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FAO AREA 18 (ARCTIC SEA): CATCH DATA RECONSTRUCTION EXTENSION OF ZELLER ET AL. (2011) TO 2010

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INTRODUCTION

The catch data reconstructions for Arctic Sea waters (i.e., FAO area 18) as summarized in Zeller *et al.* (2011) based on initial technical reports by Booth and Zeller (2008), Booth and Watts (2007) and Pauly and Swartz (2007) were here extended in time to 2010 and aligned internally to the data structure as required for global spatial allocation of the *Sea Around Us*.

ALASKA

Reconstructed fish catches were extended from the original end date of 2006 (Booth and Zeller 2008) to 2010 based on changes in human populations in 15 Arctic Alaska communities. Population anchor points for 2006 and 2010 were obtained from the Alaska Department of Labor and Workforce Development (<http://laborstats.alaska.gov/pop/popest.htm>), while population data prior to 2006 were extracted from Booth and Zeller (2008). Arctic Alaska population from 1950-2010 was calculated by interpolating between the anchor points. Reconstructed fish catches from 1950-2006 were divided by population to obtain a *per capita* fish use rate, which was then carried forward to 2010 by using 3 year running averages (i.e., *per capita* fish use rate in 2007 was the average of 2004 to 2006 use rates). Finally, annual marine fish catches in the period 2007-2010 were calculated by multiplying *per capita* fish use rate by human population data (Figure 1).

CANADA

Reconstructed fish catches of Booth and Watts (2007) were extended from 2001 to 2010 on the basis of *per capita* fish use rates and human population changes in indigenous Arctic Canada communities. *Per capita* fish use rates were extracted from Booth and Watts (2007) for three Arctic communities for various years between 1950 and 2001. Gaps in data were filled by linearly interpolating between anchor points. From 2002 to 2010, the *per capita* fish use rate was calculated as the three year running average of the average rate of the three Arctic communities. Indigenous population data from 1950-2001 for the 56 Canadian Arctic communities were extracted from Booth and Watts (2007).

In 2001, the indigenous population in the 56 Arctic communities was approximately 44,000 (Booth and Watts 2007). In 2006, the aboriginal population (First Nations, Inuit, and Métis) of northern Canada, in the provinces of Nunavut, Northwest Territories, and Nunavik, was 54,885 (Library of Parliament 2008). We extracted 2006 and 2011 census data for the 51 Canadian Arctic communities reported in Booth and Watts (2007) as being located within FAO Area 18. Out of these 51 communities, population data were available for 43 communities. Total population was 40,569 in 2006 and grew about 6% to 41,800 in 2011. Compared to the Library of Parliament (2008) aboriginal population estimate (54,885), the Statistics Canada estimate was low. Considering that i) Inuit and First Nations populations have a high fertility rate, thus their populations are expected to grow (Malenfant and Morency 2011); ii) population data from 8 communities were not available; and iii) the former estimate (54,885) may include non-fishing dependent communities, we decided to use the average of the two estimates rather than either one on its own. This resulted in a 2006 indigenous population anchor point of 47,700 people, which we then increased by 6% to arrive at a population of 50,600 people for 2010. We linearly increased the population between the anchor points in 2001, 2006 and 2010. Total annual fish catch from 2002 to 2010 was then calculated as the product of the indigenous Arctic population and the *per capita* fish use rate (Figure 2).

RUSSIA

Reconstructed fish catches were extended from the initial end year in Pauly and Swartz (2007) to include the 2007 to 2010 period based on indigenous population data and a derived fish use rate. Indigenous populations in Russia's north were estimated in 1989, 2002, and 2010. In 1989, the population in Russia's north was estimated at 9.8 million (Heleniak 2013). As all Russian Arctic catches were allocated to the subsistence sector (Pauly and Swartz 2007), we assumed that only the indigenous population was fishing in Russia's arctic marine waters, as is the case in the Canadian Arctic. A study of Arctic demography found that the indigenous populations in Russia's Arctic region made up at least 4% of the total population in 1982 (Bogoyavlenskiy and Siggner 2004). Due to a lack of other suitable data, we applied this rate to the 1989 population data to derive a Russian Arctic population of 391,000 in 1989. Population changes in Russia's north between census periods was thought to be around -14.1% for the period 1989 to 2002, and -5% from 2002 to 2010 (Heleniak 2013). We applied these rates to the 1989 population anchor point, resulting in indigenous populations of 336,000 and 319,000 in 2002 and 2010, respectively. Linear interpolation was used to fill data gaps between the three anchor points.

The reconstructed fish catch (8,045 t) in 2002 (Pauly and Swartz 2007) was divided by the 2002 indigenous population to derive a *per capita* fish use rate of 24 kg·person⁻¹·yr⁻¹. We maintained this fish use rate to 2010, multiplying it by the indigenous population to calculate total annual fish catch in Russia's arctic region.

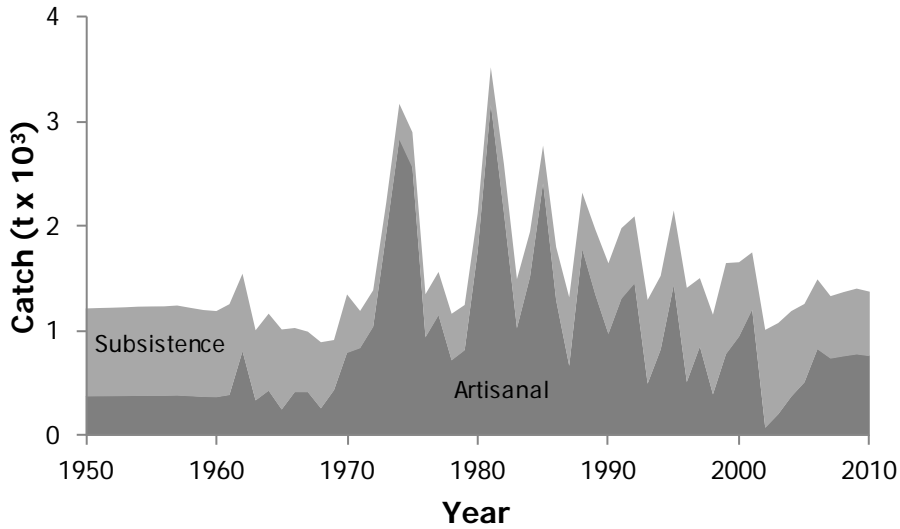


Figure 1. Reconstructed catch in Arctic Alaska, 1950-2010. Updated from Booth and Zeller (2008).

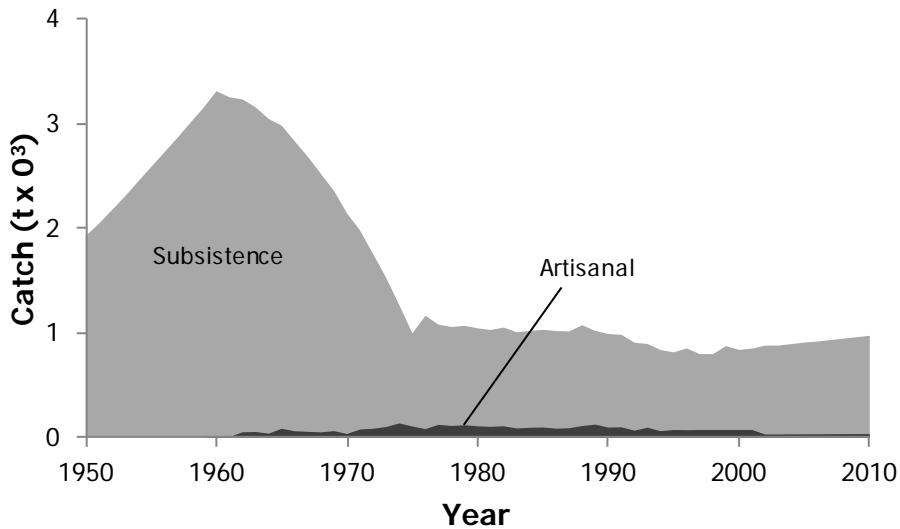


Figure 2. Reconstructed catch in Canadian Arctic communities, 1950-2010. Updated from Booth and Watts (2007).

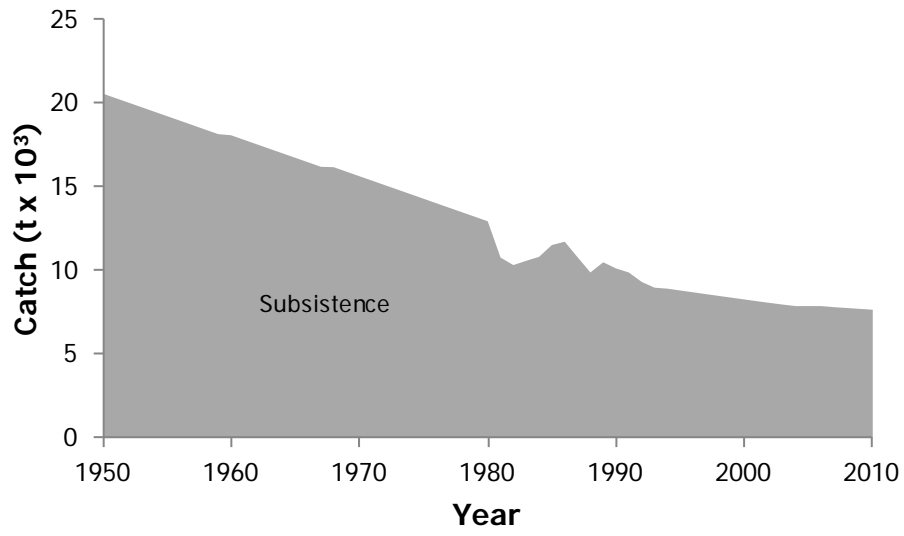


Figure 3. Reconstructed catch in the Russian Arctic, 1950-2010. Updated from Pauly and Swartz (2007).

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