THE HARVEST OF PACIFIC WALRUSES BY THE PELAGIC WHALING INDUSTRY, 1848-1914

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ABSTRACT

The most important agent in the historical reduction of the Pacific walrus population in the nineteenth century was the pelagic whaling industry. From 1848, when the whaling grounds of Bering Strait were discovered, to 1914, by which time the industry had collapsed, whaling vessels made more than 2,700 cruises seeking bowhead whales in the waters of the western Arctic. Large numbers of walruses also were taken during those voyages.

We present here the results of the first systematic attempt to determine the size of the pelagic whaling industry's walrus harvest. Our data are drawn from the best extant records: the logbooks of the whaling vessels. Our data indicate that in the course of their voyages, the whalers captured approximately 140,000 walruses.

INTRODUCTION

Recently there has been popular speculation that the Pacific walrus population has reached such a high level that it may be approaching a crash (Jones 1979). It has been suggested that this dramatic increase may be the result of a severe suppression of the population by commercial harvesting in the nineteenth and early twentieth centuries. The

population may have been reduced to such a low level that large areas of the animal's former feeding range were undisturbed for as long as a century. These unexploited areas apparently allowed an abundance of food for the recovering population when the commercial harvest ended. Like some terrestrial mammal populations that have been introduced to a new food supply, this walrus population, because of time lags in its birth and death rates, may have increased beyond the carrying capacity of its ecosystem.

To help assess this possibility it would be useful to know the size of this historical commercial harvest, but heretofore only Fay (1957) has attempted such a study. Fay's important, pioneering analysis was based on data derived from published sources, the best information then available. Recently, however, we have been able to refine our understanding of the majority of the reduction--the harvest carried out by the pelagic whaling fleets--by analyzing the data in the logbooks of the whaling vessels.

Our data begin in 1849. It is unlikely that whaling vessels took Pacific walruses before this date, for until 1848 no whaling vessel had passed far north of the Aleutian and Commander islands. In 1848 one ship reached Bering Strait, but there is no evidence that it captured any walruses; however, in 1849 and the years immediately following, several ships took a few walruses, more out of curiosity than a desire for economic gain. It was not until the 1860's that a relatively steady market price for animal

oils and a severe reduction in the bowhead whale population brought about the development of a deliberate walrus hunt.

The pattern of the bowhead's annual migration was a third factor in the development of the harvest. From mid-June to early August the bowheads, traveling in the safety of the ice in the Chukchi and Beaufort seas, were generally inaccessible to the whaleships, which could only move north with the retreating margin of the pack ice. Although the ships were kept from the bowheads, they were within easy reach of vast herds of Pacific walruses. Because the costs of a whaling voyage were fixed, regardless of whether the crew was whaling, it was logical to harvest walruses for their oil and ivory and thus to derive revenue from an otherwise unproductive period of time.

Although some ships made a concerted effort to hunt walruses in the early 1860's, the majority did not begin walrusing until after the Civil War. This intensive hunt continued until the early 1880's when a severely depleted walrus population and a declining price for oil made the hunt unprofitable. From the mid-1880's onward, walrusing was all but abandoned by the whaling fleet which had again turned its attention solely to bowheads.

METHODS

We gathered the data on the walrus harvest in the course of a larger project on the historical reduction of the bowhead whale population (Bockstoce and Botkin 1980).

The first step in our investigation was to identify all whaling vessels that cruised in the Bering Strait region and Chukchi and Beaufort seas, to determine both the size of the fleet in each year and the names of those vessels for which logbooks might have survived. The basic sources for this phase of the study were the several newspapers published in New Bedford, San Francisco, and Honolulu that reported marine news. We also gathered data from more than 500 books, magazine articles, manuscripts, and government documents. These resources allowed us to expand our purview beyond the American whaling industry to include vessels of the other nations operating in the western Arctic: Hawaii, Germany, France, and Great Britain (Australia).

In all, more than 25,000 reports were processed, giving us a record of more than 2,700 annual cruises. Significantly, as our work advanced, fewer and fewer new cruises were found to add to our list; during the extraction of data from the last hundred or so documents, no new cruises were identified. Thus we believe that our list of whaling vessels operating annually in the western Arctic is accurate to within at least 99 percent.

When we had completed our preliminary list of cruises, we were then able to locate the surviving logbooks and in turn extract the primary data from them. We extracted data for 516 complete cruises (approximately 19 percent of the total number of cruises) from logbooks spanning this entire period of whaling history. We compiled more than 66,000

days of observations and recorded the following information for each day: the ship's name; the date and geographical coordinates; the weather, ice conditions, and visibility; and the species and number of marine mammals sighted, chased, mortally wounded, wounded and escaped, captured, or found dead. The result was a continuous, representative sample of information on the activities of whaleships in the western Arctic from 1849 to 1914.

The primary information for an analysis of the whaling fleet's walrus harvest appears in Table 1 and includes the total voyages we identified (column A), the total documents we read (column B), the number of these documents that reported a walrus harvest (column C), and the number of walruses reported caught (column D).

The question arises as to the best method for extrapolating from these data to obtain a figure for the total walrus catch by the entire whaling fleet. (In our analysis, we assume that the extant documents have no consistent bias toward or against ships that sought walrus.)

By grouping the data in 5-year periods to obtain a larger sample per period, we calculated (Table 2) standard statistics for these data, including a mean catch, standard error, and confidence interval. It may be argued, however, that the data are best treated as a case study not open to an error estimate; consequently, we made a simple extrapolation, weighting the catch observed by the inverse of the fraction of the voyages read in each year. This weighting

Table 1. --Column A lists the total known voyages for each year, B the documents read, C the number of documents read that reported a walrus harvest, and D the total number of walrus caught as reported by the documents in column C.

YEAR	A WHALING VOYAGES	B TOTAL DOCUMENTS	C WALRUS DOCUMENTS	D CATCH
1849	50	7	3	4
1850	136	25	2	33
1851	176	33	9	20
1852	224	39	9	19
1853	168	27	4	11
1854	45	9	5	22
1855	7	3	1	1
1856	9	1	0	0
1857	12	2	1	29
1858	97	19	9	108
1859	86	20	14	220
1860	49	10	6	22
1861	45	10	7	310
1862	20	6	4	39
1863	35	9	3	15
1864	80	19	11	143
1865	84	19	5	54
1866	81	24	9	81
1867	83	28	18	386
1868	60	15	10	575
1869	42	11	7	1571
1870	55	15	14	3939
1871	43	10	8	1552
1872	35	9	8	1485
1873	35	5	4	645
1874	19	3	3	1455
1875	20	3	2	1962
1876	19	1	1	1877
1877	23	5	4	2890
1878	24	3	3	1641
1879	29	1	1	231
1880	23	3	3	349
1881	22	1	0	0

TABLE 1 (CONTINUED)

YEAR	A WHALING VOYAGES	B TOTAL DOCUMENTS	C WALRUS DOCUMENTS	D CATCH
1882	32	2	1	164
1883	39	3	3	271
1884	38	[illegible]	[illegible]	35
1885	41	4	2	83
1886	41	4	1	2
1887	36	3	1	12
1888	39	5	1	36
188?	42	4	1	1
1890	39	4	1	1
1891	39	7	1	2
1892	44	5	0	0
1893	44	5	0	0
1894	33	7	1	2
1895	30	7	0	0
1896	25	6	2	9
1897	23	6	3	20
1898	20	5	0	0
1899	15	4	0	0
1900	16	4	1	6
1901	13	4	1	1
1902	12	3	1	1
1903	15	3	1	1
1904	17	3	1	1
1905	16	5	1	10
1906	16	4	0	0
1907	11	3	1	14
1908	11	3	0	0
1909	5	1	1	10
1910	4	1	1	17
1911	5	1	0	0
1912	5	1	1	6
1913	5	1	1	4
1914	4	i	i	2

assumes that our 19 percent sample of all whaling voyages is sufficiently large to provide a trustworthy assessment of walrusing activities by the whaling fleet. The estimated catch extrapolated by this method is given in Table 3, column D.

Our sample extrapolation method (Table 3) yields an estimate of 148,250 walrus caught for the entire period 1849-1914. The standard statistical method yields an estimate of 133,000 ± 48,000 (Table 2). Therefore the two statistical methods yield results that are close and suggest that a reasonable estimate of the total number of walrus caught is approximately 140,000.

DISCUSSION

As Table 3 shows, the vast majority of the whalers' walrusing activities took place in the 17 years from 1867 to 1883 when about 90% of the total harvest was made. The catch statistics from our data sample have been segmented further in Table 4. It shows that the walrus were taken primarily during the months of June and July (while the whaleships , impeded by ice, moved slowly northward toward the northwest coast of Alaska to be ready to intercept the bowheads on their return migration from the Beaufort Sea in August and September).

We also subdivided the Bering, Chukchi, and Beaufort seas into 19 regions which we constructed empirically to segregate areas where the greatest concentrations of ships'

Table 3.--Estimated total walrus catch. This table uses a simple extrapolation from documents read to total number of voyages.

CATCH . . . . . number of walruses caught in documents read
CUMCAT . . . . . cumulative catch
WFACTOR . . . . . weighting factor (total number of voyages/ number of documents read)
WCATCH . . . . . weighted catch (CATCH x WFACTOR)
WCUMCAT . . . . . weighted cumulative catch

YEAR	A CATCH	B CUMCAT	C WFACTOR	D WCATCH	E WCUMCAT	YEAR
1849	4	4	7.14	29	29	1849
1850	33	37	5.44	180	208	1850
1851	20	57	5.33	107	315	1851
1852	19	76	5.74	109	424	1852
1853	11	87	6.22	68	492	1853
1854	22	109	5.00	110	602	1854
1855	1	110	2.33	2	605	1855
1856	0	110	9.00	0	605	1856
1857	29	139	6000	174	779	1857
1858	108	247	5.11	551	1330	1858
1859	220	467	4.30	946	2276	1859
1860	22	489	4*90	108	2384	1860
1861	310	799	4,s0	1395	3779	1861
1862	39	838	3*33	130	3909	1862
2863	15	853	3,89	58	3967	1863
1864	143	996	4.21	602	4569	1864
1865	54	1050	4,42	239	4808	1865
1866	81	1131	3.38	273	5081	1866
1867	386	1517	2.96	1144	6226	1867
1868	575	2092	4.00	2300	8526	1868
1869	1571	3663	3.82	5998	14524	1869
1870	3939	7602	3.67	14443	28967	1870
1871	1552	9154	4.30	6674	35641	1871
1872	1485	10639	3,89	577s	41416	1872
1873	645	11284	7.00	4515	45931	1873
1874	1455	12739	6.33	9215	55146	1874
1875	1962	14701	6,67	13080	68226	1875
1876	1877	16578	19*00	35663	103889	1876
1877	2890	19468	4.60	13294	117183	1877
1878	1641	21109	8.00	13128	130311	187%
1879	231	21340	29.00	6699	137010	1879
1880	349	21689	7*67	2676	139685	1880
1881	0	21689	22.00	0	139685	1881

TABLE 3 (CONTINUED)

YEAR	A CATCH	B CUMCAT	C WFACTOR	D WCATCH	E WCUMCAT	YEAR
1882	164	21853	16.00	2624	142309	1882
1883	271	22124	13,00	3523	145832	1883
1884	35	22159	19.00	665	146497	1884
1885	83	22242	10.25	851	147348	1885
1886	2	22244	10.25	21	147368	1886
1887	12	22256	12.00	144	147512	1887
1888	36	22292	7,80	281	147793	1888
1889	1	22293	10,50	11	147804	1809
1890	1	22294	9,75	10	147814	1890
1891	2	22296	5.57	11	147825	1891
1892	0	22296	8,80	0	147825	1892
1893	0	22296	8,80	0	147825	1893
1894	2	22298	4,71	9	147834	1894
1895	0	22298	4.29	0	147834	1895
1896	9	22307	4.17	38	147872	1896
1897	20	22327	3.83	77	147948	1897
1898	0	22327	4.00	0	147948	1898
1899	0	22327	4.00	0	147948	1899
1900	6	22333	4,00	24	147972	1900
1901	1	22334	3.25	3	147976	1901
1902	1	22335	4.00	4	147980	1902
1903	1	22336	5.00	5	147985	1903
1904	1	22337	5.67	6	147990	1904
1905	10	22347	3.20	32	148022	1905
1906	0	22347	4.00	0	148022	1906
1907	14	22361	3.67	51	148074	1907
1908	0	22361	3,67	0	148074	1908
1909	10	22371	5,00	50	148124	1909
1910	17	22388	4.00	68	148192	1910
1911	0	22388	5.00	0	148192	1911
1912	6	22394	5.00	30	148222	1912
1913	4	22398	5.00	20	148242	1913
1914	2	22400	4.00	8	14825(I	1914

cruising had occurred (Fig. 1). The ships had their greatest successes in July (Table 4) in the waters immediately north of Bering Strait (Fig. 1, division G), a time and place when the walrus were found in great numbers and the ice had disintegrated sufficiently to allow the ships relatively easy access to the herds.

Our data do not indicate whether the whalemen suppressed a particular subpopulation or age group because of the ships' proximity to certain segments of the populations at regular times of the year; nor have we found any evidence within the documents to suggest that the whalers practiced selective harvesting during the hunt.

Apart from estimating whalers' total catch, it is far more difficult to estimate the total walrus kill. After the Civil War, when the hunters began using large caliber rifles (before then they had used harpoons and lances) to kill the animals, the loss no doubt increased dramatically through the escape of large numbers of mortally wounded animals. Although the records of the walrus that were caught and processed were faithfully kept, it is regrettable that few records were kept of the total kill. The four that we have found are:

Northern Light:

June 3, 1876: retrieved 59 of 82 shot.

June 21, 1876: lost all 24 walrus shot.

July 26, 1877: retrieved 118 of 130 shot.

Lucretia:

June 21, 1883: retrieved 18 of 40 or 50 shot.

Although insufficient for use in statistical procedures, these data suggest that no more than 60 to 70 percent of the walruses shot were retrieved and processed.

Beyond the question of the size of the whalers' catch and kill lies the more difficult, if not insoluble, problem of estimating the total commercial catch and kill. Although the pelagic whaling fleet killed the greatest proportion of walruses in the nineteenth century and left a detailed body of data from which to reconstruct their harvest, vessels engaged in trade for walrus ivory left few records, and it is unlikely that their activities can be accurately measured.

The nineteenth century trade for walrus ivory took several forms: small trading vessels, personal trade by whaling captains and officers, and trade both at posts near Chukotka and by the Russian American Company and its successors. In the first case a number of schooners and brigs sailed annually from Honolulu, Hong Kong, Sydney, Hobart, and San Francisco (and after 1900, from Nome) to the Bering Strait region to trade alcohol and manufactured goods to the natives for baleen, furs, and ivory. Occasionally these vessels also hunted walruses for a short time when they had finished trading. Except in rare cases their logbooks have not survived, nor were their activities regularly reported in newspapers.

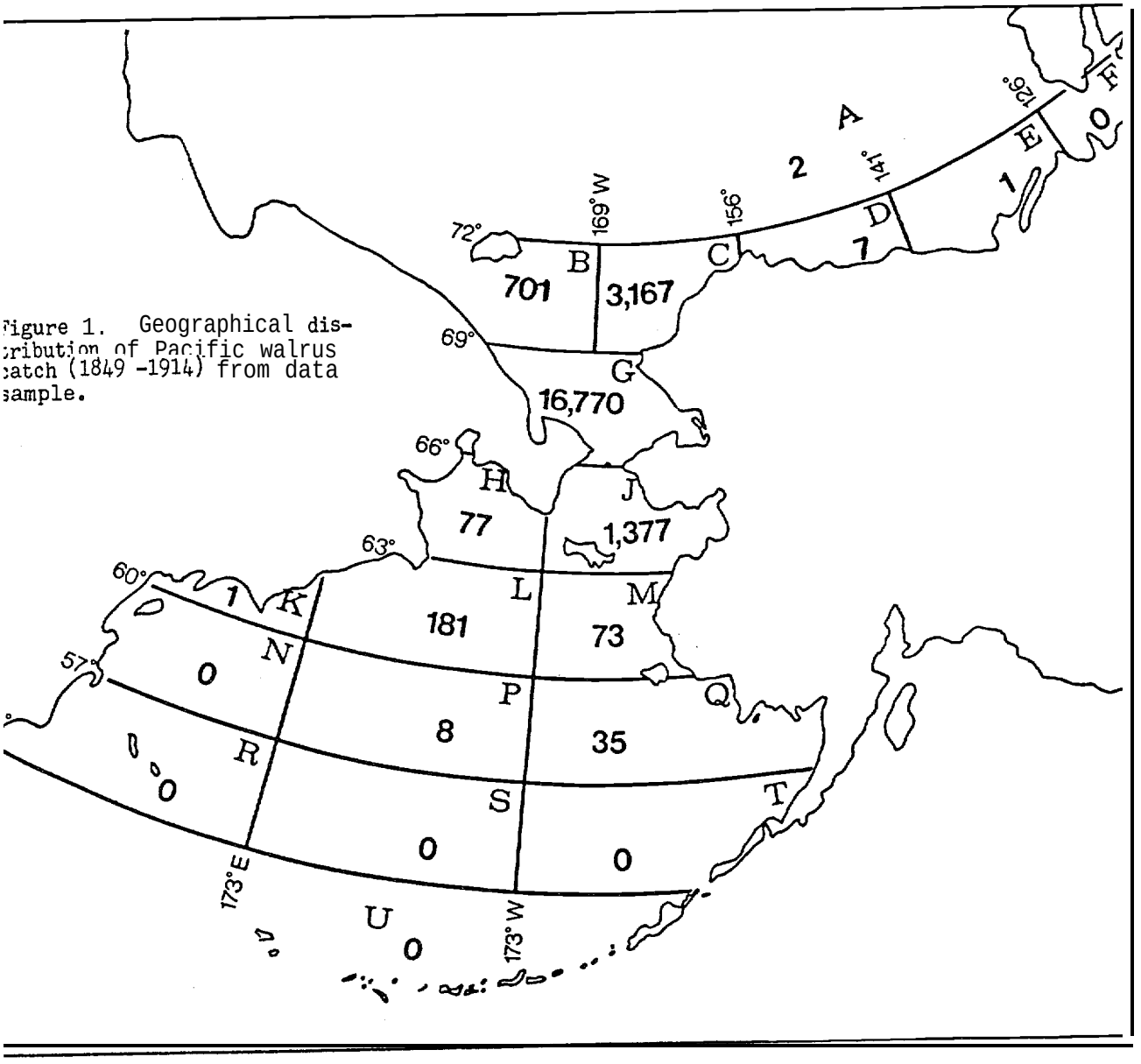

Figure 1. Geographical distribution of Pacific walrus catch (1849 -1914) from data sample.

Table 4. Summary of the sample Pacific walrus catch per month and 10-year period, 1849-1914.

	total	May	June	July	August	September
1849 - 58	247	10	40	130	54	13
1859 - 68	1,845	16	267	1,027	480	55
1869 - 78	19,017	514	4,462	12,750	1,221	70
1879 - 88	1,183	77	242	768	74	22
1889 - 98	35	0	13	3	18	1
1899 - 08	34	1	7	2	21	3
1909 - 14	39	0	4	15	10	10
total	22,400	618	5,035	14,695	1,878	174

Similarly, there is no documentation for the ivory trade carried on by whalemen with the natives for personal gain, and furthermore, surviving records of the trading companies are sparse. But even if these documents had survived, one would be faced with the possibly insoluble problem of estimating the factor by which the natives increased their subsistence hunt to provide raw materials for the trade market.

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