000
Sperm Whale		
North Pacific		
Total	N.e.	N.e.
CA/OR/WA ^{2,4}	N.e.	995
Western North Pacific	N.e.	N.e.
Eastern North Pacific	N.e.	N.e.
North Atlantic		
Total	N.e.	N.e.
Western North Atlantic	N.e.	220–2,700
Northern Gulf of Mexico	N.e.	530
Iceland	N.e.	1,230
Azores	N.e.	N.e.
Spain	N.e.	N.e.
Northern Indian Ocean	N.e.	N.e.
Southern Hemisphere		
Total	N.e.	N.e.
South of 60°S	N.e.	3,200–14,000
South of 30°S	N.e.	128,000–290,000
Equatorial East Pacific	N.e.	3,891

¹ Recent estimate 95% CI = 404–2,108 (from IWC, 1998, Workshop on the Comprehensive Assessment of Right Whales, Unpubl. Doc. SC/50/REP4).

² CA/OR/WA = California/Oregon/Washington

³ Pygmy blue whale only

⁴ Recent minimum population estimate (N_{min}) from Barlow (text footnote 75).

include fin, sei, and sperm whales. Therefore, while the abundance of some stocks may be increasing or their total abundance in any given ocean basin is relatively large (e.g. sperm whale), data on stock struc-

ture and habitat requirements are too inconclusive to warrant changing their listing status in the near future.

The comprehensive status reviews that follow are based on published lit-

Table 5.—A general evaluation of the possible recovery of endangered large whales by stock or region. Note: Stocks and regions listed represent current knowledge on distribution and density. These are not formal stock designations.

Status
Perhaps recovered ¹
Central North Pacific humpback whale
Western North Atlantic humpback whale
California, Oregon, Washington blue whale
British Isles/Spain & Portugal fin whale
Depleted ²
Southern Hemisphere right whale
Western North Pacific humpback whale
Southern Hemisphere humpback whale
North Pacific blue whale
Western North Atlantic blue whale
Southern Hemisphere blue whale
Southern Indian Ocean (pygmy) blue whale
Southern Hemisphere fin whale
North Pacific fin whale
Western North Atlantic fin whale
North Pacific sei whale
Southern Hemisphere sei whale
Iceland sperm whale
Critically low population level ³
North Pacific right whale
Western North Atlantic right whale
Insufficient data for judgment
Eastern North Atlantic right whale
Eastern North Atlantic humpback whale
Northern Indian Ocean blue whale
East Greenland/Iceland fin whale
Iceland/Davis Strait sei whale
Nova Scotia sei whale
All sperm whale stocks

¹ Recent population abundance estimate at or near population size prior to commercial whaling.

² Well below initial population size estimates, but may include low populations that have shown some recent increase (e.g. Southern Hemisphere right whales).

³ Recent population estimates number in the tens to hundreds.

erature from about 1980 through 1998. In some instances, where important data remains unpublished, we have cited personal communications, manuscripts in press, and draft documents. In other instances, where no new data has been collected since the 1984 reviews, we have cited pre-1980 literature. Scientists continue to develop new methods of gathering and analyzing population data, thus expanding our knowledge of large whale population biology; however, new and important publications after early 1999 were excluded from these reviews for the sake of timeliness. As it stands, these reviews are already more than 10 years later than the Congressionally mandated 5-year review period.