

Conservation status of North Pacific right whales

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ABSTRACT

The North Pacific right whale (*Eubalaena japonica*) is among the most endangered of all great whales, having been subject to intensive commercial whaling in the 19th century. All available 20th century records of this species in the North Pacific were reviewed. There has been a total of 1,965 recorded sightings since 1900; of these, 988 came from the western North Pacific, 693 from the eastern North Pacific and 284 had no location specified. Thirteen strandings (all but one from the western North Pacific) were recorded. Known catches for commercial or scientific purposes totalled 742 (331 in the western North Pacific, 411 in the eastern North Pacific). Most of the reported Soviet 'sightings' in the eastern North Pacific were actually catches, as may be the case for Soviet sightings in the Okhotsk Sea. In addition, the impact of known Soviet illegal catches in the Okhotsk Sea may be reflected in an apparent decline in sightings after the 1960s (although this may be partly explained by low observer effort). Overall, the data support the hypothesis that at least two stocks of right whales exist in the North Pacific. Any recovery in the western North Pacific population was compromised by the Soviet catches in the Okhotsk region, although recent sightings suggest that this population is still large enough to sustain reproduction. By contrast, Soviet catches in the now-smaller eastern North Pacific population have severely reduced its prospects for recovery. Although the prognosis for this population is poor, a long-term monitoring programme is required to better understand its conservation status and to determine whether it may be affected by human-related problems that would require mitigation.

KEYWORDS: RIGHT WHALE; PACIFIC OCEAN; NORTHERN HEMISPHERE; WHALING-MODERN; WHALING-HISTORICAL; CONSERVATION; DISTRIBUTION

INTRODUCTION

The North Pacific right whale, *Eubalaena japonica*, was once abundant in much of the North Pacific. The crew of the American whaler *Ganges*, one of the first vessels to work in the so-called 'Northwest Ground' (the Gulf of Alaska region), reported seeing 'millions' of right whales in 1835–36 (Webb, 1988). Contemporary records, compiled from the logs of 19th century whaling ships by the American naval officer Matthew Fontaine Maury, reveal an abundance of right whales across a broad range that stretched from Alaska to Japan (Scarff, 1986a; 1991). However, intensive commercial whaling proved devastating, and today the North Pacific right whale populations are among the most endangered of all the great whales (IWC, 2001b).

Aboriginal whaling for this species was conducted by various peoples from Washington state and British Columbia to eastern Asia (Tomilin, 1957; Mitchell, 1979; Omura, 1986; Scarff, 1991; Mitchell and Reeves, 2001). However, it does not appear that right whales were usually the primary target of these hunts, nor were they taken in significant numbers. Right whales were taken with some regularity in coastal Japan, where net whaling began in the 17th century (Omura, 1986). Net whaling also occurred for a short time off southern Sakhalin Island prior to 1904 (Tomilin, 1957). Catch records from these fisheries are incomplete so it is not known whether this method of exploitation had any significant effects on the population.

By contrast, the impact of commercial whaling was rapid and devastating. Pelagic whaling for right whales started first in the Sea of Japan during the 1820s. From 1835, from what came to be known as the Kodiak or Northwest Ground, whaling effort quickly spread across the Pacific. By 1845, American vessels were operating in the southern Okhotsk Sea (Webb, 1988; Scarff, 1991). By 1847–48, catches of right whales had already declined, and the discovery of bowhead whales (*Balaena mysticetus*) in high latitudes north

of the Bering Strait resulted in a change of focus for the majority of vessels in the American fishery. Best (1987) estimated that American pelagic whalers in the North Pacific (including the Okhotsk Sea but not the Sea of Japan) killed an estimated 14,500 right whales. These catches do not make any allowance for hunting loss and do not include catches by British, French and other European whalers. The total North Pacific catch of right whales has been variously estimated at 20,000 (Du Pasquier, 1986), or between 26,500 and 37,000 (Scarff, 2001). Right whales continued to be taken after 1849, although the paucity of catch records after 1900 is testament to the damage inflicted upon these populations during the period of extensive exploitation. The species was never again the principal focus of commercial whaling. Although a Japanese coastal fishery, using modern methods, took 192 right whales in the western North Pacific between 1900 and 1948 (Omura, 1986), documented legal catches elsewhere for either commercial or scientific purposes were infrequent.

The Convention for the Regulation of Whaling was concluded in Geneva on 24 September 1931. Article 4 of the Convention states that 'The taking or killing of right whales, which shall be deemed to include North-Cape whales, Greenland whales, southern right whales, Pacific right whales, and southern pigmy right whales, is prohibited'. After the close of the meeting numerous whaling nations ratified the Convention but Japan and the USSR were not parties to the Convention. After World War II, Japan was allowed to conduct whaling operations again under the regulations established by the Supreme Commander for the Allied Powers in 1945. One of these regulations stated that the killing of gray and right whales in the North Pacific was prohibited. Japan joined the IWC in April 1951. The USSR joined the IWC in 1948. Furthermore, it is now known that the Soviet Union conducted illegal whaling on a large scale, beginning in the Southern Hemisphere in the 1949/50 season (Zemsky *et al.*, 1995) and that this included large numbers of

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right whales (Tormosov *et al.*, 1998); related operations subsequently took hundreds of right whales in the Okhotsk Sea, around the Kuril Islands, in the southeastern Bering Sea and the Gulf of Alaska and maybe beyond (Yablokov, 1994; Doroshenko, 2000). The species has been so rare in the eastern North Pacific that, over the past forty years, even single sightings have merited publication (Gilmore, 1956; Woodhouse and Strickley, 1982; Carretta *et al.*, 1994; Rowlett *et al.*, 1994; Gendron *et al.*, 1999). In the western portion of their former range, right whales have been observed with greater frequency in the Okhotsk Sea (Miyashita and Kato, 1998) but sightings elsewhere are still comparatively rare.

Much is unknown or uncertain regarding even some basic aspects of the biology and behaviour of the North Pacific right whale. There is no agreement on the number of populations that exist, the current population size is unknown for either the eastern or western population, and the location of the calving grounds remains a mystery. Indeed, with the exception of a series of Soviet and Japanese papers, based primarily on 23 animals killed for research purposes (Omura, 1958; Klumov, 1962; Omura *et al.*, 1969), virtually nothing has been published on the biology of the species.

The purpose of this paper is to review knowledge concerning the right whale in the North Pacific, and to attempt to assess the status of those animals that remain. For the purpose of conservation, it is important to take a basin-wide approach to understanding population structure and abundance. A complete listing of all known sightings, strandings and catches in the 20th century is provided.

METHODS AND MATERIALS

All available records of North Pacific right whales from the 20th century were reviewed. Scarff (1986a; 1991) provided a thorough analysis of the right whale's historic distribution as determined from 19th century whaling manuscripts collected by Maury (1852; 1853) and additionally summarised sighting records for the eastern North Pacific since 1855. The current paper is based on a complete listing of all known sightings, strandings or catches of right whales, including numerous published and unpublished sources that were either not covered by, or were unavailable to, Scarff. The review begins in 1900 because it represents a convenient division and the beginning of modern-type whaling in the North Pacific (Tonnessen and Johnsen, 1982).

There is sometimes confusion in records between the right whale and the closely related bowhead. For example, we believe that the right whales referred to by Tomilin (1957) were bowheads, since their reported distribution and timing of occurrence in the western Okhotsk Sea closely fits known patterns for this species. Similarly, it is clear that all of the right whales reported by Klumov (1962) in the vicinity of the Shantar Islands were in fact bowheads (Brownell, unpublished). The Russian language contains words specific to each species (ЯПОНСКИЙ кит = *E. glacialis/E. japonica*; and ГРЕНЛАНДСКИЙ кит = *B. mysticetus*), as well as a more generic term ('smooth whales') which can imply either. In cases where the species identity was in question, the original texts were examined to verify the reliability of the English translation. The Russian originals were also examined when two or more papers gave conflicting accounts of the same sighting event(s). Where possible, authors (both Japanese and Russian) were queried for clarification of confusing or contradictory data.

In certain cases, numbers have been extrapolated from plots in the original papers, notably Berzin and Rovnin (1966) and Omura *et al.* (1969). It should be noted that it is not possible to obtain a precise count from these sources. In the case of Omura *et al.* (1969), one of us (TK) obtained the original data (those for the period 1959-62) on which some of this paper was based. Since these data give more detail in terms of sighting dates, locations and numbers of whales they have been incorporated into this review. For the remainder of the plotted sightings in Omura *et al.* (1969), each plot has been counted as a single whale, although it is known from the detailed data that this is not always the case¹. Similarly, the two types of symbol used in the plots of Berzin and Rovnin (1966, fig. 6) represent sightings of either '1-3' or '15-20' animals; consequently, calculations from counts of these plots yield a range for each area rather than a single total. In all cases where a sighting has been reported as a range, the midpoint of that range has been used when calculating the total number of sightings for each area.

Sources and effort

The majority of records of North Pacific right whales come from vessels associated with the whaling industry. These include incidental sightings by catcherboats, factory ships and marking cruises, as well as much more extensive records provided by scouting boats or by research vessels engaged in directed sighting surveys for the specific purpose of establishing the abundance and distribution of whales. Of particular value is the series of extensive annual surveys conducted since 1964 by Japan. These surveys have covered virtually the entire North Pacific north of 20°N, although largely confined to the summer months. Their effort and results are summarised by Wada (1975) and by the annual Japanese national progress reports on whale research to the International Whaling Commission from 1976 onwards.

Almost all other sources of sightings are incidental in nature. They range from scientific research vessels (notably those of the Soviet Union) and recent aerial surveys off the west coast of the USA, to opportunistic sightings from a variety of vessels and individuals.

With the exception of the Japanese sighting surveys, it is generally not possible to meaningfully quantify the effort invested by these various sources. However, some general remarks concerning coverage are possible, and these are incorporated into the Discussion.

Study area and regional divisions

The study area includes the entire North Pacific Ocean from the equator northwards, including bodies of water outside the Pacific proper (e.g. Bering Sea, Okhotsk Sea). Since there is disagreement regarding the number and boundaries of right whale stocks in the North Pacific, the study area was arbitrarily divided into eastern and western halves at the 180° line of longitude.

In addition to listing all records chronologically within event type (sighting, catch, stranding), a record was also assigned to a general region. Regional divisions are necessarily somewhat arbitrary, and are used solely for the purpose of more clearly summarising the data. The principal divisions of the North Pacific used here can be broadly defined as follows.

¹ There is an error in table 14 of Omura *et al.* (1969). The 'pelagic' sighting totals reported for the years 1954-57, which are based upon table 2 from Omura (1958), are incorrect. They represent the *total* of pelagic plus coastal sightings from Omura (1958). Pelagic data in table 14 should read: 1954 (24), 1955 (8), 1956 (75) and 1957 (25).

Japan

The waters within approximately 200 miles of the Japanese coast, including outlying islands such as the Amamis (Amami Ōshima) and the Bonins (Ogasawara Guntō). However, the region around the southwestern Kuril Islands is excluded.

Kurils

Any area in the immediate vicinity of the Kuril Islands, whether on the Okhotsk Sea or Pacific side.

Okhotsk Sea

Any region within the Okhotsk Sea, including Sakhalin Island, but excluding the Kurils.

Aleutians

Any area within a hundred nautical miles of the Aleutian Islands, either the Bering Sea or Pacific side. The Aleutians are divided into eastern and western halves, separated by the 180° line of longitude.

NW Pacific

Any offshore waters (further than approximately 200 miles from land) west of 180°, including the Commander Islands.

NE Pacific

Any offshore waters (further than 100 miles from land) east of 180°, within the exception of the Northwest Ground as defined below.

West Coast

Waters off the western coast of North America, from British Columbia to Baja California, within 100 miles of shore.

Northwest Ground

This name is borrowed from the whaling literature, since it nicely describes an important area for which there is otherwise no convenient name. It has been arbitrarily defined as extending from the Gulf of Alaska south to 50°N. Waters to the south of this area are considered NE Pacific.

Bering Sea

Any portion of the Bering Sea except for those waters within 100 miles of the Aleutian Islands or the Alaska Peninsula. (Nineteenth century whalers developed their own terminology for the North Pacific whaling grounds. They divided the Bering Sea into four major sections: Bristol Bay, Kamchatka Sea, Anadyr Sea and the Bering Straits. However, these are not used here).

Hawaii

Any area within the vicinity of the Hawaiian Island chain.

RESULTS

The total number of sightings, commercial takes, strandings and incidental catches since 1900 are summarised for both the eastern and western North Pacific in Table 1. It should be noted that, while we have been careful to exclude cases where two reports have either clearly or probably used the same data, no allowance for possible resightings of individual animals at different times can be made in the sighting records. Totals reported here are necessarily approximate. On the one hand, cases of duplication will inflate the number of individual whales observed;

conversely, some sightings counted here as single animals probably represent two or more whales, thus negatively biasing our totals.

Table 1

Total numbers of sightings, catches and strandings/entanglements of right whales recorded in the North Pacific between 1900 and 1999. For the purpose of this paper, the boundary between the western and eastern regions is set at the 180° line of longitude.

Region	Sightings	Catches	Strandings or entanglements	Total
Western North Pacific	988	331	12	1,331
Eastern North Pacific	693	411	1	1,105
Area not specified	284	-	-	284
Total	1,965	742	13	2,720

Sightings

Excluding animals that were either stranded or taken by whalers, there have been 1,965 sightings² of living right whales in the North Pacific since 1900. Of these, 988 were reported from the western portions of this ocean basin and 693 from the eastern (Tables 2.1 and 2.2). There were an additional 284 sightings of right whales by Japanese and Soviet vessels with the location described only as 'North Pacific', without reference to area (Table 2.3). Although all but twenty of these are plotted in several figures by Omura *et al.* (1969), it is largely impossible to count the number of sightings in each half of the region since the plots represent an amalgamation of data from several sources and time periods; the exceptions are sightings from the period 1959-62, for which original data were available, as noted above. In addition, a few sightings have no or confusing numbers associated with them (e.g. the sightings from 1948 reported by Slepsov, 1952), and these are not included in the totals.

Sightings are summarised by area in Table 2.4. In the western North Pacific, three areas accounted for more than 90% of the 988 sightings: Japanese waters (370 sightings, or 37.4%); the Kuril Islands (331 sightings, 33.5%); and the Okhotsk Sea (195 sightings, 19.7%). Of the 693 sightings in the eastern North Pacific, the greatest number (269, or 38.8%) were from the area of eastern Aleutians. More than a quarter (177, or 25.5%) were from the Northwest Ground; however, 139 of these sightings were derived from ranges given in the plots of Berzin and Rovnin (1966), and should therefore be interpreted with caution.

If one calculates the number of sightings on the Northwest Ground from the plots of Berzin and Rovnin (1966), one obtains a range of from 88 to 189 right whales observed by Soviet research vessels in the period 1958-1964 (the midpoint of this range, which we use for the totals given in Tables 1 and 2.4, is 139). These plots show right whales observed over a wide area within this region; the text of this paper notes that 200 right whales were encountered in 1963 in all of the northeastern Pacific. By contrast, Berzin and Doroshenko (1982) give a much more specific location on the Northwest Ground (51°N 145°W) for a single sighting of 200 right whales in 1963000, made by the same Soviet research vessels.

Text continues on p. 278

² This total ignores certain and probable duplicates, and counts the sighting of '40-45' whales by Kuzmin and Berzin (1975) as 43. It uses the midpoints of the various ranges calculated from fig. 6 of Berzin and Rovnin (1966); these total 20 and 324 for the western and eastern North Pacific, respectively.

Table 2.1

Sightings of right whales since 1900 in the western North Pacific. Where possible, exact positions are given. Location information, given as a range of latitudes and longitudes, reflects either a series of sightings within this range, or sightings for which the source reported position only to within a particular survey block (e.g. Wada, 1975). NRIFS=National Research Institute of Far Seas Fisheries; ICR=Institute of Cetacean Research.

Date	Latitude	Longitude	Location	No.	Source	Remarks
May 1931			Off Akkeshi, eastern Hokkaido	9	Shino, 1932	12 whales sighted, but 3 were killed (see Table 3.1)
Apr. 1941-1957			East and southeast of Hokkaido, Japan	37	Omura, 1958	Japanese catcherboat sightings
May 1941-1957			East and southeast of Hokkaido, Japan	46	Omura, 1958	Japanese catcherboat sightings
			Lat 46/47 east of Kurils	3		
Jun. 1941-1957			SE of Hokkaido, Japan	4	Omura, 1958	Japanese catcherboat sightings
			SE of Paramushir I., Kurils	2		
			S of Commander Islands	10		
Jul. 1941-1957			SE of Hokkaido, Japan	2	Omura, 1958	Japanese catcherboat sightings
			SE of Paramushir I., Kurils	3		
			SE of Kamchatka	2		
Aug. 1941-1957	52°N	163°E	SE of Kamchatka	2	Omura, 1958	Japanese catcherboat sightings
1948			Northeast Okhotsk Sea	?	Sleptsov, 1952	Cited in Tomilin (1957) as 'small groups of from 2-3 to 15 animals'
Apr.-Nov. 1951	39-52°N	140-158°E	Kuril Is (both Okhotsk Sea and Pacific sides)	57	Klumov, 1962	Russian catcherboat sightings
Apr.-Nov. 1953	39-52°N	140-158°E	Kuril Is (both Okhotsk Sea and Pacific sides)	16	Klumov, 1962	Russian catcherboat sightings
Apr.-Nov. 1954	39-52°N	140-158°E	Kuril Is (both Okhotsk Sea and Pacific sides)	6	Klumov, 1962	Russian catcherboat sightings
Pre-1955			NE Okhotsk Sea and western Kamchatka	?	Sleptsov, 1955	
1955			Amami Is, Japan	1	Miyazaki and Nakayama, 1989	Autumn
Apr.-Nov. 1955	39-52°N	140-158°E	Kuril Is (both Okhotsk Sea and Pacific sides)	85	Klumov, 1962	Russian catcherboat sightings
Apr.-Nov. 1956	39-52°N	140-158°E	Kuril Is (both Okhotsk Sea and Pacific sides)	50	Klumov, 1962	Russian catcherboat sightings
Apr.-Nov. 1957	39-52°N	140-158°E	Kuril Is (both Okhotsk Sea and Pacific sides)	109	Klumov, 1962	Russian catcherboat sightings
1958-1964			Western Aleutians	10-30	Berzin and Rovnin, 1966	Soviet sighting cruises. Shown (Fig. 6) as ten plots of '1-3' whales
1 Jun. 1959	53°42'N	167°23'E	Western Aleutians	1	ICR data	Japanese catcherboat sighting
28 Jun. 1959	53°05'N	179°33'E	Western Aleutians	1	ICR data	Japanese catcherboat sighting
1965			'Coastal' Japan	102	Omura <i>et al.</i> , 1969	Japanese catcherboat sightings
Between 1965 and 1970			Near Muroto, Shikoku, Japan	1	T. Kasuya, unpub.	Caught in trap net, but broke free and escaped.
1966			'Coastal' Japan	34	Omura <i>et al.</i> , 1969	Japanese catcherboat sightings
1966	45-50°N	160-170°E	NW Pacific, southeast of Kamchatka	1	Wada, 1975	Japanese scoutboat sighting
1967			'Coastal' Japan	83	Omura <i>et al.</i> , 1969	Japanese catcherboat sightings
1967			Cape Terpeniya, eastern Sakhalin I.	70	Berzin and Vladimirov, 1989	Seen by RV <i>Vityaz</i>
1967			Okhotsk Sea	14	Berzin and Doroshenko, 1981	Unclear; may be part of 70 reported by Berzin and Vladimirov (1989)
1967			Okhotsk Sea side of Urup I. (Kurils)	?	Berzin and Vladimirov, 1989	'Single individuals'
Jul. 1968	48°N	145-146°E	SE Sakhalin I., Okhotsk Sea	Few	Omura, 1968	Japanese catcher vessel sighting. Whales associated with those taken in research catch; 5 or fewer whales.
1968	45-50°N	160-170°E	NW Pacific, southeast of Kamchatka	5	Wada, 1975	Japanese scoutboat sighting
1968	45-50°N	170-180°E	NW Pacific, south of Aleutians	1	Wada, 1975	Japanese scoutboat sighting
1968	50-55°N	170-180°E	Aleutians, Pacific side	1	Wada, 1975	Japanese scoutboat sighting
1969	40-45°N	160-170°E	NW Pacific	2	Wada, 1975	Japanese scoutboat sighting
1969	45-50°N	160-170°E	NW Pacific, southeast of Kamchatka	2	Wada, 1975	Japanese scoutboat sighting
1969	45-50°N	170-180°E	South of Aleutians	1	Wada, 1975	Japanese scoutboat sighting
1970	40-45°N	150-160°E	NW Pacific, southeast of Kurils	1	Wada, 1975	Japanese scoutboat sighting
1970	45-50°N	160-170°E	NW Pacific, southeast of Kamchatka	1	Wada, 1975	Japanese scoutboat sighting
1970	45-50°N	170-180°E	South of Aleutians	1	Wada, 1975	Japanese scoutboat sighting
1971			Muroto, Shikoku, Kochi Prefecture, Japan	1	Kasamatsu and Miyashita, 1991	Escaped from fishing gear
1971	45-50°N	150-160°E	Near Kurils, Pacific side	1	Wada, 1975	Japanese scoutboat sighting

cont...

Table 2.1 continued

Date	Latitude	Longitude	Location	No.	Source	Remarks
1971	40-45°N	160-170°E	NW Pacific	1	Wada, 1975	Japanese scoutboat sighting
1971	45-50°N	170-180°E	South of Aleutians	4	Wada, 1975	Japanese scoutboat sighting
1972	40-45°N	160-170°E	NW Pacific	3	Wada, 1975	Japanese scoutboat sighting
1972	45-50°N	160-170°E	NW Pacific, southeast of Kamchatka	3	Wada, 1975	Japanese scoutboat sighting
1972	35-40°N	170-180°E	NW Pacific	1	Wada, 1975	Japanese scoutboat sighting
1972	45-50°N	170-180°E	South of Aleutians	3	Wada, 1975	Japanese scoutboat sighting
Sep. 1973			Eastern Okhotsk Sea	16	Berzin and Vladimirov, 1989	Seen by factory ship <i>Vladivostok</i>
Aug.-Oct. 1974			Central and northeastern Okhotsk Sea, NE of Kashevarov Bank	40-45	Kuz'min and Berzin, 1975	Seen by RV <i>Tamango</i>
1974	30-50°N	160-180°E	West central North Pacific	4	Anon., 1976	Japanese scoutboat sighting
1974			Coast of Japan	32	Anon., 1976	No further details
1975	30-50°N	160-180°E	West central North Pacific	4	Anon., 1977	Japanese catcherboat sightings
1976	40-45°N	170-175°E	South of central Aleutians	1	Wada, 1978	Japanese sighting cruise
Summer 1981	30-40°N	140-150°E	Coastal Japan	3	Anon., 1983	Japanese catcherboat sightings
1983	30-40°N	140-160°E	Northwestern Pacific east of Japan	2	Anon., 1985	Japanese sighting cruise
1983	30-40°N	120-140°E	Coast of Japan	2	Anon., 1985	Japanese sighting cruise
13 Jan. 1984	35°44'N	141°35'E	Coast of Japan, off eastern Honshu	2	Miyashita and Kato, 1998	Japanese sighting cruise
21 Jan. 1984	33°40'N	138°28'E	Coast of Japan, off eastern Honshu	2	Miyashita and Kato, 1998	Japanese sighting cruise
1985	30-40°N	140-150°E	Coast of Japan	1	Anon., 1987	Japanese catcherboat sighting
Jun. 1986	50°N	156°E	10-11m east of Paramushir I.	2	Blokhin, 1988	One 13-14m, one 10-11m
18 Aug. 1989	53°41'N	146°12'E	Okhotsk Sea, E of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise; individual resighted 17 Sep. 1992
8 Apr. 1990	27°09'N	142°10'E	Chichi-jima I. (Bonin Is), Japan	1	Mori <i>et al.</i> , 1998	
11 Aug. 1990	50°10'N	154°27'E	Okhotsk Sea, W of Paramushir I.	1	Miyashita and Kato, 1998	Japanese sighting cruise
6 Sep. 1990	54°28'N	151°08'E	Okhotsk Sea	4	Miyashita and Kato, 1998	Japanese sighting cruise
6 Sep. 1990	54°29'N	152°07'E	Okhotsk Sea	1	Miyashita and Kato, 1998	Japanese sighting cruise
7 Aug. 1992	51°17'N	148°38'E	Central Okhotsk Sea	1	Miyashita and Kato, 1998	Japanese sighting cruise
26 Aug. 1992	51°52'N	155°10'E	Okhotsk Sea, off western Kamchatka	1	Miyashita and Kato, 1998	Japanese sighting cruise
26 Aug. 1992	51°50'N	155°20'E	Okhotsk Sea, off western Kamchatka	5	Miyashita and Kato, 1998	Japanese sighting cruise
26 Aug. 1992	51°46'N	155°19'E	Okhotsk Sea, off western Kamchatka	1	Miyashita and Kato, 1998	Japanese sighting cruise
26 Aug. 1992	51°47'N	155°23'E	Okhotsk Sea, off western Kamchatka	4	Miyashita and Kato, 1998	Japanese sighting cruise
26 Aug. 1992	51°47'N	155°22'E	Okhotsk Sea, off western Kamchatka	1	Miyashita and Kato, 1998	Japanese sighting cruise; animal's tail stock entangled in heavyrope
27 Aug. 1992	51°26'N	155°59'E	Okhotsk Sea, off western Kamchatka	2	Miyashita and Kato, 1998	Japanese sighting cruise
27 Aug. 1992	51°20'N	156°02'E	Okhotsk Sea, off western Kamchatka	1	Miyashita and Kato, 1998	Japanese sighting cruise
27 Aug. 1992	51°21'N	156°04'E	Okhotsk Sea, off western Kamchatka	2	Miyashita and Kato, 1998	Japanese sighting cruise
27 Aug. 1992	51°22'N	156°07'E	Okhotsk Sea, off western Kamchatka	1	Miyashita and Kato, 1998	Japanese sighting cruise
27 Aug. 1992	51°16'N	155°52'E	Okhotsk Sea, off western Kamchatka	1	Miyashita and Kato, 1998	Japanese sighting cruise
6 Sep. 1992	55°48'N	147°33'E	Okhotsk Sea, northeast of Sakhalin I.	2	Miyashita and Kato, 1998	Japanese sighting cruise
9 Sep. 1992	54°07'N	152°14'E	Central Okhotsk Sea	2	Miyashita and Kato, 1998	Japanese sighting cruise
15 Sep. 1992	53°45'N	145°07'E	Okhotsk Sea, northeast of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise
15 Sep. 1992	53°42'N	145°12'E	Okhotsk Sea, northeast of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise
16 Sep. 1992	53°12'N	146°31'E	Okhotsk Sea, east of Sakhalin I.	2	Miyashita and Kato, 1998	Japanese sighting cruise
17 Sep. 1992	51°32'N	144°47'E	Okhotsk Sea, east of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise; individual previously observed 18 Aug. 1989
18 Sep. 1992	50°21'N	145°00'E	Okhotsk Sea, east of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise
18 Sep. 1992	50°18'N	145°01'E	Okhotsk Sea, east of Sakhalin I.	2	Miyashita and Kato, 1998	Japanese sighting cruise
18 Sep. 1992	50°19'N	145°11'E	Okhotsk Sea, east of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise
18 Sep. 1992	50°17'N	145°12'E	Okhotsk Sea, east of Sakhalin I.	1	Miyashita and Kato, 1998	Japanese sighting cruise

Table 2.1 continued

Date	Latitude	Longitude	Location	No.	Source	Remarks
12 Apr. 1993	27°06'N	142°10'E	Chichi-jima I. (Bonin I.), Japan	2	Mori <i>et al.</i> , 1998	With humpback whales
15 Apr. 1993	27°02'N	142°10'E	Chichi-jima I. (Bonin I.), Japan	1	Mori <i>et al.</i> , 1998	One animal from pair on 12 Apr.
12 Aug. 1994	42°10'N	142°08'E	Northwestern Pacific	2	Fujise <i>et al.</i> , 1995	Cow (51') and calf (27')
21 Jun. 1995	47°28'N	163°19'E	Northwestern Pacific	1	Fujise <i>et al.</i> , 1996	
9 Aug. 1995	45°00'N	165°34'E	Northwestern Pacific	1	Fujise <i>et al.</i> , 1996	
13 Mar. 1996	27°04'N	142°08'E	Chichi-jima I. (Bonin Is), Japan	1	Mori <i>et al.</i> , 1998	Estimated length 10m; with humpback whales
1 May 1996	34°45'N	138°44'E	Off coast of Izu, Japan	1	T. Kasuya, unpub.	Estimated length 10m
8 Aug. 1996	45°52'N	159°38'E	Northwestern North Pacific	1	NRIFS data	Japanese sighting cruise
12 Apr. 1997			Yakuichi-wan, Amami-Oshima	1	S. Uchida, unpub.	Japanese sighting cruise
15 May 1997	51°06'N	166°08'E	East of Japan (sub-area 9)	1	JARPN 1997 cruise report	Japanese sighting cruise
26 May 1997	46°10'N	162°30'E	Northwestern Pacific	2	Ishikawa <i>et al.</i> , 1997	Japanese sighting cruise
Apr.-Jun. 1998	39-41°N	145-150°E	East of Japan (sub-area 7)	3	Zenitani <i>et al.</i> , 1999	Japanese sighting cruise
9 Jun. 1999			10-15 miles off Taiji, Wakayama, Japan	1	K. Mori, pers. comm.	Observed by M. Hohana, Taiji, Japan
10 Sep. 1999	50°08'N	145°31'E	Okhotsk Sea, east of Sakhalin Island	2	Miyashita <i>et al.</i> , 2000; NRIFS data	Japanese sighting cruise
15 Sep. 1999	53°01'N	153°59'E	Okhotsk Sea, off western Kamchatka	2	Miyashita <i>et al.</i> , 2000; NRIFS data	Japanese sighting cruise
16 Sep. 1999	52°13'N	154°27'E	Okhotsk Sea, off western Kamchatka	3	Miyashita <i>et al.</i> , 2000; NRIFS data	Japanese sighting cruise
16 Sep. 1999	52°04'N	154°06'E	Okhotsk Sea, off western Kamchatka	1	Miyashita <i>et al.</i> , 2000; NRIFS data	Japanese sighting cruise
16 Sep. 1999	51°46'N	153°30'E	Okhotsk Sea, off western Kamchatka	2	Miyashita <i>et al.</i> , 2000; NRIFS data	Japanese sighting cruise
17 Sep. 1999	51°24'N	152°46'E	Okhotsk Sea, off western Kamchatka	1	Miyashita <i>et al.</i> , 2000; NRIFS data	Japanese sighting cruise

Table 2.2

Sightings of right whales since 1900 in the eastern North Pacific. Where possible, exact positions are given. Location information given as a range of latitudes and longitudes reflects either a series of sightings within this range, or sightings for which the source reported position only to within a particular survey block (e.g. Wada, 1975). NRIFS=National Research Institute of Far Seas Fisheries; ICR = Institute of Cetacean Research.

Date	Latitude	Longitude	Location	No.	Source	Remarks
27 Jun. 1928			20m SE of Rootok I. Alaska	2	Reeves <i>et al.</i> , 1985 (table 8)	Chased for 1hr by catcherboat <i>Paterson</i>
4 Aug. 1928			Off Akutan, Alaska	1	Reeves <i>et al.</i> , 1985 (p.455)	Struck and lost during whaling by catcherboat <i>Unimak</i>
3 Sep. 1929			40m off Rootok I. Alaska	1	Reeves <i>et al.</i> , 1985 (table 8)	Chased for 6hr 20min by catcherboat <i>Unimak</i>
11 May 1937			Ca 20m SE of Twohead I. (Kodiak)	2	Reeves <i>et al.</i> , 1985 (table 8)	Chased by catcherboat <i>Moran</i>
14 May 1937			Ca 1m SE of Twohead I. (Kodiak)	1	Reeves <i>et al.</i> , 1985 (table 8)	Chased for 1hr by catcherboat <i>Tanginak</i>
20 Jun. 1937			SE of Unalaska I. Alaska	1	Reeves <i>et al.</i> , 1985 (table 8)	Chased by catcherboat <i>Paterson</i>
24 Aug. 1937			28m SE of Rootok I. Alaska	1	Reeves <i>et al.</i> , 1985 (table 8)	Seen by catcherboat <i>Kodiak</i>
17 Aug. 1939			Area of Akutan Pass	1	Reeves <i>et al.</i> , 1985 (table 8)	Seen by catcherboat <i>Kodiak</i>
Jun. 1941-1957			Central and eastern Aleutians (Pacific side)	19	Omura, 1958	Japanese catcherboat sightings
			Eastern Aleutians, in SE Bering Sea	2		
Jul. 1941-1957			E Aleutians (both sides), and SE Bering Sea	92	Omura, 1958	Japanese catcherboat sightings
Sep. 1941-1957	53°N	168°W	E Aleutians (Pacific side)	3	Omura, 1958	Japanese catcherboat sightings
31 Mar. 1955	32°50'N	117°30'W	La Jolla, California	1	Gilmore, 1956	
1955-1958	40-50°N	170-180°W	South of Aleutians	4	Slijper <i>et al.</i> , 1964	Opportunistic sightings, Dutch vessels
1958			'East of longitude 180 degrees'	12	ICR data	Japanese catcherboat sightings
Post-1958?	50°N	145°W	Northwest Ground	2	Pike and McAskie, 1969	Weather ship sightings

cont...

Table 2.2 continued

Date	Latitude	Longitude	Location	No.	Source	Remarks
1958-1964			Eastern Aleutians (both sides) SE Bering Sea NE Pacific Northwest Ground	65-120 63-114 2-6 88-189	Berzin and Rovnin, 1966	Soviet sighting surveys. Shown (fig. 6) as plots of either '1-3' or '15-20' whales. Includes 200 reported in 1963 by Berzin and Doroshenko (1982), but locations in two papers conflict
8 Apr. 1959	45°55'N	125°25'W	80m W of Tillamook Hd, Washington	3	Fiscus and Niggol, 1965	Seen during fur seal research cruise; probably same group resighted near this position two days later
13-15 May 1959	37°25'N	122°48'W	16m SW of Pt Montara, California	1	Rice and Fiscus, 1968	40 feet
6 Jul. 1959	57°23'N	174°01'W	Central Bering Sea	1	Japan Whaling Association Data	Japanese catcherboat sighting
7 Jul. 1959	56°02'N	171°28'W	SE Bering Sea	5	Japan Whaling Association Data	Japanese catcherboat sightings
8 Jul. 1959	54°25'N	167°53'W	Eastern Aleutians	2	Japan Whaling Association Data	Japanese catcherboat sightings
14 Jul. 1959	54°57'N	167°11'W	Eastern Aleutians	4	Japan Whaling Association Data	Japanese catcherboat sightings
15 Jul. 1959	54°27'N	168°10'W	Eastern Aleutians	5	Japan Whaling Association Data	Japanese catcherboat sightings
11 Jun. 1960	52°34'N	175°16'W	Central Aleutians	1	Japan Whaling Association Data	Japanese catcherboat sighting
13 Jun. 1960	54°25'N	169°55'W	Eastern Aleutians	5	Japan Whaling Association Data	Japanese catcherboat sightings
15 Jun. 1960	55°45'N	168°48'W	Eastern Aleutians	10	Japan Whaling Association Data	Japanese catcherboat sightings
19 Jun. 1960	54°30'N	168°22'W	Eastern Aleutians	3	Japan Whaling Association Data	Japanese catcherboat sightings
21 Jun. 1960	55°31'N	169°41'W	SE Bering Sea	1	Japan Whaling Association Data	Japanese catcherboat sighting
22 Jun. 1960	55°45'N	170°40'W	SE Bering Sea	5	Japan Whaling Association Data	Japanese catcherboat sightings
23 Jun. 1960	56°12'N	170°03'W	SE Bering Sea	3	Japan Whaling Association Data	Japanese catcherboat sightings
24 Jun. 1960	56°10'N	170°39'W	SE Bering Sea	6	Japan Whaling Association Data	Japanese catcherboat sightings
25 Jun. 1960	54°48'N	167°51'W	Eastern Aleutians	4	Japan Whaling Association Data	Japanese catcherboat sightings
26 Jun. 1960	54°38'N	167°59'W	Eastern Aleutians	1	Japan Whaling Association Data	Japanese catcherboat sighting
28 Jun. 1960	53°49'N	170°17'W	Eastern Aleutians	1	Japan Whaling Association Data	Japanese catcherboat sighting
30 Jun. 1960	55°51'N	171°18'W	SE Bering Sea	3	Japan Whaling Association Data	Japanese catcherboat sightings
1 Jul. 1960	56°19'N	171°21'W	SE Bering Sea	1	Japan Whaling Association Data	Japanese catcherboat sighting
2 Jul. 1960	55°48'N	171°19'W	SE Bering Sea	5	Japan Whaling Association Data	Japanese catcherboat sightings
6 Jul. 1960	50°44'N	167°27'W	S of eastern Aleutians	2	Japan Whaling Association Data	Japanese catcherboat sightings
9 Jul. 1960	54°05'N	160°20'W	S of Alaska Peninsula	2	Japan Whaling Association Data	Japanese catcherboat sightings
10 Jul. 1960	54°49'N	158°06'W	S of Alaska Peninsula	2	Japan Whaling Association Data	Japanese catcherboat sightings
12 Jul. 1960	54°34'N	155°11'W	Northwest Ground	1	Japan Whaling Association Data	Japanese catcherboat sighting
15 Jul. 1960	53°39'N	164°04'W	S of Alaska Peninsula	2	Japan Whaling Association Data	Japanese catcherboat sightings
16 Jul. 1960	52°51'N	165°53'W	S of eastern Aleutians	1	Japan Whaling Association Data	Japanese catcherboat sighting
20 Jul. 1960	50°05'N	174°21'W	Central Aleutians	1	Japan Whaling Association Data	Japanese catcherboat sighting
21 Jul. 1960	52°47'N	171°40'W	Eastern Aleutians	4	Japan Whaling Association Data	Japanese catcherboat sightings
22 Jul. 1960	54°33'N	169°39'W	SE Bering Sea	13	Japan Whaling Association Data	Japanese catcherboat sightings
9 Aug. 1960	58°36'N	174°47'W	Central Bering Sea	2	Japan Whaling Association Data	Japanese catcherboat sightings
10 Aug. 1960	58°16'N	174°42'W	Central Bering Sea	2	Japan Whaling Association Data	Japanese catcherboat sightings
12 Aug. 1960	56°41'N	173°25'W	SE Bering Sea	1	Japan Whaling Association Data	Japanese catcherboat sighting
14 Aug. 1960	53°42'N	170°35'W	SE Bering Sea	4	Japan Whaling Association Data	Japanese catcherboat sightings
21 Jun. 1961	56°11'N	172°13'W	SE Bering Sea	2	Japan Whaling Association Data	Japanese catcherboat sightings
6 Jul. 1961	55°01'N	167°48'W	Eastern Aleutians	2	Japan Whaling Association Data	Japanese catcherboat sightings
8 Aug. 1961	58°04'N	149°24'W	Gulf of Alaska	1	Japan Whaling Association Data	Japanese catcherboat sighting
21 Aug. 1961	56°32'N	152°14'W	Kodiak Island	4	Japan Whaling Association Data	Japanese catcherboat sightings
22 Aug. 1961	56°03'N	153°00'W	Kodiak Island	3	Japan Whaling Association Data	Japanese catcherboat sightings
29 Aug. 1961	52°44'N	173°58'W	Central Aleutians	2	Japan Whaling Association Data	Japanese catcherboat sightings

Table 2.2 continued

Date	Latitude	Longitude	Location	No.	Source	Remarks
1961			Gulf of Alaska	1	Omura and Ohsumi, 1964	Marked; may be duplicate of 8 Aug. sighting above
13 Jul. 1962	50°22'N	165°32'W	Northeastern North Pacific	3	NRIFS data	Japanese catcherboat sightings
16 Jul. 1962	52°07'N	169°44'W	Eastern Aleutians, Pacific side	1	NRIFS data	Japanese catcherboat sighting
1962			Eastern Bering Sea	1	Omura and Ohsumi, 1964	Marked
1962			'East of longitude 180 degrees'	4	Japan Whaling Association Data	One may be duplicate of sighting on previous line
11 Apr. 1963	37°08'N	123°05'W	33m W of Pigeon Pt., California	1	Rice and Fiscus, 1968	<30 feet
10 May 1963	37°20'N	123°10'W	24m SSW Farallon Is., California	1	Rice and Fiscus, 1968	45 feet
1963	51°N	145°W	Northwest Ground (but see Remarks)	200	Berzin and Doroshenko, 1982	Sighting by Soviet research vessels. Berzin and Rovnin (1966) say 200 in all eastern North Pacific in 1963, and their plot (fig. 6) shows no large sightings near this location
Jan. 1964	40°N	157°W	NE Pacific	?	Berzin and Doroshenko, 1982	'Right whales' seen by Soviet RV
11 Mar. 1965	26°39'N	113°40'W	6-7m SW of Pta Abreojos, Baja California	2	Rice and Fiscus, 1968	Both approx. 50 feet
1965	50-55°N	160-170°W	Aleutians, Pacific side	1	Wada, 1975	Japanese scoutboat sighting
1965	55-60°N	140-150°W	Gulf of Alaska	1	Wada, 1975	Japanese scoutboat sighting
1965	45-50°N	170-180°W	S of Aleutians	1	Wada, 1975	Japanese scoutboat sighting
1966	50-55°N	170-180°W	Aleutians, Pacific side	1	Wada, 1975	Japanese scoutboat sightings
1966	50-55°N	150-160°W	S of Alaska Peninsula	3	Wada, 1975	Japanese scoutboat sighting
1966	55-60°N	140-150°W	Gulf of Alaska	1	Wada, 1975	Japanese scoutboat sightings
17 Jan. 1967	48°20'N	125°06'W	15m WSW Cape Flattery, Washington	3	Rice and Fiscus, 1968	
1967	55-60°N	160-170°W	Eastern Bering Sea	1	Wada, 1975	Japanese scoutboat sighting
1967	50-55°N	150-160°W	S of Alaska Peninsula	1	Wada, 1975	Japanese scoutboat sighting
1969	50-55°N	160-170°W	Aleutians, Pacific side	1	Wada, 1975	Japanese scoutboat sighting
1969	45-50°N	170-180°W	S of Aleutians	1	Wada, 1975	Japanese scoutboat sighting
1970	50-55°N	130-140°W	W of Queen Charlotte Is, British Columbia	2	Wada, 1975	Japanese scoutboat sightings
1973	50-55°N	160-170°W	Aleutians, Pacific side	1	Wada, 1975	Japanese scoutboat sighting
1973	45-50°N	140-150°W	NE Pacific, S of Gulf of Alaska	1	Wada, 1975	Japanese scoutboat sighting
13 Sep. 1974	39°35'N	124,45°W	33m W of Fort Bragg, California	1	NMFS Platform of Opportunity data; Scarff, 1986a	Weather ship sighting
1974	40-50°N	140-160°W	NE Pacific	1	Anon., 1976	Japanese catcherboat sighting
1975	40-45°N	140-150°W	NE Pacific, S of Gulf of Alaska	2	Wada, 1977	Japanese sighting cruise
1976	50-55°N	155-160°W	Kodiak I.	1	Wada, 1978	Japanese sighting cruise
1976	45-50°N	150-155°W	NE Pacific, S of Alaska Peninsula	1	Wada, 1978	Japanese sighting cruise
Summer 1977	20-30°N	160-180°W	Hawaiian Is region	2	Anon., 1979	Japanese catcherboat sighting
1977	45-50°N	150-155°W	NE Pacific, S of Alaska Peninsula	1	Wada, 1979	Japanese sighting cruise
1977	45-50°N	140-145°W	NE Pacific, S of Gulf of Alaska	1	Wada, 1979	Japanese sighting cruise
1977	45-50°N	135-140°W	NE Pacific, S of Gulf of Alaska	2	Wada, 1979	Japanese sighting cruise
Summer 1978	50-60°N	140-160°W	Northwest Ground/Alaska Peninsula region	2	Anon., 1980	Japanese scout boat sightings
25 Mar. 1979	20°40'N	156°53'W	Off Maui, Hawaii	1	Rowntree <i>et al.</i> , 1980 Herman <i>et al.</i> , 1980	15-16m; associated with humpback whales. Resighted 10 Apr.
Summer 1979	40-45°N	145-150°W	NE Pacific	1	Wada, 1981	Japanese sighting cruise
1979	40-50°N	140-160°W	NE Pacific	1	Anon., 1981	Marked by Japanese
17 Apr. 1981	34°07'N	119°18'W	Santa Barbara Channel, California	1	Woodhouse and Strickley, 1982	14m
20 Mar. 1982	37°30'N	122°30'W	Half Moon Bay, near San Francisco	1	Johnson, 1982; Scarff, 1986b	15m
26 Jul. 1982	60°48'N	175°18'W	NW of St Matthew I., Bering Sea	2	Brueggeman <i>et al.</i> , 1984	Sighting details provided by G. Joyce
28 Aug. 1983	48°33'N	124°39'W	Juan de Fuca Strait, British Columbia	2	Reeves and Leatherwood, 1985	
8 Sep. 1985	56°54'N	163°56'W	SE Bering Sea	1	Goddard and Rugh, 1998	Photographed

cont...

Table 2.2 continued

Date	Latitude	Longitude	Location	No.	Source	Remarks
5 Feb. 1988	32°50'N	117°30'W	La Jolla, California	1	Scarff, 1991	
9 May 1990	33°28'N	118°25'W	8m N of Santa Catalina I., California	1	Rae-Dupree and Krikorian, 1990	Photographed
4 Aug. 1991	43°03'N	179°09'W	Northeastern North Pacific	1	NRIFS data; NMFS Platform of Opportunity data	Photographed
24 Mar. 1992	32°14'N	118°42'W	70km SW of San Clemente I., California	1	Carretta <i>et al.</i> , 1994	Length 12.6m
24 May 1992	47°17'N	125°11'W	65km W of Cape Elizabeth, Washington	1	Rowlett <i>et al.</i> , 1994	Seen from aerial survey and reidentified 6hrs later 48km W of Destruction I.
12 Apr. 1993	54°43'N	165°03'W	Southeastern Bering Sea	1	Goddard and Rugh, 1998	Sighting K. Vicknair, NMFS Platform of Opportunity data
7 Aug. 1993	57°46'N	166°27'W	Southeastern Bering Sea	2	Goddard and Rugh, 1998	Sighting D. Morse, NMFS Platform of Opportunity data
3 May 1995	35°40'N	121°17'W	Off Piedras Blancas, California	1	Rowlett, unpub.	Seen from shore
20 Feb. 1996	23°02'N	109°30'W	15 miles off Cabo San Lucas, Mexico	1	Gendron <i>et al.</i> , 1999	Photographed from aeroplane
2 Apr. 1996	20°56'N	156°46'W	Off Maui, Hawaii	1	Salden and Mickelson, 1999	
30 Jul. 1996	57°36'N	163°21'W	Southeastern Bering Sea	4	Goddard and Rugh, 1998	Possibly included calf?
25 Sep. 1996	56°48'N	164°24'W	Southeastern Bering Sea	2-4	Goddard and Rugh, 1998	Sighting T. Lewandowski
20 Jul. 1997	57°08'N	162°50'W	Southeastern Bering Sea	4-5	Tynan, 1998	Biopsied and photographed
22-23 Oct. 1997	56°50'N	164°30'W	Southeastern Bering Sea	1+	M. Bomlander, unpub.	Sighting M. Bomlander, NMFS Platform of Opportunity data, photographed
27 Feb. 1998	35°44'N	121°30'W	Big Sur Coast, California	1	Evans, 1998	Photographed
14-19 Jul. 1998	56°46'- 57°05'N	164°15'- 164°51'W	Southeastern Bering Sea	6	Perryman <i>et al.</i> , 1999	Photographed from aeroplane
14 Jul. 1998	57°08'N	151°51'W	S of Kodiak I.	1	K. Wynne and J. Waite, unpub.	Photographed
8-17 Jul. 1998	56°39'- 57°07'N	163°11'- 164°18'W	Southeastern Bering Sea	5	LeDuc <i>et al.</i> , 2000	Photographed from aeroplane
15 Jun. 1999			Southeastern Bering Sea	1	Tynan, 2001	
31 Jul. 1999	56°53'N	163°33'W	Southeastern Bering Sea	2	Moore <i>et al.</i> , 2001	Photographed from RV <i>Miller Freeman</i>
29 Oct. 1999	56°26'N	164°32'W	Southeastern Bering Sea	1	K. Williams, unpub.	Sighting K. Williams, NMFS Platform of Opportunity data, photographed

Table 2.3
Sightings of right whales in the North Pacific, with location not specified.

Date	Latitude	Longitude	Location	No.	Source	Remarks
1954 to ?	-	-	North Pacific, north of 40°N	20	Ivashin and Rovnin, 1967	All marked; no details given
1958-1962	-	-	'Pelagic' region	193	Omura <i>et al.</i> , 1969, table 14	Japanese catcherboat sightings; table 14 shows 310 sightings, but 117 for which details are available from unpublished ICR data sources are given separately above
1963	-	-	'Northern North Pacific'	49	Omura <i>et al.</i> , 1969, table 15	May include 3 whales killed as scientific research take. Table 15 includes whales in other years, presumably duplicating those listed in table 14 and noted above
1966-1967	-	-	'Pelagic' region	22	Omura <i>et al.</i> , 1969	Japanese catcherboat sightings

Notes: Two reports of 8 right whales observed off Washington state in 1959 by Fiscus and Niggol (1965) have been excluded because of the unreliable nature of the sightings; see the critique of Scarff (1986a, p.52). Nasu (1960) reports 2 right whales in the Chukchi and northern Bering seas in Aug 1958, but these were probably bowheads.

Berzin and Doroshenko (1982) note a 'recent' sighting at 58°30'N (longitude given in Berzin and Rovnin 1966 as 167°32'W), with no further details.

Possible but unconfirmed sightings of right whales are reported in Zenkovich (1934), Klumov (1962), DeBus (1975), Morris *et al.* (1983, p.141), Reeves and Leatherwood (1985), Scarff (1986a), and Blokhin (1988). Several other tentative sightings were recorded between 1959 and 1989 by NMFS Platform of Opportunity data.

Table 2.4

Summary of sightings since 1900 by area. Excluded are 284 sightings with no location specified. The 41 NE Pacific sightings include 16 reported only as 'East of 180°'.

Western North Pacific		Eastern North Pacific	
Japan	370	Northwest Ground	177 ¹
Kuril Islands	331	West Coast	24
Okhotsk Sea	195	Bering Sea	178
NW Pacific	69	NE Pacific	41
Western Aleutians	23	Eastern Aleutians	269
		Hawaii	4
Total	988	Total	693

¹This total includes sightings in 1958-64 reported by Berzin and Rovnin (1966) but not the 200 animals reported for 1963 by Berzin and Doroshenko (1982). See text for discussion of the conflict between these two papers.

The latter report represents a striking anomaly in an area where subsequent sightings of this species have been rare, and have generally been of single animals. Data given in Wada (1975) for Japanese sighting cruises made between 1965 and 1973 revealed no right whale sightings in the area of the Soviet sighting, and a total of only ten whales in the survey blocks that surround it for several hundred miles in all directions. More significantly, Berzin and Rovnin's (1966) plots of sightings from the same source show a scatter of animals across the northeastern Pacific, with no concentrations near the position given by Berzin and Doroshenko (1982). Finally, although the English translation of Berzin and Rovnin (1966) could be verified, Berzin and Doroshenko (1982) was submitted only in English and we could not locate the original Russian manuscript to check various details. In light of all this, and the seeming improbability of the existence of such a large concentration of right whales, it has been assumed that the scattered distribution shown by Berzin and Rovnin (1966) is accurate. There appears no way of determining the extent to which these data include duplicate sightings or other errors, and they are reported with this caveat.

Catches

In all, 741 right whales are recorded as being caught for either scientific or commercial purposes since 1900. Of these, 330 were killed in the western North Pacific (Table 3.1), 160 of which were taken in the waters of Japan and the Okhotsk Sea by the Japanese (Omura, 1986). A total of 411 were killed in the eastern North Pacific (Table 3.2). Twenty-eight were taken in the Gulf of Alaska or eastern Bering Sea between 1911 and 1938. Eleven were taken by Japanese and Soviet whalers as scientific catches, but the remaining 372 were killed during Soviet illegal pelagic whaling from the Bering Sea and Gulf of Alaska. There is only a single catch record from the west coast of the continental United States: a whale killed on 9 April 1924 near the Farallon Islands off central California (Gilmore, 1956). Another whale was accidentally killed off the northwest coast of Vancouver Island, Canada in May 1951 (Pike and MacAskie, 1969). The single right whale killed on 1 June 1964 (Table 3.1) by the USSR and reported as an infraction is included in the 1964 illegal USSR catches from the Gulf of Alaska.

A number of sources list animals taken off the northwestern coast of North America and give different numbers. Kellogg (1931) reports 17 right whales taken; one of which was reported killed off British Columbia in 1924 but is not included in the total of 27 given for the period

1914-1935 by Reeves *et al.* (1985). We have not found this whale in original record summaries for British Columbia and believe Kellogg to be in error. Tomilin (1957) reported that 28 right whales were killed in this region between 1911 and 1938; however, he provided neither details nor sources. Our records for this same period agree with Tomilin.

Other right whales may have been illegally caught but not recorded by the Soviet Union in the western North Pacific. For example, Yablokov (1994) noted that right whales had been taken in the late 1950s by a whaling station on Paramushir Island in the northern Kurils.

Among the recorded catches, 23 were animals taken for the purpose of scientific research (9 and 14 in the eastern and western North Pacific, respectively). All of these have been previously reported, including ten taken by the USSR (Klumov, 1962), and 13 by Japan (Omura, 1958; Omura *et al.*, 1969).

Best (1987) estimated that seven right whales were taken by American whalers throughout the North Pacific between 1900 and 1909. However, this figure does not come from specific catch records; rather, it was calculated based upon imports of oil and baleen during this period. Consequently, they have not been incorporated into the present review.

Strandings and entanglements

The 13 records of strandings and entanglements are listed in Table 4; all but one are from the western North Pacific. Five of the 12 western records are from the Commander Islands, three from Kamchatka, two from Japan, and one each from the Kuril Islands and Sakhalin Island. The sole eastern North Pacific record, from California, dates from 1916.

DISCUSSION

Population structure and migration

Distribution

Nineteenth-century whaling records show that right whales were once abundant across much of the North Pacific (Maury, 1852; 1853; Townsend, 1935; Scarff, 1986a; 1991). Areas of concentration included Japan, the Okhotsk Sea, the Kurils, Kamchatka, the Aleutians and southeastern Bering Sea (Bristol Bay Ground), and the Northwest Ground.

The data summarised here generally confirm this distribution. In the western North Pacific, right whales have been observed in significant numbers within the last forty years in areas known to be historically important. In particular, the Okhotsk Sea has consistently had significant numbers of sightings, the most during the 1990s; it is clear that this region, and the adjacent Kuril Islands and Kamchatka coast, represent a major feeding ground for the species. Furthermore, a concentration of Japanese sightings in the Bering Sea, loosely centered around 55°N, 170°W, suggests that this region was an important summer habitat for eastern North Pacific right whales. Small numbers of right whales have been sighted east of this area in recent years (1998-1999) during dedicated vessel and aerial surveys (LeDuc *et al.*, 2000). A detailed Geographic Information Systems analysis of all data presented here is in preparation.

The current rarity of right whales in previously populous parts of the eastern North Pacific is testament to the extreme damage done by whaling. Nowhere is the contrast between past and present abundance more striking than on the Northwest Ground. Scammon (1874) noted that right whales were there 'scattered... as far as the eye can discern from the

Table 3.1
Commercial and scientific catches of right whales in the western North Pacific since 1900.

Date	Latitude	Longitude	Location	No.	Source	Nation	Remarks
1911-1948			Kuril Is, S Hokkaido and NE Honshu S Honshu and E Kyushu Bonin Is Okhotsk Sea W Kyushu Coast of Korea	113 26 8 8 4 1	Omura, 1986	Japan	
Feb. 1921	28°00'N	129°24'E	Amami Is, Japan	1	Miyazaki and Nakayama, 1989	Japan	47ft - stranding?
1924-1925			Off Kamchatka	2	Tomilin, 1957	Norway	Factory ship <i>Kommandoren I</i>
1932-1946			WN Pacific and Bering Sea	9	Zenkovich, 1955	USSR	Factory ship <i>Aleut</i>
Aug. 1940			Bering Sea	1	Terry, 1950	Japan	Factory ship <i>Tonan maru</i>
10-11 Jun. 1941	48°N	158-159°E	SE of Kamchatka	2	Matsuura and Maeda, 1942; Omura, 1958	Japan	Factory ship <i>Tonan maru</i> . 58ft female, 45ft male
1941			Off Kamchatka	1	Terry, 1950	Japan	Factory ship <i>Tonan maru</i>
17 May 1955	45°08'N	149°46'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 18.3m female
1 Jun. 1955	46°23'N	152°34'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 17m male
19 Jun. 1955	47°01'N	150°25'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 16.3m female
13 Jul. 1955	49°44'N	157°17'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 17.1m male
22 Jul. 1955	49°34'N	156°35'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 17.4m female
22 Jul. 1955	49°42'N	154°31'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 19m male
10 Aug. 1955	50°47'N	155°21'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 16.6m male
10 Aug. 1955	50°22'N	155°12'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 16.6m male
11 Aug. 1955	51°05'N	155°51'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 11.4m female
28 Aug. 1955	50°00'N	154°25'E	Kuril Is	1	Klumov, 1962	USSR	Scientific research take; 17.8m female
May-Jun. 1956	38-42°N	143-149°E	Off eastern Japan	2	Omura, 1957	Japan	Scientific research take; 12.4m male, 12.6m female
Late 1950's			Off Paramushir I., Kuril Is	?	Yablokov, 1994	USSR	Number unknown, but Yablokov had 'anatomical materials' from right whales taken at this time.
1967			Off SE Sakhalin I., Okhotsk Sea	126	Doroshenko, 2000	USSR	Illegal pelagic whaling
1967			Olyutorskiy Bay, Kamchatka	1	Doroshenko, 2000	USSR	
20/25 Jul. 1968	48°N	145-146°E	Southeastern Sakhalin I., Okhotsk Sea	2	Omura <i>et al.</i> , 1969	Japan	Scientific research take; 15.2m male, 12.6m female
1971			Northern Kuril Is	10	Doroshenko, 2000	USSR	Illegal pelagic whaling
Jan. 1973			Haiyang I., Yellow Sea	2	Wang, 1978	China	18m female, 12.8m male. In Dailan Museum of Natural History
Mid-Oct. 1974			Sea of Japan	1	Park, 1987	Korea	'Approx 64ft'. Taken by whaling ship <i>Je 3 Deyahng</i>
Dec. 1977			SE Haiyang I., Yellow Sea	1	Wang, 1988	China	17.1m female with 4.99m foetus

Table 3.2
Commercial and scientific catches of right whales in the eastern North Pacific since 1900.

Date	Latitude	Longitude	Location	No.	Source	Nation	Remarks
1911-1938			Gulf of Alaska, SE. Bering Sea and off British Columbia	28	Tomilin, 1957 Reeves <i>et al.</i> , 1985 Brueggeman <i>et al.</i> , 1986 Kellogg, 1931	USA Canada	Years and total of 28 taken from Tomilin; others give fewer animals over shorter period. See text.
9 Apr. 1924	37°40'N	124°W	Off Farallon Is, California	1	Gilmore, 1956	USA	Moss Landing whaling station log says 40ft female, empty stomach.
May 1951			Off British Columbia	1	Pike and McAskie, 1969	Canada	'accident'
1961	55°54'N	153°07'W	South of Kodiak I., Alaska	1	Omura <i>et al.</i> , 1969	Japan	Scientific research take
1961	55°54'N	153°08'W	South of Kodiak I., Alaska	1	Omura <i>et al.</i> , 1969	Japan	
1961	55°53'N	153°06'W	South of Kodiak I., Alaska	1	Omura <i>et al.</i> , 1969	Japan	
1962	53°42'N	171°17'W	SE Bering Sea (north of Aleutians)	1	Omura <i>et al.</i> , 1969	Japan	Scientific research take; TK on factory ship
1962	54°30'N	170°22'W	SE Bering Sea (north of Aleutians)	1	Omura <i>et al.</i> , 1969	Japan	
1962	54°18'N	170°21'W	SE Bering Sea (north of Aleutians)	1	Omura <i>et al.</i> , 1969	Japan	
1963	53°52'N	172°46'W	SE Bering Sea (north of Aleutians)	1	Omura <i>et al.</i> , 1969	Japan	Scientific research take
1963	54°04'N	172°35'W	SE Bering Sea (north of Aleutians)		Omura <i>et al.</i> , 1969	Japan	
1963	54°03'W	172°50'W	SE Bering Sea (north of Aleutians)		Omura <i>et al.</i> , 1969	Japan	
1963			Gulf of Alaska	141	Doroshenko, 2000	USSR	Illegal pelagic whaling
1 Jun. 1964	57°20'N	150°00'W	Gulf of Alaska, E of Kodiak I.	1*	IWC database	USSR	Infraction. Factory ship <i>Dalnij Vostok</i> . 13.8m male
1964			Gulf of Alaska	87	Doroshenko, 2000	USSR	Illegal pelagic whaling
1964			SE Bering Sea	113	Doroshenko, 2000	USSR	Illegal pelagic whaling
1965			Gulf of Alaska	20	Doroshenko, 2000	USSR	Illegal pelagic whaling
1966			Gulf of Alaska	3	Doroshenko, 2000	USSR	Illegal pelagic whaling
1967			SE Bering Sea	8	Doroshenko, 2000	USSR	Illegal pelagic whaling

* This whale is not included in the total count as it is considered part of the 87 whales illegally taken in the Gulf of Alaska in 1964.

masthead'. Remarkably few right whales have been observed in these waters in the past thirty-five years despite often extensive effort in the form of dedicated marine mammal surveys.

It has been suggested by several researchers that the current paucity of sightings from waters off the west coast of North America is due to overexploitation (e.g. Gaskin, 1987). However, Scarff (1986a; 1991) makes a convincing case that right whales were never common in this region. Although some records are available from Washington state, there is little evidence that right whales were regularly taken by local aboriginal peoples. Relatively few right whales were observed or killed by whalers on this coast in even the early years of the fishery (Townsend, 1935; Scarff, 1986a; Mitchell and Reeves, 2001). Furthermore, as Scarff (pers. comm.) points out, there is not a single record of a calf, either at sea or stranded, from this region (this is not the case for the western North Pacific).

Migratory movement, breeding and calving

The seasonal migratory movement of right whales in the North Pacific has been a topic of debate for many years. In general, one observes a northward movement to high latitudes in spring, and a similar southward trend in autumn (although there is considerably less information for the latter period). However, right whales are found across a broad latitudinal range during both seasons, suggesting a staggered migration (Scarff, 1991).

A more fundamental question relates to the location of breeding and calving grounds. In the western North Pacific, various areas have been proposed, including the Ryukyu Islands (Omura, 1986), the Yellow Sea (Tomilin, 1957), the Sea of Japan (Omura, 1986), and offshore waters far from land (Scarff, 1991). There are no recent reports of right whales around Taiwan, although Townsend (1935) plotted a

small number of catches in the Taiwan Strait. The Bonin Islands have also been proposed as a wintering area (Omura, 1958); the three recent sighting records from this area, all made in April, are of interest in this regard, although Scarff (1991) notes that Maury recorded few right whales in this area despite reasonable search effort in late winter. Overall, mid-winter sightings and seasonal movements in spring and autumn give various degrees of support to all of the above suggestions, but the general paucity of records from winter make a definitive assessment impossible.

There is very little information on where right whales from the eastern North Pacific spend their winters. The 14 sightings (of a total of 15 animals) from California and Baja California this century exhibit seasonality: with the exception of one September record, all occurred between February and May. While this could be viewed as a remnant population continuing to follow traditional routes to or from an unknown wintering area off the west coast, the historical data do not support the idea that this region ever contained major habitats for right whales at any time of year. Based upon some autumn and spring records in mid-ocean in Maury's compilations, Scarff (1991) argues for more rigorous examination of the possibility that the animals which summered along the high-latitude margins on the eastern North Pacific wintered and calved in mid-ocean waters far offshore. Others have suggested that right whales on both sides of the North Pacific calve (or once calved) in embayments, as occurs in the North Atlantic and in southern right whales (*Eubalaena australis*). However, no such bay has been identified. Furthermore, in areas where coastal calving or nursing takes place (e.g. western North Atlantic, Kraus *et al.*, 1986; Argentina, Payne, 1986), not all females appear to use these habitats, and some may calve offshore. Since the advantage of coastal calving is not clear, there is currently no good reason to suppose that right whales would not give birth and perhaps mate far from land.



Fig. 1. North Pacific right whale taken in the southeastern Bering Sea (Bristol Bay Grounds) in 1964 and being processed on board the USSR factory ship the *Vladivostok*. Courtesy of A.A. Berzin.



Fig. 2. North Pacific right whale landed on 25 June 1929 at Rose Harbour, northern end of Kughit Island, Queen Charlotte Islands, Canada. Courtesy of J. Storrie via J. Goddard and the Maritime Museum of British Columbia, Victoria, BC, Canada.



Fig. 3. North Pacific right whale found stranded 14 November 1999 on the west coast of Kamchatka, Russia. Courtesy of V.S. Nikulin.

Table 4
Strandings and entanglements of North Pacific right whales since 1900.

Date	Latitude	Longitude	Location	Source	Remarks
1902			Hamiyashima, Amami I., Japan	Miyazaki and Nakayama, 1989	Stranded
14 Nov. 1916			Santa Cruz I., California	Woodhouse and Strickley, 1982	Stranded
Dec. 1939			Lundskii Bay, Sakhalin I.	Tomilin, 1957	Stranded <i>ca</i> 9m
1976			Bering I. (Commander Is)	Ivashin and Vertjankin, 1987	Stranded female
15 Apr. 1977	34°40'N	138°45'E	Kumomi, Izu Peninsula Japan	Yamamoto and Hiruta, 1978	Stranded 11.5m male
1980			Bering I. (Commander Is)	A.M. Burdin, pers. comm.	Stranded?
15 Mar. 1984			Bering I. (Commander Is)	A.M. Burdin, pers. comm.	Stranded male
25 Jul. 1984			Medny I. (Commander Is)	A.M. Burdin, pers. comm.	Stranded?
16 Oct. 1989			Pacific coast of C Lopatka, Kamchatka	Kornev, 1994	Stranded 12.15m male, entangled in gillnet
25 Jun. 1991			Medny I. (Commander Is)	A.M. Burdin, pers. comm.	Stranded, size and sex unknown
29 Mar. 1997			Cape Lopatka, Kamchatka	V.S. Nikulin, pers. comm.	Stranded, <i>ca</i> 14m
Summer 1998			Shumshu I., Kuril Is	S.I. Kornev, pers. comm.	Stranded, size and sex unknown
14 Nov. 1999			West coast of Kamchatka	V.S. Nikulin, pers. comm.	Stranded, 12.6m male

Note: On 27 Jan 1995 a right whale skull was unearthed at a beach development 2 miles north of Crescent City, California (41°46'N, 124°15'W). Its date of burial and the animal's cause of death were unknown (J. Cordaro, pers. comm.)

Stock separation

The question of whether two or more stocks of right whales exist in the North Pacific remains open. Townsend's (1935) charts show a largely discontinuous distribution of right whales across high latitudes, with few catches in the mid-Pacific region. This has been used by a number of authors as evidence of the existence of two discrete populations (e.g. Klumov, 1962). However, Scarff (1991) noted that Maury's charts showed a relatively continuous distribution across the Pacific, including a surprisingly high (relative to effort) incidence of sightings in mid-ocean. Scarff maintained that the gaps in Townsend's charts result from a lack of searching effort in the regions concerned, and that the relatively low number of catches from the central Aleutians region was due to the whalers' concentration on known high-density areas elsewhere.

Twentieth century sightings support the two-stock hypothesis. The fact that the right whale populations in the eastern and western North Pacific appear to have distinct catch and recovery histories also supports the idea that at least two stocks exist, at least with regard to feeding ground divisions. The eastern population was clearly the more intensively whaled, and this is reflected in the fact that fewer animals exist there today than in the west. This difference in post-exploitation abundance represents some evidence in favour of the two-stock hypothesis. However, the extent of

exchange between the two populations in high latitudes, and whether the different feeding stocks mix on a common breeding ground offshore, is unknown. This could be addressed with molecular genetic analyses using both mitochondrial and microsatellite DNA, although finding and sampling a sufficient number of whales (notably in the east) would be a major obstacle to such a study.

A second question relates to possible subdivision within the western North Pacific. Both Klumov (1962) and Omura (1986) believed that the right whales which summer in the Okhotsk Sea represent a discrete population which winters in the Sea of Japan and perhaps the East China Sea. However, right whales today in the Sea of Japan appear to have been almost extirpated. Omura (1986) believed that a second, 'Pacific', stock migrates up the east coast of Japan, possibly from breeding grounds in the Ryukyu Islands, and summers in the Kurils and the Bering Sea. Although we find it difficult to accept that animals found in such close proximity to one another (notably in the Kurils and Okhotsk Sea) could represent discrete stocks, we can offer no new data to this debate.

Extent of illegal catches

In order to address the question of the present status of North Pacific right whales, the extent of illegal hunting by the Soviet Union must be examined. Three known episodes can

be identified: factory ship whaling in the Okhotsk Sea and the Northwest Ground/southeastern Bering Sea, and a land-based operation in the Kurils. Based upon the evidence presented below, it seems probable that many of the Soviet 'sightings' of right whales in these areas are in fact whales that were killed.

Southeastern Bering Sea/Northwest Ground/eastern North Pacific

As noted above, there is considerable confusion concerning exactly where the Soviets observed 200 right whales in 1963, and whether this uncharacteristically large number can be considered accurate. However, the more significant issue concerns whether these sightings (wherever they were made), and others reported in 1958–64 by Berzin and Rovnin (1966), actually represent catches. It should be noted that the Soviet catches in the southeastern Bering Sea and in the Gulf of Alaska in 1964 totalled 200 right whales (Doroshenko, 2000). A.A. Berzin (pers. comm. to RLB) reported that two sister ships built specifically for the North Pacific (the *Vladivostok* and the *Dalniy Vostok*) killed about 200 right whales in the eastern North Pacific in 1964.

The Soviet catch of 372 right whales during the 1960s must have represented a large proportion, probably the majority, of the remaining eastern North Pacific population. If so, one would expect to see this depletion reflected in data from subsequent years. This appears to be the case. In addition to the Soviet sightings of several hundred animals in 1958–64 (Berzin and Rovnin, 1966), analysis of Japanese whaler observations from 1954 to 1957 show more than a hundred sightings of right whales in the eastern Aleutians and southeastern Bering Sea in the months of June and July, including approximately 60 in July of 1956 alone (Omura, 1958, fig. 1). Overall, between 1941 and 1964 there were 598 sightings of right whales east of 180° (including a midpoint total of 330 for Berzin and Rovnin, 1966, and ignoring the 200 from Berzin and Doroshenko, 1982); this is an average of 24.9 whales per year. These records contrast sharply with the results of surveys conducted in later years: from 1965 to 1999, only 82 sightings were reported for the entire eastern North Pacific, or 2.3 per year. This number includes the results of extensive Japanese surveys conducted over a 27-year period from 1965 to 1991, including in the previously quite populous eastern Aleutians and southeastern Bering Sea. Even if *all* of the sightings reported by Berzin and Rovnin (1966) were false, a major decline is still evident.

As early as the mid-1970s, Gilmore (1978) suggested that illegal catches were made on the Northwest Ground. However, information to support his suspicion was not available until very recently and emerged in part because of the present review. In conclusion, it is clear that the Soviet takes inflicted severe damage on the remaining eastern North Pacific population.

Kuril Islands/Okhotsk Sea

Yablokov (1994) stated that 'hundreds' of right whales (including bowheads) were taken in the Okhotsk Sea in the 1960s, and also mentions whaling of undetermined extent from Paramushir Island in the Kurils prior to the late 1950s (this whaling was in addition to the scientific research take of ten animals reported by Klumov, 1962). Since Paramushir was just one of several whaling stations that began operations in the Kurils in 1948, it is possible that the 1950s takes were also extensive.

Available data show that the take of right whales in this region was indeed substantial. As in the eastern North Pacific, the sighting data for this area reveal a pattern of relative abundance followed by apparent decline. In just three summers (1955–57), 244 right whale sightings were reported by Soviet whaling vessels in the Kurils alone (Klumov, 1962), although the actual number of whales or of the rate of duplicate sightings involved is unknown. In the years that followed, there were only two substantial reports of right whales in the Okhotsk Sea region: one of 70 animals off eastern Sakhalin in 1967 (Berzin and Vladimirov, 1989) and another of 40–45 northeast of Kashevarov Bank in 1974. In 1967, 126 right whales were killed by Soviet commercial whaling operations off the southeastern end of Sakhalin Island (Doroshenko, 2000). In July 1968, the Japanese killed two right whales in the same area under a research whaling permit (Omura *et al.*, 1969). By contrast, between 1975 and 1991, only nine animals were recorded in the region by either Soviet or Japanese surveys, although 34 were observed in the summer of 1992 and 11 in the summer of 1999. Although the trend is less marked than in the eastern North Pacific, the general decline in sightings after the 1960s suggests that a significant proportion of the right whales of the Okhotsk Sea region were killed during one or more periods of illegal whaling by the USSR. How many of the various Soviet sightings (including the 244 reported from the 1950s by Klumov) may represent catches is unclear, and no original data appear to exist from this period.

Present status

Regrettably, none of the published estimates of abundance relating to North Pacific right whales can be regarded as reliable. Even the indices of abundance calculated from extensive Japanese sighting surveys (e.g. Ohsumi and Wada, 1974) suffer from the inevitable problems of high variance that accompany extrapolations from very few observations over a wide area. Other estimates appear to be little more than conjecture based upon general patterns of sightings: examples include '300–500' for the North Pacific (Berzin and Yablokov, 1978), 100–200 for the North Pacific (Braham and Rice, 1984) and 150–200 for the Okhotsk Sea (Berzin and Vladimirov, 1989, citing Berzin, 1982), or 800 and 900 for the Okhotsk Sea (Vladimirov, 1994 and Vladimirov, 2000, respectively). However, no quantitative data exist to confirm any of these estimates. The most refined preliminary estimate for the Okhotsk Sea is 900 whales (Miyashita and Kato, 1998), but the confidence interval for this estimate (404–2,108) is large. The only thing common to all of the estimates, whether regional or basin-wide, is that they are low: all agree that the North Pacific right whale is not numerous anywhere within its historic range.

The data summarised here clearly support this view. The relative paucity of sightings virtually everywhere in the 20th century, and the pattern of apparent decline observed after the 1960s, all point to a situation in which remnant populations may have been slowly recovering from intensive whaling, only to be devastated by illegal Soviet catches. In the western North Pacific, Soviet catches nullified any increases that occurred during the 20th century. Although quantitative analysis is impossible, recent sightings suggest that this population may number at least in the low hundreds and may therefore be large enough to survive. By contrast, sightings of right whales in the eastern North Pacific are today exceedingly rare; this is true despite the often intensive search effort that has occurred in many potential right whale habitats as a result of offshore oil and gas development, and recent dedicated surveys. Overall, the situation in the North

Pacific closely parallels that with the North Atlantic right whale. The eastern North Atlantic stock was greatly reduced by protracted whaling; it appears likely that the remaining animals were then virtually extirpated by a burst of Norwegian catches at the turn of the 20th century (Collet, 1909; Brown, 1986). A remnant population numbering approximately 300 animals remains in the western North Atlantic (IWC, 2001a).

It is not clear what the future holds for the right whale in the North Pacific. It is possible that the western population is large enough that, given sufficient time and protection, it will recover. However, one should note that no increase has been apparent in a population of similar size in the western North Atlantic despite six decades of protection, although this population is known to suffer a high mortality rate from anthropogenic factors such as entanglements and vessel collisions (Kraus, 1990; Clapham *et al.*, 1999; IWC, 2001a). Entanglements in fishing gear may represent a significant problem for the western population of North Pacific right whales, particularly given the present operation of Japanese salmon driftnet fisheries within the Russian EEZ inside the Okhotsk Sea.

The prognosis for the eastern North Pacific population is poor. This population is one of the most endangered populations of whales in the world and is also one of the most poorly studied (Clapham *et al.*, 1999). A long-term monitoring programme is needed to better understand the conservation status of this population and to determine if it may be affected by any negative human interactions that require mitigation. This is especially needed because these whales are long lived, delay breeding, have a long reproductive cycle and have a small current population. Long-term monitoring will also allow better determination of the range of the summer feeding grounds in the eastern North Pacific. It is hoped that the increases reported in southern right whale populations, which were also heavily exploited during the 19th century and then again by USSR whaling operations (during the late 1950s and 1960s) in the Southern Hemisphere (Tormosov *et al.*, 1998), will be repeated by the right whale population in the eastern North Pacific.

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