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ABSTRACT: We review all known catches of humpback whales in the North Pacific, with assignments to nine feeding areas and five breeding grounds. Catch records go back to 1656, although inevitably early records are incomplete. Taking maximum values for the historical fisheries in Asia and California-Oregon, the recorded total catch for the period 1656-1972 is 39,855 whales. The total for just the 20th century (1900-72) is 29,466. Notable differences between catch totals and current estimates of abundance for certain areas likely represent varying recovery scenarios; the most striking difference is evident for the northern Washington/southern British Columbia feeding ground, where catches exceeded current abundance by an order of magnitude.

INTRODUCTION

Humpback whales (*Megaptera novaeangliae*) are common in all oceans and conduct long seasonal migrations between winter breeding areas in the tropics and summer feeding grounds in high latitudes (Clapham & Mead 1996). In the North Pacific (NP) they are found along all coastal areas of Asia and North America (Mackintosh 1946). Currently, it is believed that NP humpback whales exist in at least five breeding sub-populations stretching from coastal Mexico to Asia; these are connected to various feeding areas in the northern NP, from the western coast of the United States through British Columbia and Alaskan waters to Russia in the east.

In part because the catch record has until recently been incomplete, NP humpback whales have never been the focus of a Comprehensive Assessment by the International Whaling Commission (IWC). Such assessments use recent estimates of abundance and trend together with a historical catch series to assess the pre-exploitation size of the population, and its current status relative to that benchmark. Recently, the catch record has been updated to include new information on extensive illegal takes by the USSR (Ivashchenko *et al.* 2013). In addition, there is now considerable new information on the current abundance and population structure of NP humpbacks, derived from the multi-national photo-identification and genetic study known as Structure Levels of Abundance and Status of Humpback Whales (SPLASH) (Calambokidis *et al.* 2008; Barlow *et al.* 2011; Baker *et al.* 2013).

Here, we summarize humpback whale catches in the North Pacific for the period 1656-1972, and make some qualitative comments with regard to this information relative to current estimates of abundance by area. Some of the information summarized here duplicates that already presented to the IWC Scientific Committee relative to development of a population model (SC/66b/IA 19), but is repeated here for convenience.

BACKGROUND

Whaling history

Whaling for humpback whales in the NP existed for centuries, with known hunting locations including Japan, North America, the Aleutian Islands and Chukotka (Reeves & Smith 2006). Three main periods are described based upon the methods and materials used in the hunt and the extent of the operations: aboriginal, historical and modern whaling.

Aboriginal whaling is characterized by a number of whaling methods used in the different regions throughout the NP. These include poison-tipped arrows, hand harpoon and lance, and nets (Reeves & Smith 2006). The most detailed whaling records from the aboriginal period exist in Japan. In this area, the hunt of large whales was recorded as early as the 10th century (Omura 1986). Starting in the 16th century, the use of nets revolutionized whaling in Japan and led to increased catches not only of humpbacks but other species as well; detailed records that

survive from a few whaling areas provide an example of the extent and composition of catches (Omura 1986). In other regions of the NP no information exists on the number of whales killed, but there is occasionally reference to which species were hunted (Krupnik 1979, 1980; Stoker & Krupnik 1993). Concerning humpback whales, the only records of the actual number of whales killed come from Japanese coastal whaling operations; however, these records cover only a few areas out of many whaling locations around Japan and must be considered incomplete. Additionally, the almost complete lack of information concerning the number of humpbacks taken along the western coast of North America, Aleutian Islands and Chukotka makes assessing of the extent of aboriginal whaling very difficult. However, it is probably a reasonable assumption that the number of whales taken in the northern and eastern NP by these relatively primitive operations was not high, and thus likely had little impact on the populations concerned. The same may not be true of the historical Japanese hunts, which may have taken significant numbers of humpback whales around the coasts of Japan.

Studies of the Chukotka hunt for large whales show that bowhead (*Balaena mysticetus*) and gray whales (*Eschrichtius robustus*) were the primary target, with humpback whales only occasionally taken; this was the case even during the period 1910-1930 when bowhead whales were severely depleted. During this time, there was an increase in the number of gray whales in the catch records, but very few humpbacks were taken despite their abundance at that time (Krupnik 1987; Bogoslovskaya *et al.* 1982).

Historical whaling, involving sail-based vessels and hand-thrown harpoon technology, first appeared in the NP about 1780; at various times the main target species were sperm (*Physeter macrocephalus*), North Pacific right (*Eubalaena japonica*) and bowhead whales (Webb 1988). However, humpback whales were also killed, albeit in much smaller numbers. Townsend (1935), who analyzed logbooks and journals from American ("Yankee") whaling vessels for the period 1785 to 1912, gives the only known numbers for historical catches of humpback whales in the NP. During that period, Townsend (1935) recorded large number of humpback whales killed in the Southern Hemisphere and North Atlantic; by contrast, the reported catch in the NP was very limited and totals only 208 whales caught in four main areas: the Mexican wintering grounds (147 animals), the Mariana Islands (51), California (5) and areas around Japan (5). The true extent of historical catches of humpback whales in the NP has not been assessed, and requires additional studies of whaling logbooks and journals.

The intermediate period, described by Reeves and Smith (2006) as American shore whaling, began during the second half of the 19th century and was characterized by the establishment of a number of shore whaling stations along the coasts of California and Baja California. These hunted gray and humpback whales using catcher boats, but with still rather inefficient equipment and processing methods. A detailed analysis of catches of both species was published by Reeves and Smith (2010); these data, as well as extrapolation for unknown catches, gave an estimate of humpback landings of 1,637 (SE=62), including struck and lost animals. This number inevitably has associated uncertainties, and additional work by local historians is required to fill the gaps. However, it currently represents the best estimate of humpback whale catches during this period.

Modern whaling expanded throughout the NP beginning in 1889, when Russian whaling companies working around Japan used a floating factory and modern steam-powered catchers equipped with Føyn's harpoon guns (Webermann 1914; Webb 1988). Over the next four decades, numerous coastal operations were established in Japan and along the western coast of North America (Webb 1988). During that period humpback whales became one of the primary target species for whalers in the eastern NP, and excessive catches drove some local populations into a significant decline which ultimately forced the closure of whaling stations (Starks 1922; Webb 1988).

From the beginning of the 20th century numerous companies hunted humpback whales and other balaenopterid species all over the NP. Webb (1988) and Tønnessen and Johnsen (1982) describe a common pattern of temporary success followed by declining whale abundance and the inevitable closure of many whaling stations. Most companies ran shore-based operations and were thus limited in their whaling range; consequently, when whale resources in the area were exhausted the station had to be closed or operations moved elsewhere (Webb 1988). On a few occasions whaling companies invested in factory ships which worked as a processing station instead of or together with a land station; this occurred in Alaskan waters (in the Shumagin Islands, Baranof Islands, and at Akutan) and also along the Mexican coast. However, some of these attempts proved unsuccessful due to the high cost of operating and the low catches (Tønnessen & Johnson 1982).

Catch statistics for humpback whales in the North Pacific are close to complete, although many do not include information regarding the positions, length, sex and maturity of individual animals. Overall, whaling production in the NP varied significantly among different companies and among years, but humpbacks were one of the most common species in the catch, and were sometimes taken in large numbers. For example, the American Pacific Whaling Company, operating from Gray's Harbor, Washington during the period 1911-1925, took 2,698 whales, of which 1,933 were humpbacks (Tønnessen & Johnson 1982). During a similar period (1919-26), the shore stations at Moss Landing and Trinidad in California killed 2,111 whales, of which the great majority (1,871) were humpbacks; this resulted in a population crash and the closure of both stations (Clapham *et al.* 1997).

Beginning in 1932, truly pelagic whaling operations, involving roaming factory ships and their associated fleets of catcher vessels, came to the NP. The first operation was Russian: the first Soviet whaling fleet (the *Aleut*) began its work in 1932 with a "training" catch of 7 sei whales on the way to its home port of Vladivostok (Zenkovich 1954; Ivashchenko *et al.* 2011). In 1940, Japanese whaling factories went for the first time into the areas off Kamchatka and Chukotka (Terry 1950). All pelagic whaling fleets that worked in the NP belonged to only two countries: Japan and the Soviet Union.

Before the Second World War pelagic operations in the North Pacific were few, and annual catches of humpback whales were small, ranging from a few animals to 143 (Allison 2012). In 1946, fifteen countries signed the International Convention for the Regulation of Whaling (ICRW), among them the Soviet Union. From that point on each country was required to report to the Bureau of International Whaling Statistics (BIWS) detailed information on each whale taken, which resulted in a detailed database of catches for all species. For the catches of NP humpback whales the only limitation was a minimum size limit, set at 10.7m (35 feet), as well as a prohibition on the killing of lactating females and calves, and any pelagic operations in the area between 0 and 20-35 N latitude (IWC 1950). This remained the case until all catches of humpback whales in the NP were prohibited beginning from the 1966 season (IWC 1967). By that time, however, catches of humpback whales were already very low, and the situation was assumed to be a repeat of that in the Antarctic, where humpback populations had been greatly over-exploited. The IWC (1966) noted that the prohibition in the NP was necessary "in order for the population to rebuild to a level giving a substantial sustainable yield".

Until 1993, it was widely assumed that the modern whaling catch record was largely complete, especially for the period following creation of the IWC, with the exception of some years of missing data for specific shore whaling stations. The total catch of NP humpback whales during the period 1946-66 was believed to be 7,808, and 26,564 for the entire period of modern whaling (1900-66) (Allison 2012).

However, in 1993, it was revealed that Soviet whalers had conducted a global campaign of illegal whaling, with large unreported catches in both the Antarctic and the NP (Ivashchenko *et al.* 2011). Humpback whales were one of the main targets of the hunt, with more than 48,000 taken (mostly illegally) in the Antarctic (Clapham *et al.* 2009). An attempt to reconstruct Soviet catch totals for the NP was made by Doroshenko (2000a,b), but this was based upon incomplete data and lacked details on the timing and position of catches. More recently, Ivashchenko *et al.* (2013) used previously unavailable Soviet whaling reports to give an updated total for all Soviet whaling catches in the NP.

METHODS AND MATERIALS

Catches

Catch information was taken from different sources. The IWC database was used for humpback whale catches made by different countries for the period 1906-2006, except for Soviet catches from 1962 through 1972. Earlier catches (by Japan and land stations along the western coast of North America) were taken from the published literature. Soviet catches were reconstructed using formerly secret internal whaling industry reports (primarily those written by fleet scientists and whaling inspectors) that provided details of the distribution and number of catches (Ivashchenko *et al.* 2013). Using these reports together with geo-referencing of maps given by Doroshenko (2000b), we were able to assign positions to 3,271 Soviet humpback whale catches made after 1962.

Definitions of Breeding and Feeding Areas

We have adopted the locations of humpback whale breeding and feeding areas from the SPLASH project; these are shown in Figure 1. To define the boundaries of each region we first drew a 100-nm buffer from the 1000-m isobath. Many catches were distributed much further offshore of this designated buffer, and some of the regions were expanded offshore or additional regions were created.

Breeding areas

Five breeding areas have being described for the North Pacific (Barlow *et al.* 2011). Since no pelagic catches were made on the breeding grounds, we describe the breeding area boundaries as wider ovals and include the Philippines

and Okinawa, Hawaii, Mexico, Central America and the Unknown Breeding Area (Figure 1). Coastal whaling catches were made only in the Philippines/Okinawa and Mexico.

Feeding areas

Currently six different feeding regions are recognized in the NP: Russia (= eastern Kamchatka), Aleutians/Bering Sea (Al_BS), Gulf of Alaska (GOA), combined Southeast Alaska (SEAK) and northern British Columbia (NBC), combined Southern British Columbia (SBC) and northern Washington (NWA), and combined California (CA) and Oregon (OR).

Additional areas were designated in order to assign catches, as follows:

I. **Pelagic Gulf of Alaska** (pelagic GOA): this region includes offshore waters south of the GOA and SEAK regions with a southern boundary along latitude 52°N. It was created to incorporate pelagic catches in the GOA.

II. **Pelagic North Pacific** (pelagic NP): this region covers the area south of the GOA and west of British Columbia, Washington and part of Oregon. The southern boundary follows latitude 43°N with the eastern margin at longitude 160°W.

III. **Japan, Ogasawara** and **Baja**. These are considered migration routes, with Baja and Ogasawara possibly representing a mixing of whales from two or more feeding/breeding grounds.

Allocation of catches

After all the regions described above were defined in GIS, all modern catches with individual positions were assigned to a particular region. Known coastal catches were assigned based upon the locations of coastal whaling stations. All catches from coastal Japan were assigned to the Russian feeding region. We suggest that the Ogasawara catches, based upon the SPLASH photo-id exchange rates observed with the feeding regions, should be split 30%, 47% and 23% between Russia, Al_BS and GOA. Catches from the beginning of the 20th century off Baja are assumed to come from the breeding population in Mexico, although a small percentage were likely whales migrating from Central America. Mexico has been shown to have connections to all known feeding grounds.

Catches from the pelagic regions were assigned in different ways. Pelagic GOA catches were divided based upon the boundary proportion of neighboring feeding regions: 75% to GOA and 25% to SEAK_NBC. Humpback whale catches made in the pelagic North Pacific region were split in equal parts (1/3 each) between AL_BS, GOA and SEAK_NBC. The very limited number of catches made around the Kuril Islands were assigned as follows: 50% to Al_BS and 50% to the Russian feeding region.

Two areas have major uncertainties in catch totals: California catches during the period 1856-1900, and Japanese coastal catches from 1656 through 1900. We have used three scenarios for each area, with values for minimum, median and maximum catch totals. For Japanese catches the minimum (base) can be represented by known (recorded) catches; however, given that catch data are available from only some of the stations that were known to have existed, we have also used values that are double and triple the base numbers. In total, we developed nine scenarios for use in a population model (see SC/66a/IA16, Appendix 1). Humpback whale catch records from Japan before 1850s often came as a summary number for a period of years (10-50 years), and for the purpose of the yearly catch database the totals were evenly split between all years for the period covered (for example: during 1748-57 a total of 48 humpback whales were caught, so the catch database assigns 5 whales each year with two years of 4 whales).

A final list of catches, by year and area, is given in Table 1.

RESULTS AND DISCUSSION

Catch totals

The period covered in the review of catches is 1656-1972, and 1854-1972 if one excludes Asia but includes CA-OR. Excluding Asia and CA/OR, the total number of catches is 23,552 (all made during the period 1906-72); the total for all areas (including Asia and CA-OR) for just the 20th century (1900-72) is 29,466.

Including the minimum, medium and maximum values for both Asia and CA-OR brings the catch totals for the entire period (1656-1972) to 32,994 (min), 36,420 (med) and 39,855 (max). Catches are listed by year and area in Table 1. The distribution of catches for the 20th century is shown in Figure 2. Figure 3 shows catch totals by ten-year periods for all regions.

Catches versus current abundance

Figure 4 shows the catch totals for each area together with current estimates of abundance from Wade *et al.* (2017). Detailed comparisons between catch totals and estimates of current abundance are beyond the scope of this paper and are more appropriately addressed by an assessment model. However, we offer a few comments on specific areas.

Asia: Japan- Russia

If photo-id and genetic matching data are reliable indicators of movement, the great majority of whales from the Asian breeding area migrate to Russia (unlike other breeding areas, which have connections to multiple feeding grounds). Catches around coastal Japan began a long time ago; they continued at a moderately high level for more than two centuries, until about 1930. After that, the majority of catches came from Ogasawara and Okinawa. Assuming that this population was depleted early, it is not surprising that 20th century catches of humpback whales along the Russian coast were extremely low.

The number of catches for Asia (10,859) greatly exceeds the current estimate of abundance of 1,059 whales. However, the catch number refers to the entire period of more than three centuries. A more appropriate catch total to use is 2,917, which is the number of catches in this area during the 20th century.

Aleutian Island-Bering Sea (AI-BS)

There is limited exchange (estimated by Wade *et al.* 2017 at 6%) between Asia and Aleutians-Bering Sea area. Early Soviet catches (starting in 1933) in the area around the Commander Islands did not include high numbers for humpbacks, but a dramatic increase in numbers in the island chain was evident after the 1950's as whaling effort moved east towards Attu Island. The rest of the Aleutian-Bering Sea population was relatively untouched and this division in the abundance of whales suggests that there is a stronger connection between Asia and the Commander Islands relative to areas to the north and east.

There is a major difference between the total catches in this region (7,192, most of which occurred during a 20-year period), and the current abundance estimate of 2,427. This suggests either that the population today is well below its pre-exploitation level, or that the discrepancy is in part somehow due to the existence of the "unknown" breeding ground, which is believed to have migratory connections to the Aleutians and Bering Sea.

Gulf of Alaska and Southeast Alaska/Northern British Columbia (GOA and SEAK-NBC)

These two regions had two periods of intensive catches. The abundance estimate for the Gulf of Alaska (2,089) is well below the total catch of 4,529 whales. In contrast, the estimate of SEAK-NBC (6,137) is much higher than the total catch (4,527) for the region. Whether these discrepancies relate to differing recovery scenarios after whaling ceased is unclear and may be clarified by ongoing work to produce an assessment model (Punt & Privitera-Johnson, this meeting).

Southern British Columbia/Northwest America (SBC-NWA)

The most striking difference between total catches and current abundance is for this region (3,987 versus 307, respectvely, an order of magnitude difference). Although limited sampling during the SPLASH project may have negatively biased the abundance estimate, it is nonetheless difficult to escape the conclusion that this population remains well below its pre-exploitation level. It is possible that some catches involved animals migrating through this region to Alaska, but that is unlikely to represent a sufficient explanation for the disparity concerned.

Mexico and related feeding areas

Of the four known breeding grounds, Mexico is the one which had relatively high catches and which was also connected to feeding areas with high catches. Wade *et al.* (2017) estimate exchange rates with Mexico at 73% (CA-OR), 3% (NBC-NWA), 5% (SEAK-SBC), 10% (GOA) and 9% (AI-BS). However, the great majority of the Mexican catches were made between 1910 and 1929; this was also the period of peak catches for California, although hundreds more whales were taken there in the 1950s and 60s. Abundance for CA-OR (the primary destination of Mexican whales today) is estimated at 3,734, suggesting strong recovery in the last few decades.

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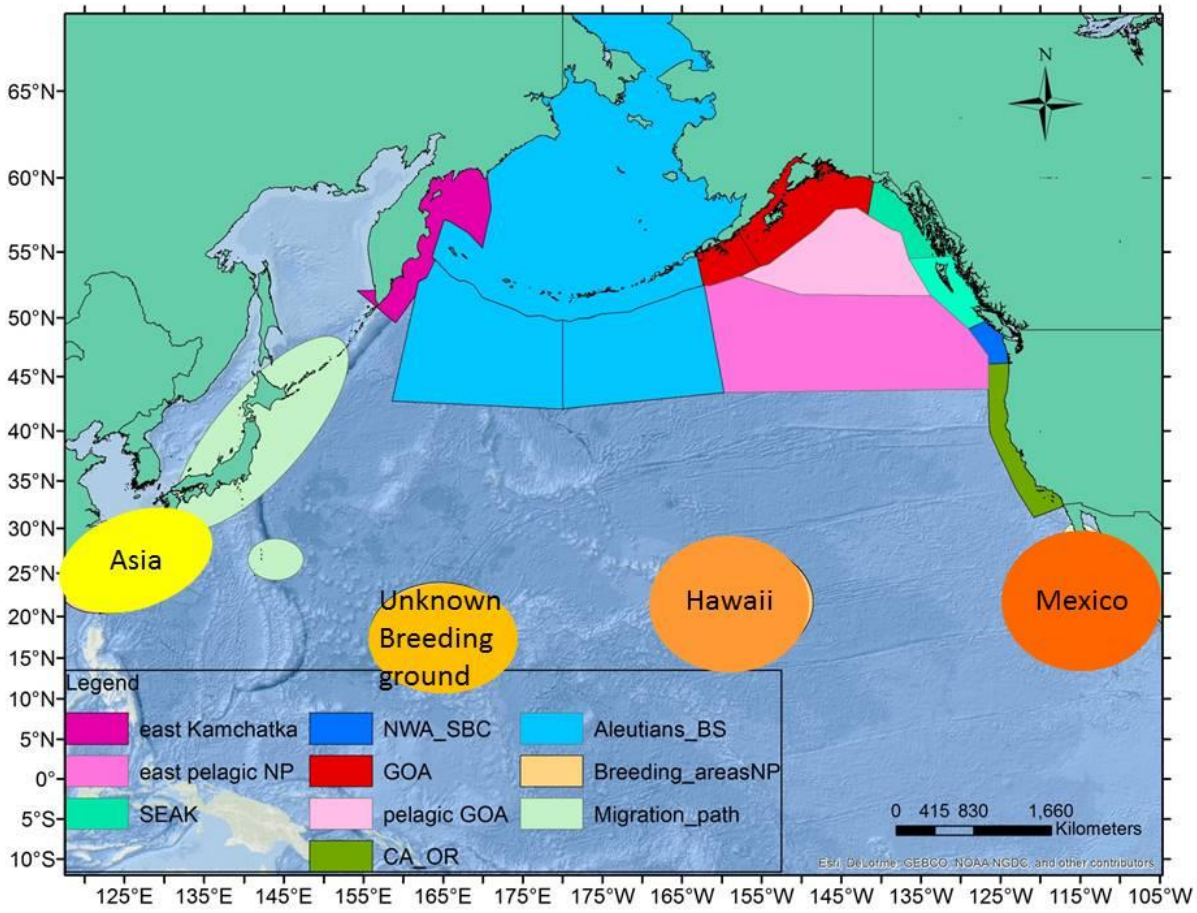

Figure 1. Definitions/assigned boundaries of feeding and breeding areas.

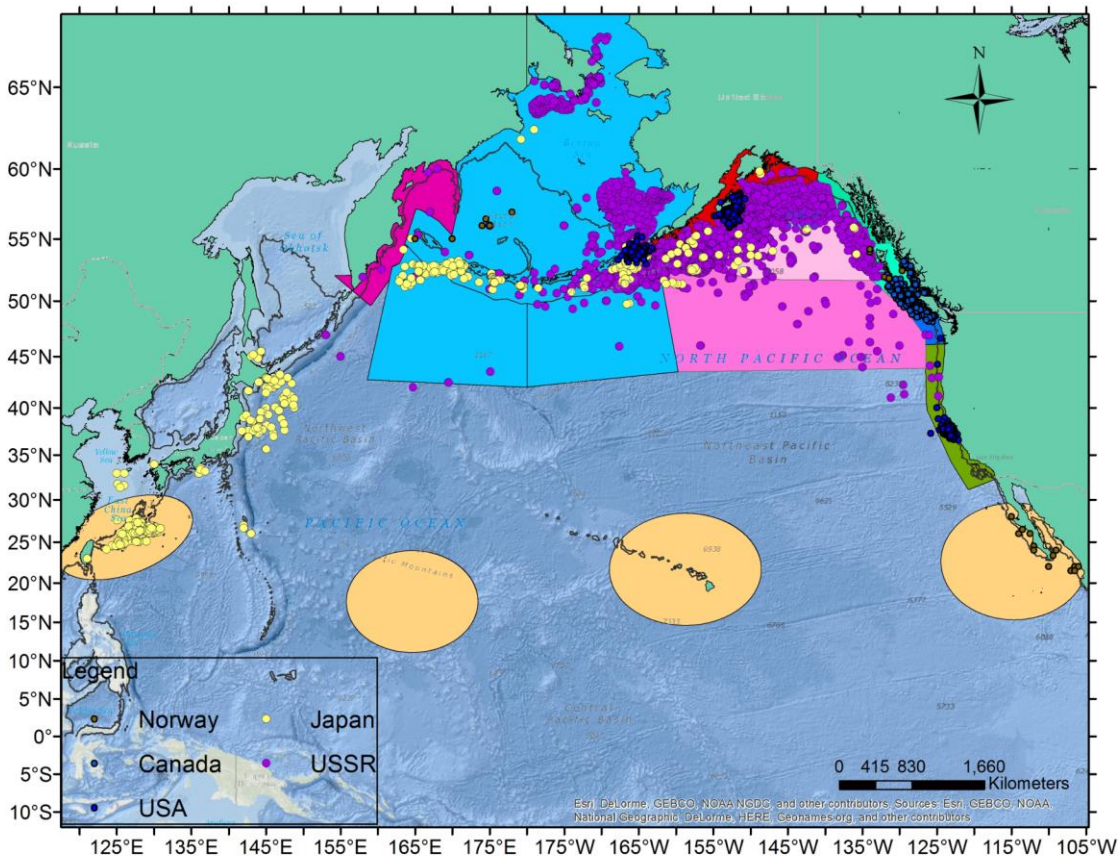

Figure 2. Distribution of 20th century humpback whale catches by all countries.

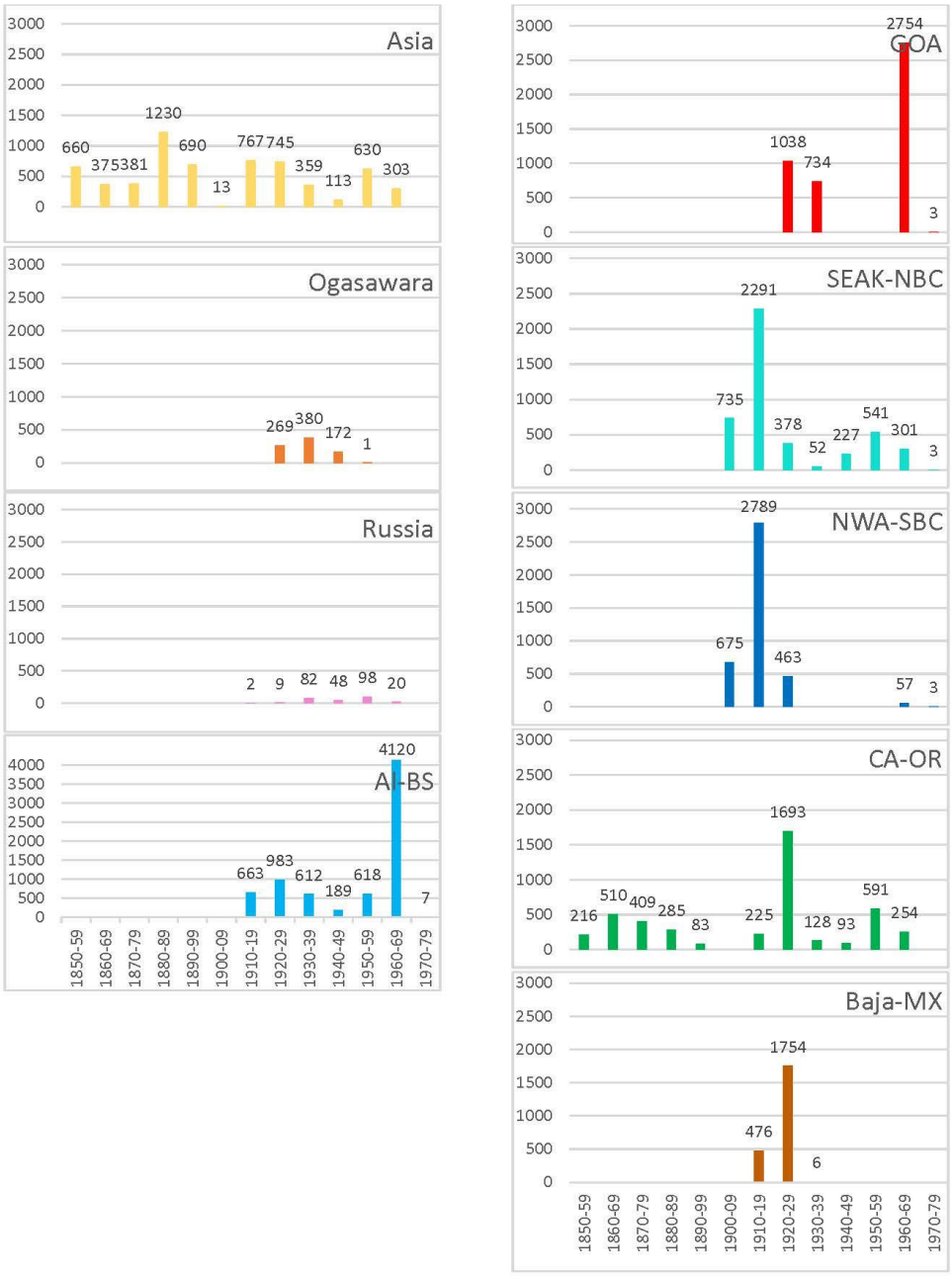

Figure 3. Ten-year catch totals, by region.

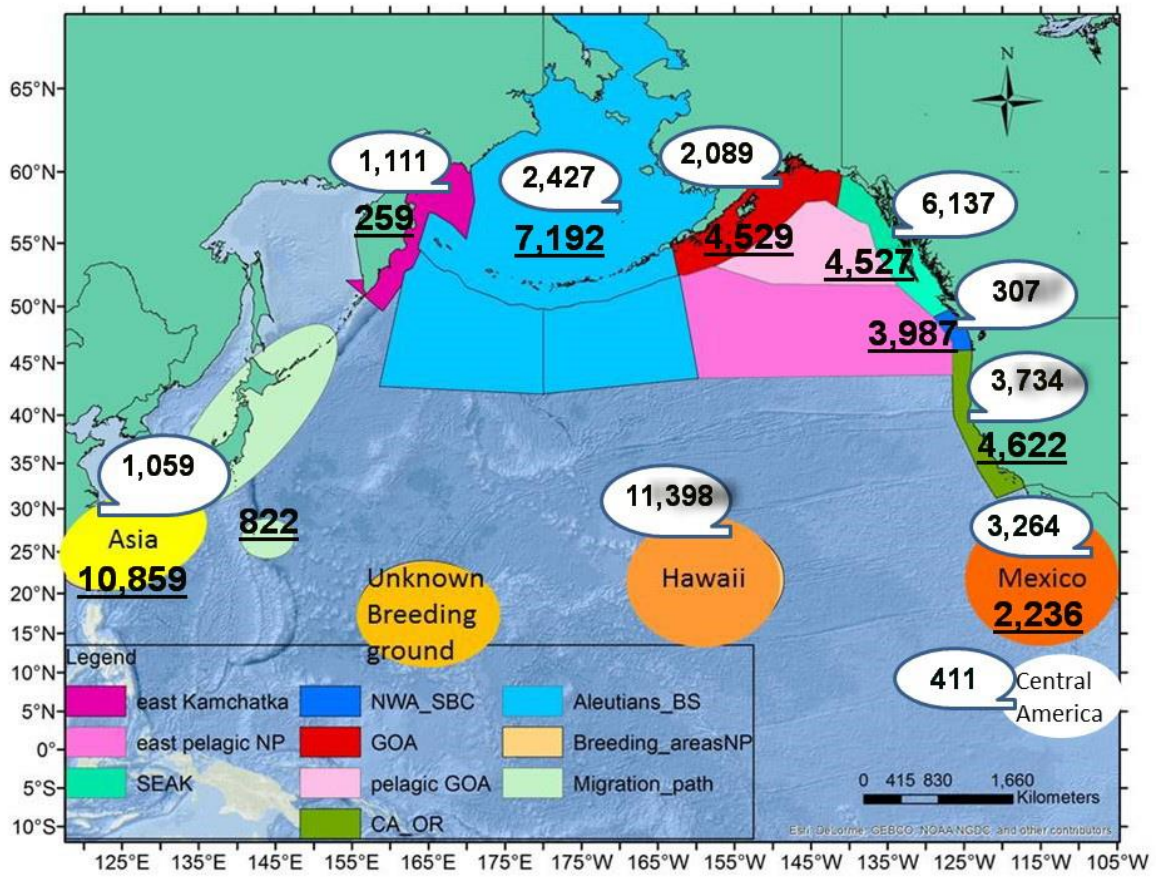

Figure 4. Catch totals (bold, underlined) and abundance estimates (in the white callouts) for each region.

Table 1. List of catches of humpback whales in the North Pacific, by year and area. Among the breeding areas, Hawaii and Central America had no catches and thus are not included here.

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
Total	5588	8246	10904	822	259	7192	4529	4527	3987	4622	3854	5399	2236
1656	1	2	3										
1657													
1658	2	4	6										
1659													
1660	1	2	3										
1661													
1662	2	4	6										
1663	1	2	3										
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1678													
1679	1	2	3										
1680	2	4	6										
1681	2	4	6										
1682	1	2	3										
1683													
1684	1	2	3										
1685	1	2	3										
1686	1	2	3										
1687													
1688	2	4	6										
1689	1	2	3										
1690	1	2	3										
1691	1	2	3										
1692													
1693	2	4	6										
1694													
1695	2	4	6										
1696	1	2	3										
1697	1	2	3										
1698	10	20	30										
1699	10	20	30										
1700	11	22	33										
1701	10	20	30										
1702	9	18	27										

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
1703	12	24	36										
1704	9	18	27										
1705	10	20	30										
1706	11	22	33										
1707	11	22	33										
1708	10	20	30										
1709	11	22	33										
1710	11	22	33										
1711	11	22	33										
1712	10	20	30										
1713	12	24	36										
1714	10	20	30										
1715	11	22	33										
1716	11	22	33										
1717	11	22	33										
1718	10	20	30										
1719	12	24	36										
1720	11	22	33										
1721	11	22	33										
1722	11	22	33										
1723	12	24	36										
1724	10	20	30										
1725	11	22	33										
1726	11	22	33										
1727	11	22	33										
1728	9	18	27										
1729	10	20	30										
1730	10	20	30										
1731	11	22	33										
1732	10	20	30										
1733	10	20	30										
1734	10	20	30										
1735	10	20	30										
1736	10	20	30										
1737	12	24	36										
1738	9	18	27										
1739	10	20	30										
1740	10	20	30										
1741	10	20	30										
1742	9	18	27										
1743	11	22	33										
1744	9	18	27										
1745	11	22	33										
1746	10	20	30										
1747	10	20	30										
1748	6	12	18										
1749	6	12	18										
1750	4	8	12										
1751	7	14	21										
1752	5	10	15										
1753	6	12	18										

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
1754	5	10	15										
1755	6	12	18										
1756	4	8	12										
1757	5	10	15										
1758	5	10	15										
1759	6	12	18										
1760	7	14	21										
1761	6	12	18										
1762	7	14	21										
1763	8	16	24										
1764	5	10	15										
1765	6	12	18										
1766	6	12	18										
1767	8	16	24										
1768		0	0										
1769	1	2	3										
1770		0	0										
1771	1	2	3										
1772		0	0										
1773	2	4	6										
1774		0	0										
1775	1	2	3										
1776	1	2	3										
1777	1	2	3										
1778		0	0										
1779	1	2	3										
1780		0	0										
1781	2	4	6										
1782		0	0										
1783	1	2	3										
1784		0	0										
1785	1	2	3										
1786	1	2	3										
1787	1	2	3										
1788		0	0										
1789	1	2	3										
1790		0	0										
1791	1	2	3										
1792		0	0										
1793	1	2	3										
1794		0	0										
1795	1	2	3										
1796		0	0										
1797	1	2	3										
1798		0	0										
1799	1	2	3										
1800	5	10	15										
1801	5	10	15										
1802	11	22	33										
1803	20	40	60										
1804	32	64	96										

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
1805	22	44	66										
1806	26	52	78										
1807	29	58	87										
1808	33	66	99										
1809	15	30	45										
1810	14	28	42										
1811	22	44	66										
1812	27	54	81										
1813	23	46	69										
1814	9	18	27										
1815	43	86	129										
1816	10	20	30										
1817	16	32	48										
1818	23	46	69										
1819	19	38	57										
1820	15	30	45										
1821	16	32	48										
1822	11	22	33										
1823	28	56	84										
1824	28	56	84										
1825	34	68	102										
1826	16	32	48										
1827	25	50	75										
1828	18	36	54										
1829	20	40	60										
1830	29	58	87										
1831	26	52	78										
1832	20	40	60										
1833	16	32	48										
1834	8	16	24										
1835	15	30	45										
1836	7	14	21										
1837	6	12	18										
1838	5	10	15										
1839	7	14	21										
1840	0	0	0										
1841	8	16	24										
1842	9	18	27										
1843	9	18	27										
1844	8	16	24										
1845	8	16	24										
1846	9	18	27										
1847	8	16	24										
1848	10	20	30										
1849	21	42	63										
1850	25	50	75										
1851	34	68	102										
1852	20	40	60										
1853	33	66	99										
1854	19	38	57							23	13	33	
1855	19	38	57							36	16	56	

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
1856	17	34	51							29	18	40	
1857	23	46	69							34	20	48	
1858	16	32	48							46	32	60	
1859	14	28	42							48	33	63	
1860	27	54	81							48	33	63	
1861	9	18	27							71	44	98	
1862	20	40	60							60	38	82	
1863	12	24	36							67	45	89	
1864	25	50	75							59	29	89	
1865	12	24	36							48	27	69	
1866	8	16	24							50	28	72	
1867	5	10	15							49	28	70	
1868	4	8	12							51	29	73	
1869	3	6	9							55	33	77	
1870	5	10	15							45	22	68	
1871	3	6	9							45	22	68	
1872	4	8	12							45	22	68	
1873	3	6	9							42	21	63	
1874	9	18	27							44	22	66	
1875	10	20	30							44	22	66	
1876	17	34	51							43	21	65	
1877	28	56	84							48	23	73	
1878	22	44	66							47	22	72	
1879	26	52	78							51	26	76	
1880	27	54	81							42	21	63	
1881	21	42	63							43	21	65	
1882	52	104	156							44	22	66	
1883	49	98	147							38	21	55	
1884	38	76	114							39	22	56	
1885	38	76	114							27	16	38	
1886	44	88	132							22	11	33	
1887	51	102	153							24	11	37	
1888	58	116	174							24	11	37	
1889	32	64	96							24	11	37	
1890	24	48	72							11	2	20	
1891	22	44	66							11	2	20	
1892	4	8	12							11	2	20	
1893	14	28	42							11	2	20	
1894	24	48	72							11	2	20	
1895	41	82	123							11	2	20	
1896	61	122	183							5	0	13	
1897	34	68	102							5	0	13	
1898	4	8	12							5	0	13	
1899	2	4	6							2	2	2	
1900	1	1	1										
1901	12	12	12										
1902													
1903													
1904													
1905													
1906									139				

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
1907								231					
1908								242	201				
1909								262	335				
1910	29	29	29					352	389				
1911	60	60	60					619	576				
1912	68	68	68			148		469	422				
1913	138	138	138					222	397				
1914	165	165	165			109		122	160				476
1915	105	105	105			117		115	252				
1916	92	92	92			82		143	137				
1917	31	31	31			23		81	205				
1918	24	24	24			58		98	129				
1919	55	55	55		2	126		70	122	225	225	225	
1920	83	83	83			67		8	106	380	380	380	
1921	100	100	100		1			72	15	157	157	157	35
1922	82	82	82		1	87		57	124	502	502	502	
1923	68	68	68		1	156		78	99	376	376	376	
1924	69	69	69	86	2	72		47	98	197	197	197	150
1925	72	72	72	86	2	266		40	21	43	43	43	403
1926	57	57	57	53		150	236	24		21	21	21	499
1927	80	80	80	14	1	98	455	21					472
1928	65	65	65	25	1	42	178	21		10	10	10	179
1929	69	69	69	5		45	169	10		7	7	7	16
1930	60	60	60	2		13	178	12					
1931	42	42	42	27	1								
1932	53	53	53	34		2	128						
1933	44	44	44	48		26	114			65	65	65	
1934	29	29	29	28	6	72	139	13					
1935	42	42	42	34	1	246	37	1		1	1	1	6
1936	26	26	26	53	23	57	95	14					
1937	21	21	21	50	20	102	43	7		3	3	3	
1938	22	22	22	44	16	40		4					
1939	20	20	20	60	15	54				59	59	59	
1940	33	33	33		12	129		2		19	19	19	
1941	16	16	16	22	5	8		11		16	16	16	
1942	14	14	14	14	5	9		16		12	12	12	
1943	10	10	10	57	10	19		7		5	5	5	
1944	5	5	5	59						1	1	1	
1945	11	11	11		1								
1946	8	8	8	12	3	6							
1947	8	8	8	1	3	7				13	13	13	
1948	8	8	8	3	6	7		115		16	16	16	
1949	0	0	0	4	3	4		76		11	11	11	
1950	5	5	5		10	12		95					
1951	4	4	4		4	5		51		4	4	4	
1952	2	2	2	1	14	51		61					
1953	9	9	9		4	55		47					
1954	12	12	12		14	151		106					
1955	20	20	20		14	136		37					
1956	14	14	14		8	70		28		133	133	133	
1957	32	32	32		18	34		49		199	199	199	

Year	Asia min	Asia med	Asia max	Ogasawara	Russia	Al-BS	GOA	SEAK-NBC	NWA-SBC	CA-OR med	CA-OR min	CA-OR max	Baja-MX
1958	294	294	294		8	29		40		115	115	115	
1959	238	238	238		4	75		27		140	140	140	
1960	170	170	170		4	56				67	67	67	
1961	95	95	95		11	333				62	62	62	
1962	25	25	25		1	1181	657	16		39	39	39	
1963	3	3	3		3	1098	1532	147	5	55	55	55	
1964	1	1	1		1	1025	320	10	26	27	27	27	
1965	4	4	4			300	210	79	9	4	4	4	
1966	5	5	5			52	6	13					
1967						65	14	22	5				
1968						8	15	14	9				
1969						2			3				
1970						3	3	3	3				
1971													
1972						4							
TOTAL	5588	8246	10904	822	259	7192	4529	4527	3987	4622	3854	5399	2236
20th Cent			2930	822	259	7192	4529	4527	3987			2984	2236