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 (Tomlin, 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 (Tomlin, 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 grey 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...
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 Oshima) and the Bonins (Ogasawara Gunto). 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 whalesmen 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.

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 Sleptsov, 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 1963 (Sleptsov, 1966), made by the same Soviet research vessels.

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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  | 12 whales sighted, but 3 were killed (see Table 3.1) |
| Apr. 1941-1957 |            |               | East and southeast of Hokkaido, Japan     | 37  | Omura  | Japanese catcherboat sightings                |
| May 1945  |              |               | East and southeast of Hokkaido, Japan     | 46  | Omura  | Japanese catcherboat sightings                |
| Jun. 1945  |              |               | Lat 46°-47° east of Kurils               | 3   |        |                                              |
| Jul. 1945  |              |               | SE of Hokkaido, Japan                    | 4   | Omura  | Japanese catcherboat sightings                |
| Aug. 1945  | 52°N 163°E  |               | SE of Kamchatka                          | 2   | Omura  | Japanese catcherboat sightings                |
| Apr.-Nov. 1951 | 39-52°N 140-158°E |            | Kuril Is (both Okhotsk Sea and Pacific sides) | 57  | Klumov | Russian catcherboat sightings                |
| Apr.-Nov. 1953 | 39-52°N 140-158°E |            | Kuril Is (both Okhotsk Sea and Pacific sides) | 16  | Klumov | Russian catcherboat sightings                |
| Apr.-Nov. 1954 | 39-52°N 140-158°E |            | Kuril Is (both Okhotsk Sea and Pacific sides) | 6   | Klumov | Russian catcherboat sightings                |
| Apr.-Nov. 1955 | 39-52°N 140-158°E |            | Kuril Is (both Okhotsk Sea and Pacific sides) | 85  | Klumov | Russian catcherboat sightings                |
| Apr.-Nov. 1956 | 39-52°N 140-158°E |            | Kuril Is (both Okhotsk Sea and Pacific sides) | 50  | Klumov | Russian catcherboat sightings                |
| Apr.-Nov. 1957 | 39-52°N 140-158°E |            | Kuril Is (both Okhotsk Sea and Pacific sides) | 109 | Klumov | Russian catcherboat sightings                |
| 1958-1964  |              |               | NE Okhotsk Sea and western Kamchatka     | 1   | ICR data | Japanese catcherboat sighting                |
| 1959       | 53°42’N 167°23’E |            | Western Aleutians                        | 102 | Omura et al., 1969 | Japanese catcherboat sightings                |
| 1965       | 53°05’N 179°33’E |            | Western Aleutians                        | 1   | T. Kasuya, unpub. | Caught in trap net, but broke free and escaped.                             |
| and 1970   |              |               |                                            |     |        |                                              |
| 1966       |              |               | ‘Coastal’ Japan                           | 34  | Omura et al., 1969 | Japanese catcherboat sightings                |
| 1967       | 45-50°N 160-170°E |            | NW Pacific, southeast of Kamchatka        | 1   | Wada, 1975 | Japanese scuba boat sighting                |
| 1967       |              |               | ‘Coastal’ Japan                           | 83  | Omura et al., 1969 | Japanese catcherboat sightings                |
| 1967       |              |               | Cape Terpeniya, eastern Sakhalin I.      | 70  | Berzin and Vladimirov, 1989 | Seen by RV Fiyaz                        |
| 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)     | 2   | 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 scuba boat sighting                |
| 1968       | 45-50°N 170-180°E |            | NW Pacific, south of Aleutians            | 1   | Wada, 1975 | Japanese scuba boat sighting                |
| 1969       | 40-45°N 160-170°E |            | NW Pacific, Pacific side                  | 1   | Wada, 1975 | Japanese scuba boat sighting                |
| 1969       | 45-50°N 160-170°E |            | NW Pacific, southeast of Kamchatka        | 2   | Wada, 1975 | Japanese scuba boat sighting                |
| 1969       | 45-50°N 170-180°E |            | South of Aleutians                        | 2   | Wada, 1975 | Japanese scuba boat sighting                |
| 1970       | 40-45°N 150-160°E |            | NW Pacific, southeast of Kurils            | 1   | Wada, 1975 | Japanese scuba boat sighting                |
| 1970       | 45-50°N 160-170°E |            | NW Pacific, southeast of Kamchatka        | 1   | Wada, 1975 | Japanese scuba boat sighting                |
| 1970       | 45-50°N 170-180°E |            | South of Aleutians                        | 1   | Wada, 1975 | Japanese scuba boat 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 scuba boat sighting                |

cont...
| Date          | Latitude | Longitude | Location                                                                 | No. | Source                  | Remarks                                      |
|---------------|----------|-----------|---------------------------------------------------------------------------|-----|-------------------------|----------------------------------------------|
| 1971          | 40-45°N  | 160-170°E | NW Pacific                                                                | 1   | Wada, 1975              | Japanese scoubboat sighting                  |
| 1971          | 45-50°N  | 170-180°E | South of Aleutians                                                        | 4   | Wada, 1975              | Japanese scoubboat sighting                  |
| 1972          | 40-45°N  | 160-170°E | NW Pacific                                                                | 3   | Wada, 1975              | Japanese scoubboat sighting                  |
| 1972          | 45-50°N  | 160-170°E | NW Pacific, southeast of Kamchatka                                         | 3   | Wada, 1975              | Japanese scoubboat sighting                  |
| 1972          | 35-40°N  | 170-180°E | NW Pacific                                                                | 1   | Wada, 1975              | Japanese scoubboat sighting                  |
| 1972          | 45-50°N  | 170-180°E | South of Aleutians                                                        | 3   | Wada, 1975              | Japanese scoubboat sighting                  |
| Sep. 1973     |          |           | Eastern Okhotsk Sea                                                       | 16  | Berzin and Vladimirov, 1989 | Japanese scoubboat sighting                  |
| Aug.-Oct. 1974|          |           | Central and northeastern Okhotsk Sea, NE of Kashevarov Bank               | 40-45| Kuz’min and Berzin, 1975 | Japanese scoubboat sighting                  |
| 1974          | 30-50°N  | 160-180°E | West central North Pacific                                               | 4   | Anon., 1976             | Japanese scoubboat sighting                  |
| 1974          | 32°      |           | Coast of Japan                                                            | 4   | 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 scubaing 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 scubaing cruise                     |
| 1983          | 30-40°N  | 120-140°E | Coast of Japan                                                            | 2   | Anon., 1985             | Japanese scubaing cruise                     |
| 13 Jan. 1984  | 35°44′N  | 141°35′E  | Coast of Japan, off eastern Honshu                                         | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 21 Jan. 1984  | 33°40′N  | 138°28′E  | Coast of Japan, off eastern Honshu                                         | 2   | Miyashita and Kato, 1998 | Japanese scubaing 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            | Japanese scubaing cruise; individual resighted 17 Sep. 1992 |
| 18 Aug. 1989  | 53°41′N  | 146°12′E  | Okhotsk Sea, E of Sakhalin I                                               | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 8 Apr. 1990   | 27°09′N  | 142°10′E  | Chichi-jima I. (Bonin Is), Japan                                          | 1   | Mori et al., 1998        | Japanese scubaing cruise                     |
| 11 Aug. 1990  | 50°10′N  | 154°22′E  | Okhotsk Sea, W of Paramushir I                                            | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 6 Sep. 1990   | 54°28′N  | 151°08′E  | Okhotsk Sea                                                               | 4   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 6 Sep. 1990   | 54°29′N  | 152°07′E  | Okhotsk Sea                                                               | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 7 Aug. 1992   | 51°17′N  | 148°38′E  | Central Okhotsk Sea                                                       | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 26 Aug. 1992  | 51°52′N  | 155°10′E  | Okhotsk Sea, off western Kamchatka                                        | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 26 Aug. 1992  | 51°50′N  | 155°20′E  | Okhotsk Sea, off western Kamchatka                                        | 5   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 26 Aug. 1992  | 51°46′N  | 155°19′E  | Okhotsk Sea, off western Kamchatka                                        | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 26 Aug. 1992  | 51°47′N  | 155°23′E  | Okhotsk Sea, off western Kamchatka                                        | 4   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 26 Aug. 1992  | 51°47′N  | 155°22′E  | Okhotsk Sea, off western Kamchatka                                        | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise; animal’s tail stock entangled in heavy rope |
| 27 Aug. 1992  | 51°26′N  | 155°59′E  | Okhotsk Sea, off western Kamchatka                                        | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 27 Aug. 1992  | 51°20′N  | 156°02′E  | Okhotsk Sea, off western Kamchatka                                        | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 27 Aug. 1992  | 51°21′N  | 156°04′E  | Okhotsk Sea, off western Kamchatka                                        | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 27 Aug. 1992  | 51°22′N  | 156°07′E  | Okhotsk Sea, off western Kamchatka                                        | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 27 Aug. 1992  | 51°16′N  | 155°52′E  | Okhotsk Sea, off western Kamchatka                                        | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 6 Sep. 1992   | 55°48′N  | 143°33′E  | Okhotsk Sea, northeast of Sakhalin I.                                     | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 9 Sep. 1992   | 54°07′N  | 152°14′E  | Central Okhotsk Sea                                                       | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 15 Sep. 1992  | 53°45′N  | 145°07′E  | Okhotsk Sea, northeast of Sakhalin I.                                     | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 15 Sep. 1992  | 53°42′N  | 145°12′E  | Okhotsk Sea, northeast of Sakhalin I.                                     | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 16 Sep. 1992  | 53°12′N  | 146°31′E  | Okhotsk Sea, east of Sakhalin I.                                          | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 17 Sep. 1992  | 51°32′N  | 144°47′E  | Okhotsk Sea, east of Sakhalin I.                                          | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 18 Sep. 1992  | 50°18′N  | 145°01′E  | Okhotsk Sea, east of Sakhalin I.                                          | 2   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 18 Sep. 1992  | 50°19′N  | 145°11′E  | Okhotsk Sea, east of Sakhalin I.                                          | 1   | Miyashita and Kato, 1998 | Japanese scubaing cruise                     |
| 18 Sep. 1992  | 50°17′N  | 145°12′E  | Okhotsk Sea, east of Sakhalin I.                                          | 1   | Miyashita and Kato, 1998 | Japanese scubaing 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 et al., 1998 | With humpback whales                          |
| 15 Apr. 1993 | 27°02’N | 142°10’E | Chichi-jima I. (Bonin I.), Japan              | 1   | Mori et al., 1998 | One animal from pair on 12 Apr.              |
| 12 Aug. 1994 | 42°10’N | 142°08’E | Northwestern Pacific                          | 2   | Fujise et al., 1995 | Cow (51) and calf (27)                      |
| 21 Jun. 1995 | 47°28’N | 163°19’E | Northwestern Pacific                          | 1   | Fujise et al., 1996 |                                             |
| 9 Aug. 1995  | 45°00’N | 165°34’E | Northwestern Pacific                          | 1   | Fujise et al., 1996 |                                             |
| 13 Mar. 1996 | 27°04’N | 142°08’E | Chichi-jima I. (Bonin Is), Japan              | 1   | Mori et al., 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 |        |          | Yakuchi-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 et al., 1997 | Japanese sighting cruise                    |
| Apr.-Jun. 1998 | 39-41°N | 145-150°E | East of Japan (sub-area 7)                   | 3   | Zenitani et al., 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 et al., 2000; NRIFS data | Japanese sighting cruise |
| 15 Sep. 1999 | 53°01’N | 153°59’E | Okhotsk Sea, off western Kamchatka            | 2   | Miyashita et al., 2000; NRIFS data | Japanese sighting cruise |
| 16 Sep. 1999 | 52°13’N | 154°27’E | Okhotsk Sea, off western Kamchatka            | 3   | Miyashita et al., 2000; NRIFS data | Japanese sighting cruise |
| 16 Sep. 1999 | 52°04’N | 154°06’E | Okhotsk Sea, off western Kamchatka            | 1   | Miyashita et al., 2000; NRIFS data | Japanese sighting cruise |
| 17 Sep. 1999 | 51°46’N | 153°30’E | Okhotsk Sea, off western Kamchatka            | 2   | Miyashita et al., 2000; NRIFS data | Japanese sighting cruise |
| 17 Sep. 1999 | 51°24’N | 152°46’E | Okhotsk Sea, off western Kamchatka            | 1   | Miyashita et al., 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 | Reeves et al., 1985 (table 8) | 2   | Chased for 1hr by catcherboat Paterson        |
| 4 Aug. 1928  |        | Of Akutan, Alaska | Reeves et al., 1985 (p.455) | 1   | Struck and lost during whaling by catcherboat Unimak |
| 3 Sep. 1929  |        | 40m off Rootok I. Alaska | Reeves et al., 1985 (table 8) | 1   | Chased for 6hr 20min by catcherboat Unimak    |
| 11 May 1937  |        | Ca 20m SE of Twohead I. (Kodiak) | Reeves et al., 1985 (table 8) | 2   | Chased by catcherboat Moran                   |
| 14 May 1937  |        | Ca 1m SE of Twohead I. (Kodiak) | Reeves et al., 1985 (table 8) | 1   | Chased for 1hr by catcherboat Tanginak        |
| 20 Jun. 1937 |        | SE of Unalaska I. Alaska | Reeves et al., 1985 (table 8) | 1   | Chased by catcherboat Paterson                |
| 24 Aug. 1937 |        | 28m SE of Rootok I. Alaska | Reeves et al., 1985 (table 8) | 1   | Seen by catcherboat Kodik                     |
| 17 Aug. 1939 |        | Area of Akutan Pass | Reeves et al., 1985 (table 8) | 1   | Japanese catcherboat sightings                |
| Jun. 1941-1957 |        | Central and eastern Aleutians (Pacific side) | Omura, 1958 | 19  | Japanese catcherboat sightings                |
| Jul. 1941-1957 |        | Eastern Aleutians, in SE Bering Sea | Omura, 1958 | 2   | Japanese catcherboat sightings                |
| Sep. 1941-1957 | 53°N  | 168°W | E Aleutians (Pacific side) | Omura, 1958 | 92  | Japanese catcherboat sightings                |
| 31 Mar. 1955 | 32°50’N | 117°30’W | La Jolla, California | Gilmore, 1956 | 1  | Japanese catcherboat sightings                |
| 1955-1958 | 40°-50°W | 170-180°W | South of Aleutians | Slipet et al., 1964 | 4  | Opportunistic sightings, Dutch vessels        |
| 1958 |        | ‘East of longitude 180 degrees’ | ICR data | 12  | Japanese catcherboat sightings                |
| Post-19587 | 50°N  | 145°W | Northwest Ground | Pike and McAskie, 1969 | 2  | Weather ship sightings                        |

cont...
| Date         | Latitude | Longitude | Location          | No. | Source                   | Remarks                                                                 |
|--------------|----------|-----------|-------------------|-----|--------------------------|--------------------------------------------------------------------------|
| 1958-1964    |          |           | Eastern Aleutians (both sides) |     | 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 | NE Pacific        | 6-5 | 8-120                    | Fiscus and Niggol, 1965                                                   |
| 6 Jul. 1959  | 57°23'N | 174°01'W | Central Bering Sea|     | 1                        | Rice and Fiscus, 1968                                                   |
| 7 Jul. 1959  | 56°02'N | 171°28'W | SE Bering Sea      | 2   | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 8 Jul. 1959  | 54°25'N | 167°53'W | Eastern Aleutians  | 3   | 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 | 179°16'W | Central Bering Sea|     | 1                        | Japanese catcherboat sightings                                           |
| 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  | 6   | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 19 Jun. 1960 | 54°30'N | 168°22'W | Eastern Aleutians  | 7   | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 21 Jun. 1960 | 55°31'N | 169°41'W | SE Bering Sea      | 8   | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 22 Jun. 1960 | 55°45'N | 170°40'W | SE Bering Sea      | 9   | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 23 Jun. 1960 | 56°12'N | 170°03'W | SE Bering Sea      | 10  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 24 Jun. 1960 | 56°10'N | 170°39'W | SE Bering Sea      | 11  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 25 Jun. 1960 | 54°48'N | 167°51'W | Eastern Aleutians  | 12  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 26 Jun. 1960 | 54°38'N | 167°59'W | Eastern Aleutians  | 13  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 28 Jun. 1960 | 53°49'N | 170°17'W | Eastern Aleutians  | 14  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 30 Jun. 1960 | 55°51'N | 171°18'W | SE Bering Sea      | 15  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 1 Jul. 1960  | 56°19'N | 171°21'W | SE Bering Sea      | 16  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 2 Jul. 1960  | 55°48'N | 171°19'W | SE Bering Sea      | 17  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 6 Jul. 1960  | 50°44'N | 167°27'W | S of eastern Aleutians | 18  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 9 Jul. 1960  | 50°05'N | 160°20'W | S of Alaska Peninsula | 19  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 10 Jul. 1960 | 54°49'N | 158°06'W | S of Alaska Peninsula | 20  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 12 Jul. 1960 | 54°34'N | 155°11'W | Northwest Ground   | 21  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 15 Jul. 1960 | 53°39'N | 164°04'W | S of Alaska Peninsula | 22  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 16 Jul. 1960 | 52°51'N | 165°53'W | S of eastern Aleutians | 23  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 20 Jul. 1960 | 50°05'N | 174°21'W | Central Aleutians  | 24  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 21 Jul. 1960 | 52°47'N | 171°40'W | Eastern Aleutians  | 25  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 22 Jul. 1960 | 54°33'N | 169°39'W | SE Bering Sea      | 26  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 9 Aug. 1960  | 58°36'N | 174°47'W | Central Bering Sea|     | 2                        | Japanese catcherboat sightings                                           |
| 10 Aug. 1960 | 58°16'N | 174°42'W | Central Bering Sea|     | 2                        | Japanese catcherboat sightings                                           |
| 12 Aug. 1960 | 56°41'N | 173°25'W | SE Bering Sea      | 27  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 14 Aug. 1960 | 53°42'N | 170°35'W | SE Bering Sea      | 28  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 21 Jun. 1961 | 56°11'N | 172°13'W | SE Bering Sea      | 29  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 6 Jul. 1961  | 55°01'N | 167°48'W | Eastern Aleutians  | 30  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 8 Aug. 1961  | 58°04'N | 149°24'W | Gulf of Alaska     |     | 3                        | Japanese catcherboat sightings                                           |
| 21 Aug. 1961 | 56°32'N | 152°14'W | Kodiak Island      | 31  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 22 Aug. 1961 | 56°03'N | 153°00'W | Kodiak Island      | 32  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |
| 29 Aug. 1961 | 52°44'N | 173°58'W | Central Aleutians  | 33  | Japan Whaling Association Data | Japanese catcherboat sightings                                           |

cont...
| Date       | Latitude | Longitude | Location                                | No. | Source                      | Remarks                                                   |
|------------|----------|-----------|-----------------------------------------|-----|-----------------------------|-----------------------------------------------------------|
| 1961       | 50°22'N  | 165°32'W | Gulf of Alaska                          | 1   | Omura and Ohsumi, 1964     | Marked; may be duplicate of 8 Aug. sighting above         |
| 13 Jul.    | 52°07'N  | 169°44'W | Northeastern North Pacific              | 3   | NRIFS data                 | Japanese catcherboat sightings                             |
| 16 Jul.    | 37°08'N  | 123°05'W | Eastern Aleutians, Pacific side         | 1   | NRIFS data                 | Japanese catcherboat sighting                             |
| 1962       | 37°10'N  | 123°10'W | 33°M W of Pigeon Pt., California        | 1   | Omura and Ohsumi, 1964     | Marked                                                   |
| 1962       | 37°20'N  | 145°15'W | Northwest Ground (but see Remarks)     | 200 | Berzin and Doroshenko, 1982 | Sighting by Soviet research vessels. Berzin and Rovnin (1964) 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                              | 2   | Berzin and Doroshenko, 1982 | 'Right whales' seen by Soviet RV                           |
| 11 Mar.    | 26°39'N  | 113°40'W | 6-7M SW of Pta Abreojos, Baja California| 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1965       | 50-55°N  | 160-170°W | Aleutians, Pacific side                 | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1965       | 55-60°N  | 140-150°W | Gulf of Alaska                          | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1965       | 45-50°N  | 170-180°W | S of Aleutians                          | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1966       | 50-55°N  | 170-180°W | Aleutians, Pacific side                 | 1   | Wada, 1975                  | Japanese scountboat sightings                              |
| 1966       | 50-55°N  | 170-180°W | S of Aleutians                          | 1   | Wada, 1975                  | Japanese scountboat sightings                              |
| 1966       | 50-55°N  | 150-160°W | S of Alaska Peninsula                  | 2   | Wada, 1975                  | Japanese scountboat sightings                              |
| 1966       | 55-60°N  | 140-150°W | Gulf of Alaska                          | 1   | Wada, 1975                  | Japanese scountboat sightings                              |
| 1967       | 55-60°N  | 160-170°W | Eastern Bering Sea                     | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1967       | 50-55°N  | 150-160°W | S of Alaska Peninsula                  | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1969       | 50-55°N  | 160-170°W | Aleutians, Pacific side                 | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1969       | 45-50°N  | 170-180°W | S of Aleutians                          | 1   | Wada, 1975                  | Japanese scountboat sighting                              |
| 1970       | 50-55°N  | 130-140°W | W of Queen Charlotte Is, British Columbia| 1   | Wada, 1975                  | Japanese scountboat sightings                              |
| 1973       | 50-55°N  | 160-170°W | Aleutians, Pacific side                 | 2   | Wada, 1975                  | Japanese scountboat sightings                              |
| 1973       | 45-50°N  | 140-150°W | NE Pacific, S of Gulf of Alaska         | 1   | Wada, 1975                  | Japanese scountboat sightings                              |
| 13 Sep.    | 39°35'N  | 124,45°W  | 33°M W of Fort Bragg, California       | 1   | NMFS Platform of Opportunity data; Scarrf, 1986a | Weather ship sighting                                     |
| 1974       | 40-50°N  | 140-160°W | NE Pacific                              | 1   | Anon., 1976                 | Japanese catcherboat sighting                              |
| 1974       | 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    | 20-30°N  | 160-180°W | Hawaiian Is region                     | 1   | Anon., 1979                 | Japanese catcherboat sighting                              |
| 1977       | 45-50°N  | 130-155°W | NE Pacific, S of Alaska Peninsula       | 1   | Wada, 1979                  | Japanese catcherboat sighting                              |
| 1977       | 45-50°N  | 140-145°W | NE Pacific, S of Gulf of Alaska         | 1   | Wada, 1979                  | Japanese scount boat sightings                             |
| 1977       | 45-50°N  | 135-140°W | NE Pacific, S of Gulf of Alaska         | 2   | Wada, 1979                  | Japanese scount boat sightings                             |
| Summer    | 50-60°N  | 140-160°W | Northwest Ground/Aleaska Peninsula region | 2   | Anon., 1980                 | Japanese scount boat sightings                             |
| 25 Mar.    | 20°40'N  | 156°53'W  | Off Maui, Hawaii                        | 1   | Rowntree et al., 1980       | 15-16m; associated with humpback whales. Resighted 10 Apr.  |
|            |          |           |                                         |     | Herman et al., 1980        |                                                           |
| Summer    | 40-45°N  | 145-150°W | NE Pacific                              | 1   | Wada, 1981                  | Japanese sighting cruise                                  |
| 17 Apr.    | 34°07'N  | 119°18'W  | Santa Barbara Channel, California       | 1   | Anon., 1981                 | Marked by Japanese                                        |
| 20 Mar.    | 37°30'N  | 122°30'W  | Half Moon Bay, near San Francisco       | 1   | Woodhouse and Strickley, 1982| 14m                                                       |
| 26 Jul.    | 60°48'N  | 175°18'W  | NW of St Matthew I., Bering Sea         | 2   | Johnson, 1982; Scarrf, 1986b | 15m                                                       |
| 28 Aug.    | 48°33'N  | 124°39'W  | Juan de Fuca Strait, British Columbia   | 2   | Brueggeman et al., 1984     | Sighting details provided by G. Joyce                    |
| 8 Sep.     | 56°54'N  | 163°56'W  | SE Bering Sea                           | 1   | Reeves and Leatherwood, 1985| 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 L., 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 L., California | 1   | Carretta et al., 1994       | Length 12.6m                                 |
| 24 May 1992| 47°17'N  | 125°11'W  | 65km W of Cape Elizabeth, Washington | 1   | Rowlett et al., 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         | 1   | 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 et al., 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         | 1   | 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                                 |
| 1-14 Jul. 1998| 56°46'N| 164°15'W  | Southeastern Bering Sea         | 6   | Perryman et al., 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'N| 163°11'W  | Southeastern Bering Sea         | 5   | LeDuc et al., 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 et al., 2001         | Photographed from RV Miller Freeman          |
| 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 et al., 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 et al., 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 et al., 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 Zenovich (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                 | Northwest Ground      | 1771 |
| Kuril Islands         | West Coast            | 24   |
| Okhotsk Sea           | Bering Sea            | 178  |
| NW Pacific            | NE Pacific            | 41   |
| Western Aleutians     | Eastern Aleutians     | 269  |
| Total                 | Hawaii                | 4    |
|                       | 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 1965 and 1973 revealed no right whale sightings in the area. 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 northeastern 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 1990.

| Date       | Latitude | Longitude | Location | No. | Source     | Nation   | Remarks                        |
|------------|----------|-----------|----------|-----|------------|----------|--------------------------------|
| 1911-1948  |          |           | Kuril Is, S Hokkaido and NE Honshu | 113 | Omura, 1986 | Japan    |                                |
|            |          |           | S Honshu and E Kyushu | 26  |            |          |                                |
|            |          |           | Bonin Is | 8   |            |          |                                |
|            |          |           | Okhotsk Sea | 8   |            |          |                                |
|            |          |           | W Kyushu | 4   |            |          |                                |
|            |          |           | Coast of Korea | 1   |            |          |                                |
| Feb. 1921  | 28°00’N | 129°24’E | Amami Is, Japan | 1   | Miyazaki and Nakayama, 1989 | Japan    | 47th - stranding?               |
| 1924-1925  |          |           |          | 2   | Tomlin, 1957 | Norway   | Factory ship Kommandorens I    |
| 1932-1946  |          |           | Off Kamchatka | 9   | Zenkovich, 1955 | USSR    | Factory ship Aleut             |
| Aug. 1940  |          |           | Bering Sea | 1   | Terry, 1950 | Japan    | Factory ship Tonan maru        |
| 10-11 Jun. 1941 | 48°N | 158-159°E | SE of Kamchatka | 2   | Matsuura and Maeda, 1942; Omura, 1958 | Japan    | Factory ship Tonan maru. 58ft female, 45ft male |
| 1941       |          |           | Off Kamchatka | 1   | Terry, 1950 | Japan    | Factory ship Tonan maru        |
| 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°31’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    | Illegal pelagic whaling         |
| 20/25 Jul. 1968 | 48°N | 145-146°E | Southeastern Sakhalin I, Okhotsk Sea | 2   | Omura et al., 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 Dailian Museum of Natural History |
| Mid-Oct. 1974 |          |           | Sea of Japan | 1   | Park, 1987 | Korea   | ‘Approx 64ft’. Taken by whaling ship Je 3 Deuyung |
| Dec. 1977  |          |           | SE Haiyang I, Yellow Sea | 1   | Wang, 1988 | China   | 17.1m female with 4.99m foetus |

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 comercial 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   | USA      | 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. 'accident' |
| May 1951   |          |           | Off British Columbia             | 1   | Pike and Mearskie, 1969 | Canada   | Scientific research take                          |
| 1961       | 55°54'N  | 153°07'W | South of Kodiak I, Alaska         | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1961       | 55°54'N  | 153°08'W | South of Kodiak I, Alaska         | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1961       | 55°53'N  | 153°06'W | South of Kodiak I, Alaska         | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1962       | 53°42'N  | 171°17'W | SE Bering Sea (north of Aleutians) | 1   | Omura et al., 1969 | Japan    | Scientific research take; TK on factory ship     |
| 1962       | 54°30'N  | 170°22'W | SE Bering Sea (north of Aleutians) | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1962       | 54°18'N  | 170°21'W | SE Bering Sea (north of Aleutians) | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1963       | 53°52'N  | 172°46'W | SE Bering Sea (north of Aleutians) | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1963       | 54°04'N  | 172°35'W | SE Bering Sea (north of Aleutians) | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 1963       | 54°03'W  | 172°50'W | SE Bering Sea (north of Aleutians) | 1   | Omura et al., 1969 | Japan    | Scientific research take                          |
| 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     | Illegal pelagic whaling                           |
| 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.

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 (Scarth, 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 (Scarth, 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 Kunghit Island, Queen Charlotte Islands, Canada.Courtesy of J. Storrie via J. Goddard and the Maritime Museum of British Columbia, Victoria, BC, Canada.
exist in the North Pacific remains open. Townsend
Stock separation
Scarff maintained that the gaps in Townsend
(relative to effort) incidence of sightings in mid-ocean.
However, Scarff (1991) noted that Maury
populations (e.g. Klumov, 1962). However, Scarff (1991)
authors as evidence of the existence of two discrete
mid-Pacific region. This has been used by a number of
whales across high latitudes, with few catches in the
charts show a largely discontinuous distribution of right
Whales across high latitudes, with few catches in the
charts show a largely discontinuous distribution of right
populations from the central 
Aleutians region was due to the whalers
that the relatively low number of catches from the central
from a lack of searching effort in the regions concerned, and
from an area of low abundance. This has been used by a number of
groups to argue for the existence of two discrete
populations, with one in the central 
Aleutians and another (notably in the Kurils and Okhotsk Sea) could
be argued 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
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.

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

| Date       | Latitude | Longitude | Location          | Source                    | Remarks      |
|------------|----------|-----------|-------------------|---------------------------|--------------|
| 1902       |          |           |                   | Miyazaki and Nakayama, 1989| Stranded     |
| 14 Nov. 1916 |        |           |                   | Woodhouse and Strickley, 1982| Stranded     |
| Dec. 1939  |          |           |                   | Tomilin, 1957             | Stranded ca 9m |
| 1976       |          |           |                   | Ivashin and Verjankin, 1987| Stranded female |
| 15 Apr. 1977 | 34°40′N | 138°45′E  | Kumomi, Izu Peninsula Japan | Yamamoto and Hirata, 1978 | Stranded 11.5m male |
| 1980       |          |           |                   | A.M. Burdin, pers. comm.   | Stranded?    |
| 15 Mar. 1984 |        |           |                   | A.M. Burdin, pers. comm.   | Stranded male |
| 25 Jul. 1984 |        |           |                   | 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 |        |           |                   | A.M. Burdin, pers. comm.   | Stranded, size and sex unknown |
| 29 Mar. 1997 |        |           | Cape Lopatka, Kamchatka | V.S. Nikulin, pers.comm.  | Stranded, ca 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
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 Dalny 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 whalecatcher 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 historically focused on this area and its 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 (Collett, 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 the range of the summer feeding grounds in the eastern North Pacific (Tormosov et al., 1998), will be repeated by the right whale population in the eastern North Pacific.

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