Seasonal and spatial distribution and sex ratio of fin whale catches off West Greenland, 1987-2006

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ABSTRACT

Here we present an analysis of the sex ratio and the spatial and temporal distribution of the fin whale catch from 1987 to 2006 based on the catch reports from Greenlandic whale hunters. The fin whales were caught in the area between Nanortalik and Uummannaq, however more than 50 % were caught in the northern most part of this area. The peak catch period was during August and September in the north and during September and October in the centre and south. There was no significant difference in the distribution of males and females in relation to the latitude or the time of the year. There were significantly more years with most females compared to males, caught in the study period.

INTRODUCTION

In the last century several populations of fin whale (*Balaenoptera physalus*) were heavily utilized and in 1985 the International Whaling Commission (IWC) quotas for commercial fin whaling were reduced to zero (Anon. 1986). However, quotas for a limited number of fin whales are still given for aboriginal subsistence whaling in West Greenland (Anon. 2006).

Fin whales have been caught in West Greenland since 1922. During the period of 1922-1939, Norwegian whalers caught 705 fin whales during 8 cruises in West Greenland. They caught an average of 88 whales pr cruise (Unpubl. data, Greenland Institute of Natural Resources). During most of the twentieth century, Greenland was under administration by Denmark through the Greenland Office. In 1924 the Greenland Office began whaling with the catcher-boat S/S *Sonja*, given the task of catching large whales off West Greenland with the purpose of supplying the oil plant in Copenhagen, with blubber and to provide the Greenlanders with meat for consumption and intestinal fat to feed the dogs (Anon. 1944, in Kapel 1979). The greater number of whales was landed in Southwest Greenland, where a decline in the seal hunt had caused a pronounced lack of meat, but the northern settlements were also visited regularly (Kapel 1979). The whaling activity by the Greenland office was stopped during World War II. From 1924 to 1939 the Greenland office caught 356 fin whales in West Greenland with an average of 21 fin whales per year. After World War II S/S *Sonja* resumed and continued until the activities were found unprofitable in 1958. Between 1946 and 1958 they caught 256 fin whales with an average of 21 whales per yr. Since 1978 Greenlandic hunters have caught an average of 12 whales per year under an IWC aboriginal subsistence quota (Unpubl. data, Greenland Institute of Natural Resources).

Biological parameters such as sex ratio, reproductive state and the size of caught animals provide valuable information for stock assessments. The hunters are obliged by Greenlandic law to report catch of fin whale to the municipality and to send tissue samples to the Greenland Institute of Natural Resources (Executive order no 13 of April 3rd, 1998. On reporting of hunt and wounding of large whales, Greenlandic Home Rule Government). The municipality forward the catch report to the Ministry of Fisheries, Hunting and Agriculture, Greenlandic Home Rule Government. Nearly all catches since 1987 were licensed and it is reasonable to assume that close to all fin whales caught in that period have been reported. Here we present an analysis of the spatial and temporal distribution and the sex ratio of the fin whale catches reported by Greenlandic hunters from 1987 to 2006.

METHODS

Hunters are provided by the municipalities with forms for catch reporting. These are filled in with operational information on the hunter, vessel, weapon, catch position, time to death and flensing site, as well as biological parameters including, the species, sex, estimated length, estimated weight of edible products, stomach content, presence/absence of milk and presence/absence of a foetus including its length and sex.

Not all catch reports contained information on all parameters and when information was missing, we analysed the data available, and informed the sample size for the given parameter.

The study area was divided into three main catch areas: North, NW (71.0˚N - 67.5˚N), Central, CW (67.5˚N - 63.0˚N) and South, SW (63.0˚N - 60.0˚N), Figure 1 and 1a-c. Given the small size of the catcher boats we assumed that whales, for which no catch position was reported, were caught within the catch area of the vessels home harbour (NW, CW, or SW; Figure 1).

RESULTS

A total of 265 catch reports on fin whales from West Greenland from 1987-2006 were analysed. Figure 2 shows the yearly catches and quota set by the IWC.

Sex of the caught animal was reported more regularly in the end of the study period compared to the beginning (Figure 3). Reports of length and reproductive state (occurrence of foetus/milk) varied through the whole period (Figure 3). In 1987 no reports contained information on the catch position but since 2003 more than 75 % reported the catch position (Figure 3). Although reporting of this parameter has generally improved, only 48 % of the total reports informed the catch position.

The spatial distribution of the catches was: 54.7 % of all catches were taken in the northern catch area (N= 128) (Fig. 1a). 33.6 % of all catches were taken in the central catch area (N = 88) (Fig. 1b). And only 11.7 % (N = 49) of all catches were taken in the southern catch area (Fig. 1c).

Fin whales were caught at almost all times of the year however the majority was caught between July and December with a little difference depending on area. The peak period for the NW areas was August/September while the main peak for the CW and the SW hunting areas was September/October (Figure 4).

There was no significant difference in the distribution of catches of males and females in relation to latitude (χ^2 test: v=1.85, df=2, P=0.397) or time of the year (χ^2 test: v=5.215, df=6, P=0.563; Figure 5), even though most of the caught animals at the beginning of the season (April – July) were females. There was no significant difference in the number of males and females caught during the study period (Kruskal-Wallis test: H=9.28, P=0.412). However, there were a significant higher number of years where more females than males were caught (Wilcoxon's test: Z=9.83, P<0.01; Figure 6).

There was a significant difference in the length of caught males and females (Mann-Whitney U-test: Z=2.12, P<0.05) with the females being larger than the males (Figure 7). The majority of the whales were estimated to be 16 – 22 m long. Exceptions were three females with estimated lengths of 12, 26 and 28 m, and one male of an estimated length of 28 m.

DISCUSSION

For the earlier catches in 1946-76 there is information on catch area and time of the year for 99.5 % (N=665) of the catches (Kapel 1979). These catches were taken by a single boat and therefore the catch area and season reflects the movement of the catcher boat rather than the movement of the whales. However, it is reasonable to assume that the boat attempted to operate in the area where it expected most whales, thus the catch information should to some extent reflect the distribution of the whales (Kapel 1979).

As now, the fin whales in 1946 – 76 were caught from southern Greenland to Uummannaq in the north of Greenland (Kapel 1979). The main catch period was July to September. Most of the whales taken between the end July and the beginning of August were caught in the NW area, while the whales that were caught earlier and later in the season were taken mainly in the CW and SW areas (Kapel 1979). The seasonal peaks of the catches from 1987-2006 presented in this paper shifted to approximately one month later. The NW area had its peak in August-September and the CW and SW areas in September – October. This shift is probably due to operational factors between the two fisheries, although it may reflect changes in the weather and/or changes in sea surface temperature in Davis Strait, which could affect the migration of the whales causing them to arrive later in the season.

There was no difference in the distribution of caught male and female fin whales with latitude, however during 1987 and 2006 there were more females than males caught in West Greenland. Also the catch of minke whales in West Greenland during 1987 to 2006, had a skewed sex ratio with significantly more females than males (Simon et al. 2007). Earlier fin whale catches had a tendency of more males in the catch: in 1946-53 the sex ratio in the caught animals with reported sex (51% of the total catch) was M106:F103 and in 1954-76 the sex ratio was M53:F47 (Kapel 1979).

De la Mare (1992, table 1) presented yearly median length data on fin whales caught in Icelandic whaling from 1962-89. The yearly median length of females was significantly larger than those of males (ANOVA nonpar. $H = 40.64$, $df = 1$, $P<0.01$). Female fin whales caught off West Greenland between 1987 and 2006 were also significantly larger than the males (present work). However, an approximate difference in length of two metres is unlikely to cause the hunters to target the slightly larger females.

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LITTERATURE

Anon. 1986. Annual Report of the International Whaling Commission 2006. Schedule. IWC

Anon. 2006. Annual Report of the International Whaling Commission 2006. Schedule, table 1. IWC

de la Mare, W.K. 1992. Matters Concerning Abundance and Trends. Rep. Int. Whal. Commn. 42: 613.

Kapel. F.O. 1979. Exploitation on Large Whales in West Greenland in the Twentieth Century. *Rep. Int. Whal. Commn.* 29: 197-214.

Simon, M., Kingsley, M. and Witting, L. 2007. Biological parameters and the seasonal and spatial distribution of minke whale catch off West Greenland. *IWC/SC/59/AWMP3*.

FIGURE LEGENDES

FIGURE 1. Maps of the catch areas. a. Catch area NW, covering the northern most villages catching fin whales in West Greenland. b. Catch area CW, covering the central villages. c. SW, covering the southern most villages. The stars indicate the main city of the municipality. Dots indicate the position of caught female fin whales and triangles indicate the position of caught male fin whales. The catches with no reported position are not indicated on the map.

FIGURE 2. Yearly catches of fin whales of West Greenland from 1987 to 2006 with the annual catch limit set by the IWC (grey lines).

FIGURE 3. Yearly variation in the proportion of the catch reports informing catch position, length, sex and reproductive state (milk/foetus).

FIGURE 4. Yearly variation in the number of fin whales caught in the three catch areas.

FIGURE 5. Number of female and male fin whales caught in the three catch areas over the year. There was no significant difference between males and females caught over the latitudes (χ^2 test: v=1.85, df=2, P=0.397 or over the seasons (χ^2 test: v=5.215, df=6, P=0.563).

FIGURE 6. Cumulative male and female fin whales caught between 1987 and 2006, showing the proportion of females and males in the total catch. The dots indicate a new year.

FIGURE 7. Distribution of the length (cm) of caught male and female fin whales. There is a significant difference between the length of males and females (Mann-Whitney U-test: Z=2.12, P<0.05).

FIGURE 1

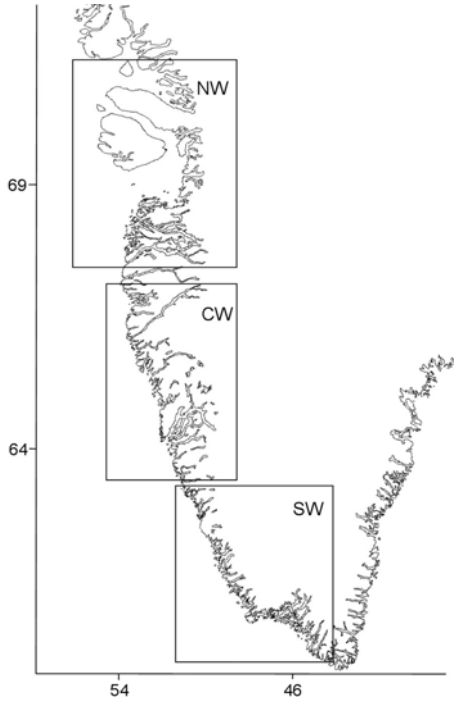


FIGURE 1a

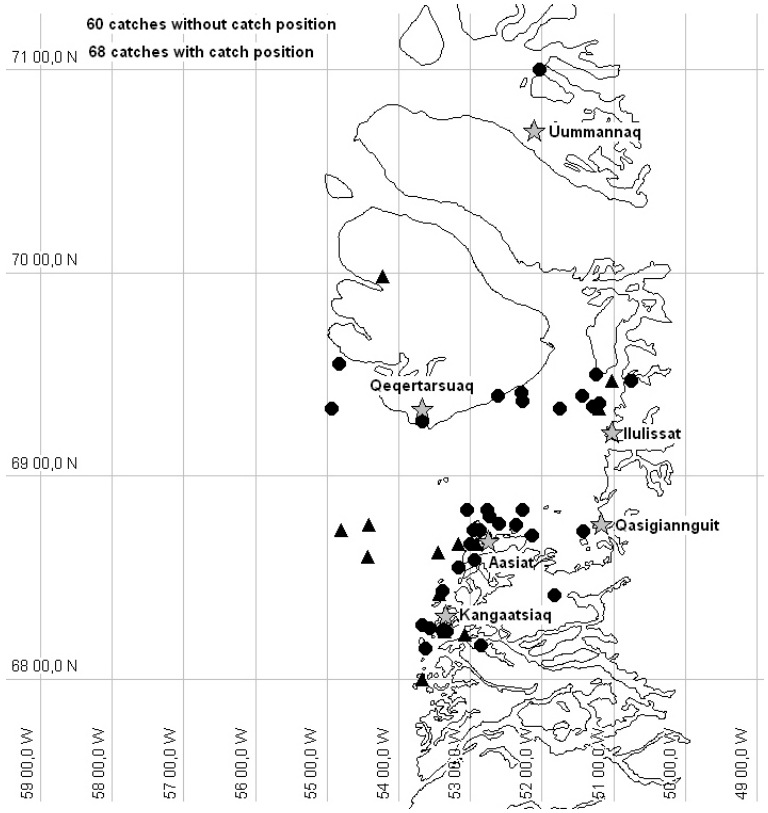
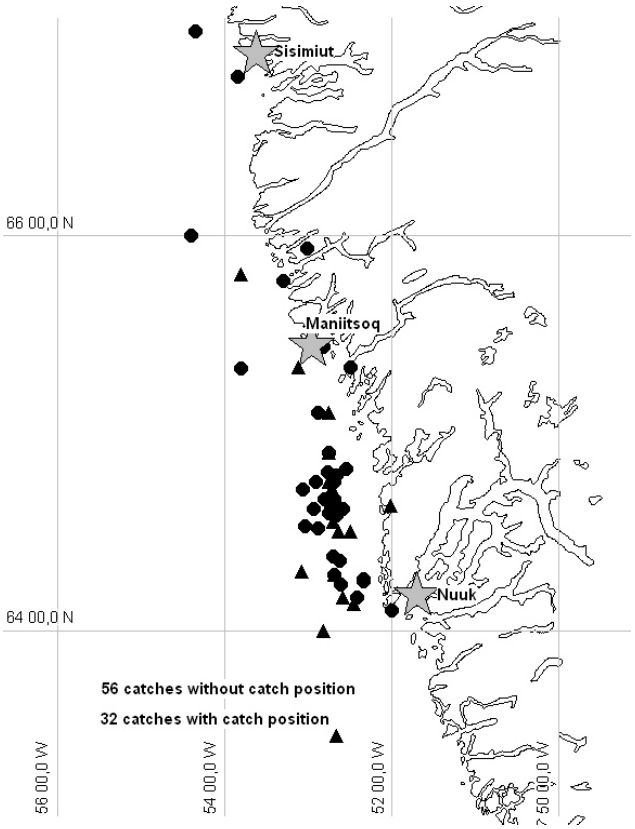


FIGURE 1b



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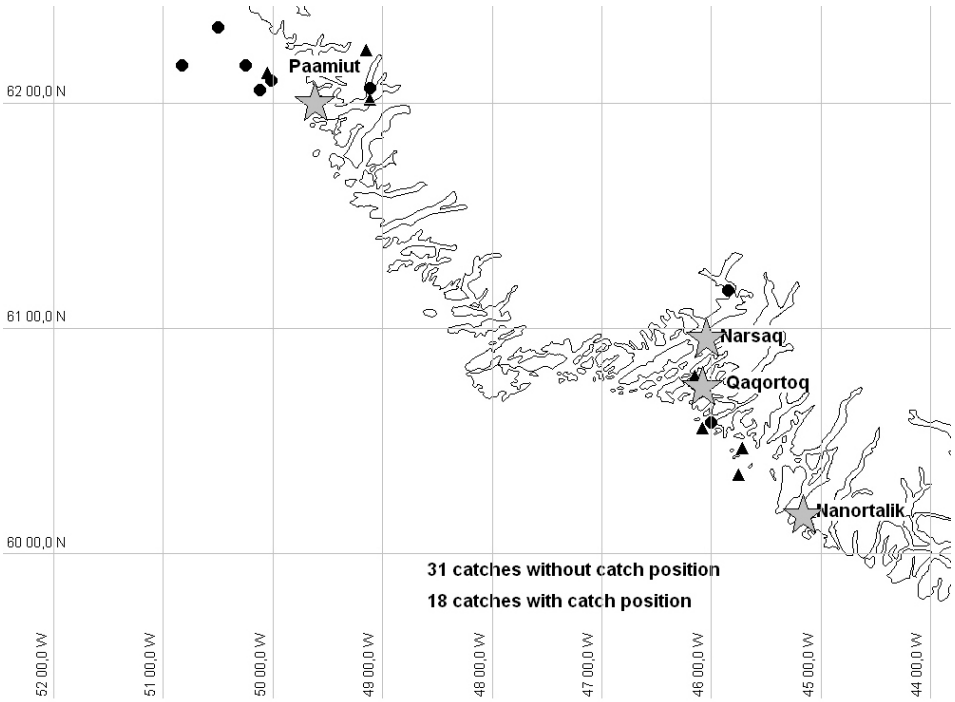


FIGURE 2

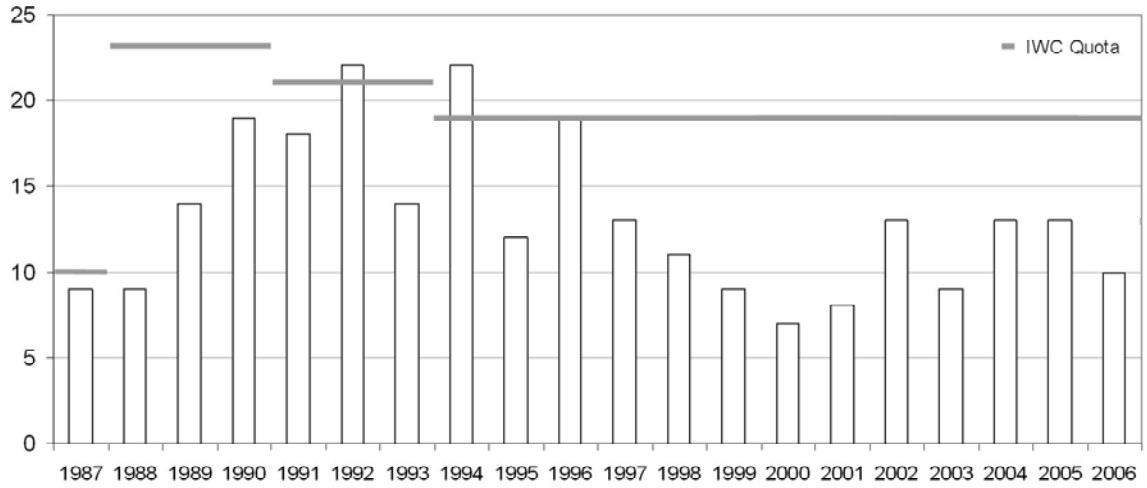
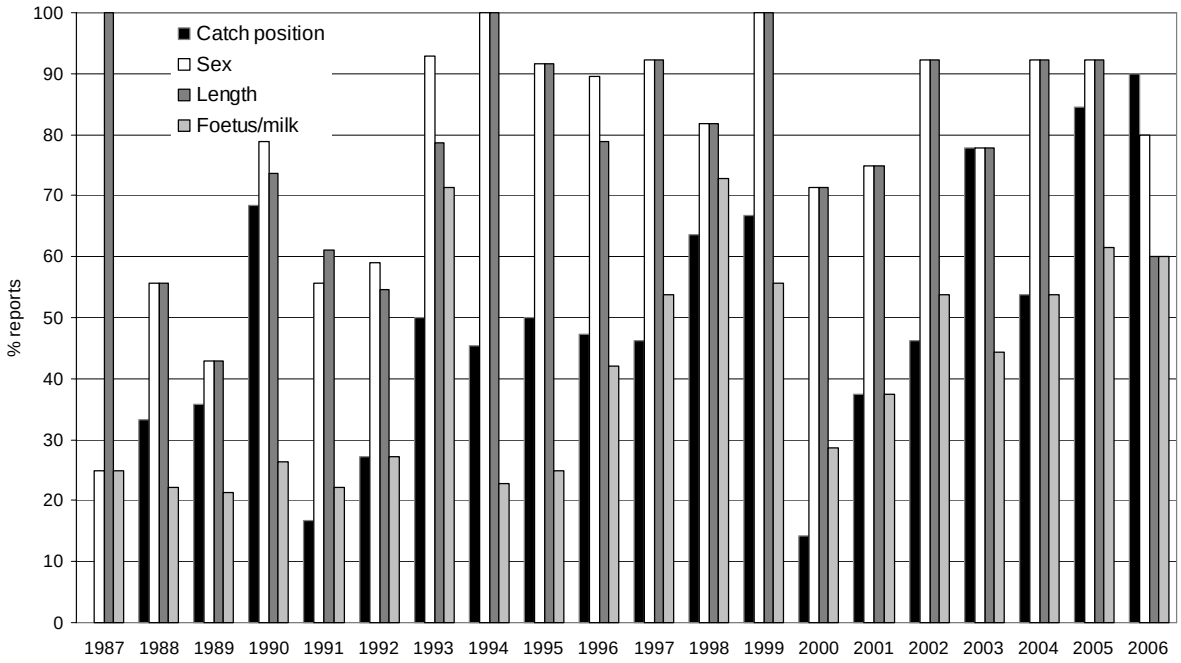


FIGURE 3



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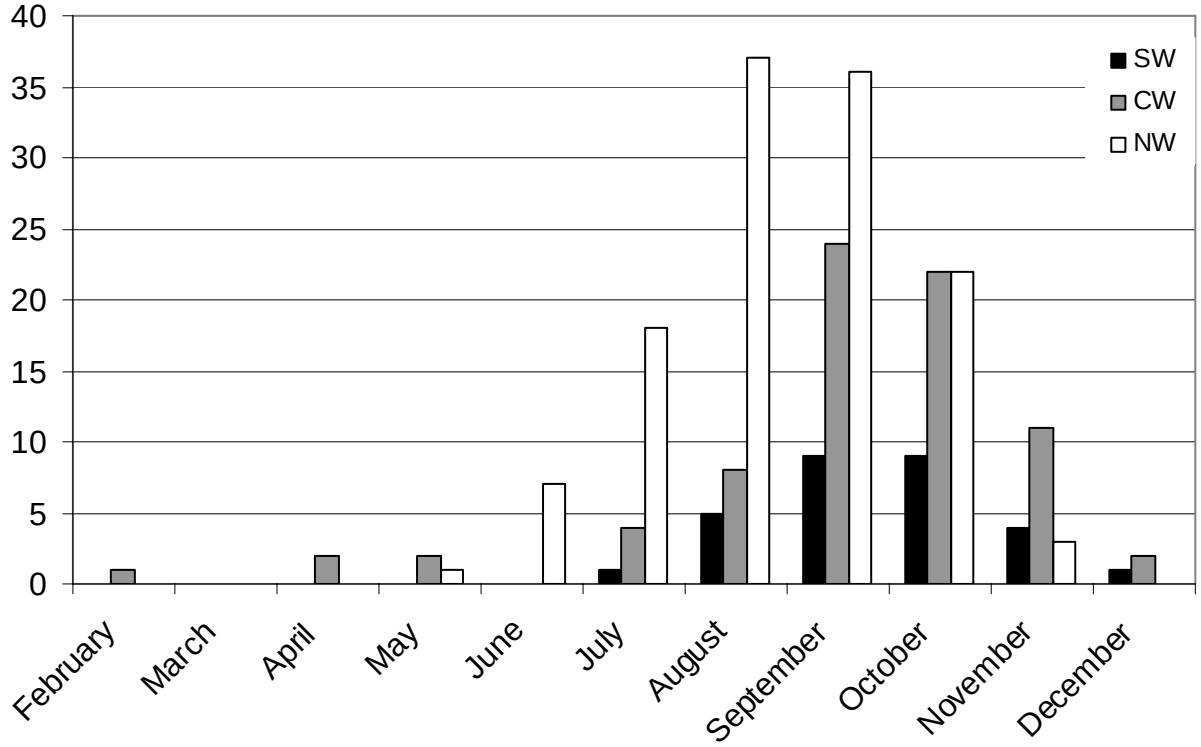

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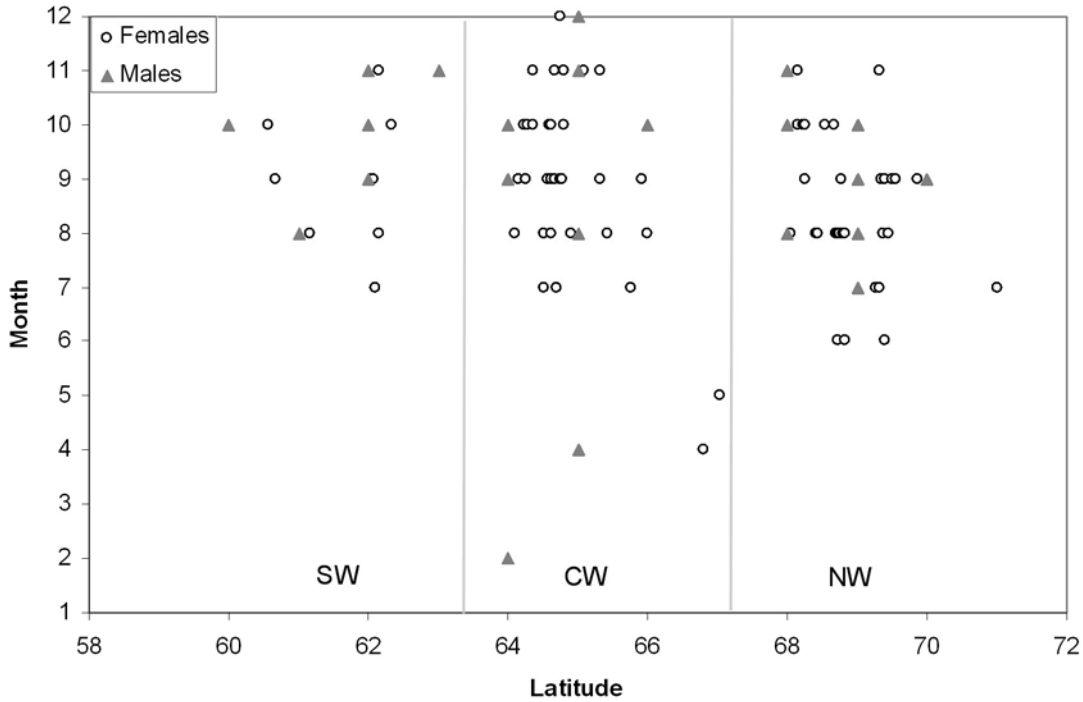

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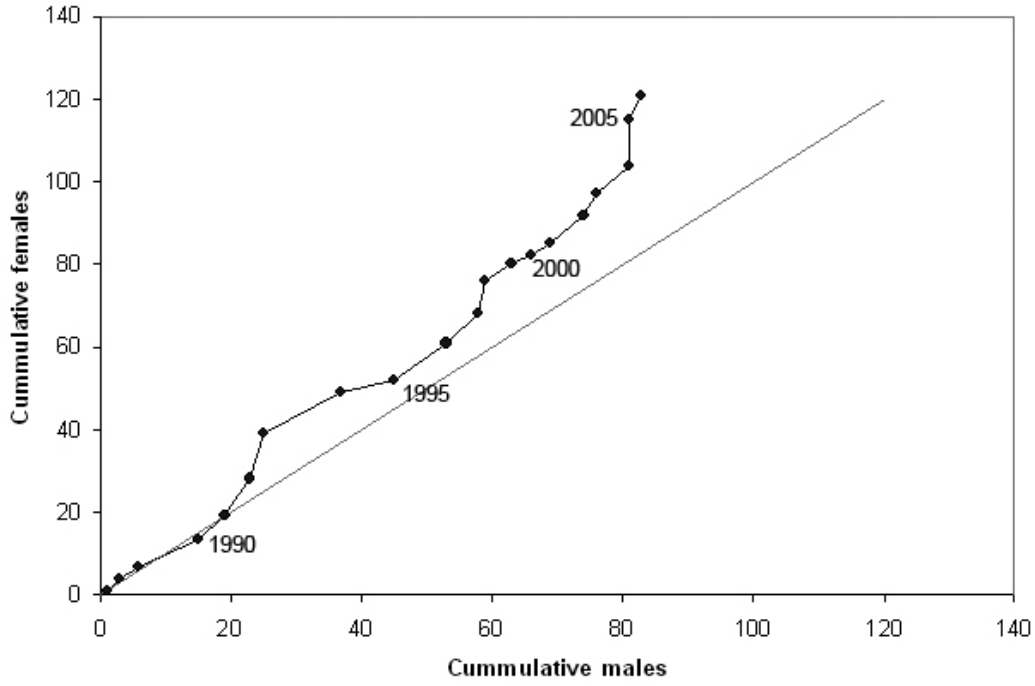
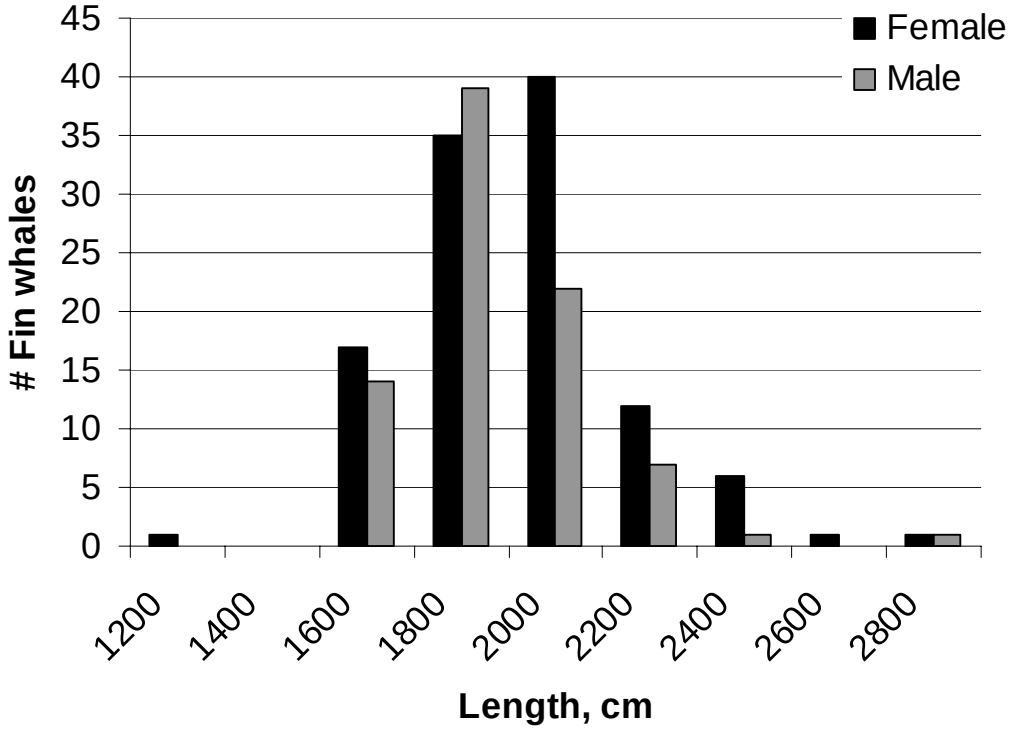
FIGURE 7