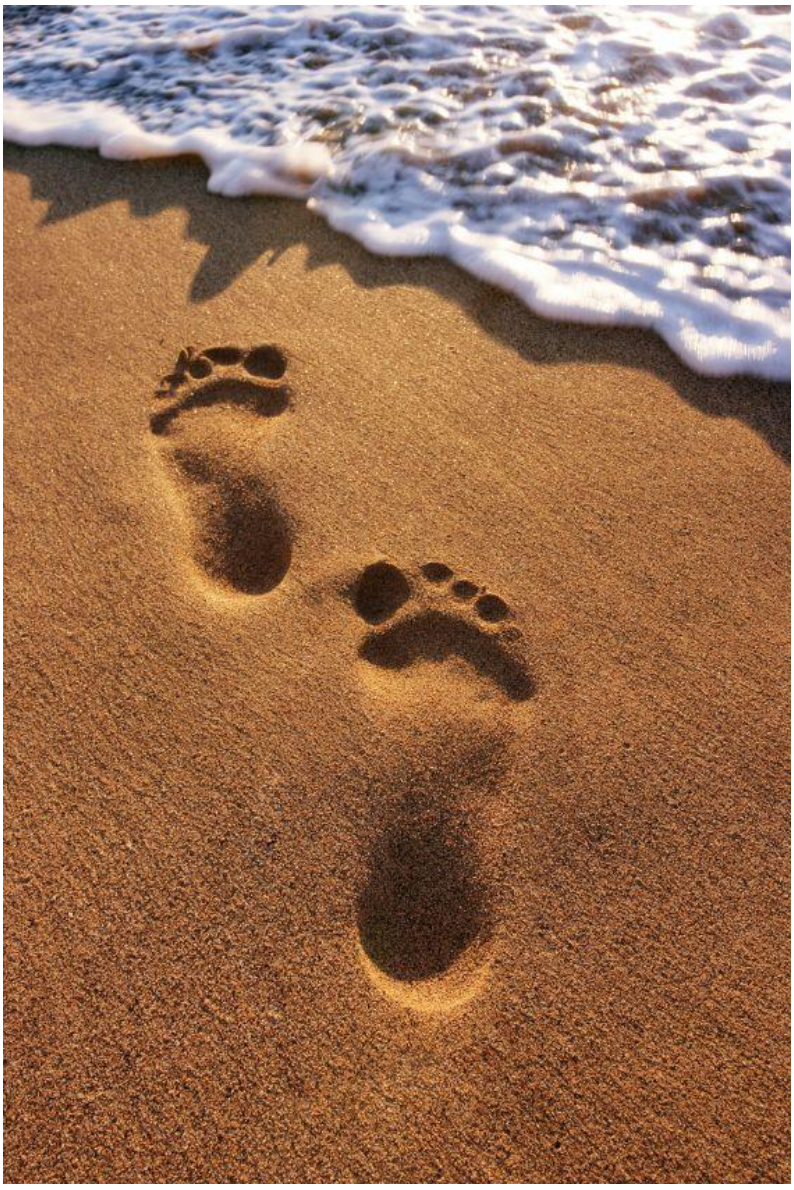
Historical Marine Footprint for Atlantic Europe, 1500-2019

Supporting Documentation



https://www.pinterest.co.uk/pin/2674081015650225/

Summary

Dataset Title:	Consumption Fish and Whale, Atlantic Europe, 1500-2019
Case Study:	Historical Marine Footprint for Atlantic Europe, 1500-2019
Large Marine Ecosystem(s):	8. Scotia Shelf, 9. Labrador/Newfoundland, 18. Canadian Eastern Arctic - West Greenland, 19. Greenland Sea, 20. Barents Sea, 21. Norwegian Sea, 22. North Sea, 24. Celtic Biscay Shelf, 25. Iberian Shelf, 59. Iceland Shelf and Sea, 60. Faroe Plateau
Subject:	Human footprint of exploitation, consumption, catches and effect, 1500-2019

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Extent:	2,397 records, 83 tables, 7 figures
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Contents

Introduction

The “Historical Marine Footprint for Atlantic Europe, 1500-2019” paper presents a footprint concept that indicates the actual consumption levels of marine resources over five centuries. The European countries that border the North Atlantic have all been included in the study which evaluates the exploitation of fish and whales primarily for purposes of consumption.

This document provides the supporting information that informs the paper and enables access to the actual figures, sources, data and information that was used in the study.

Each section (or country summary) is accompanied by its own bibliography enabling immediate access to the relevant source materials that are cited. A Primary Bibliography appears at the end of the document that incorporates all sources and references used to establish the data displayed.

An explanation of Conversion Factors applied, methodologies and processes followed, and Units applied is included. Each country is individually described and provided with it’s own summary table and any tables or figures that may be relevant in assisting in understanding and interpreting teh data used.

Measurements, Conversion Factors and Abbreviations

Table 1. Data Types

Apparent Consumption	Apparent consumption is a proxy measure that estimates consumption based on total supply of fish divided by the population intended to consume that fish.
Observed Consumption	Observed consumption estimates are based on sources such as household and institutional accounts that directly record the consumption of individuals or small groups.
Approximated Consumption	These are consumption estimates with large degrees of uncertainty that may rely on interpolations or estimations based on factors other than direct documentary evidence. The details of such estimates can be found in the summary section of each respective country.

Table 2. Abbreviations

CF	Conversion Factor
EW	Edible Weight
CW	Consumed Weight
PW	Processed Weight
LW	Live Weight
kg LW	Kilograms of Live Weight
t LW	Metric tonnes of Live Weight
p/c	Per Capita

Table 3. Seafood types and conversion factors

Seafood Type	Description	Conversion Factor	Conversion Type	Source
Herring		1.67	PW to LW	Helland 1896
Cod, salted		5	PW to LW	Helland 1896
Cod, dried		6.67	PW to LW	Helland 1896
Fresh seafish		1.82	PW to LW	Helland 1896

Freshwater		1.82	PW to LW	Helland 1896
Marinated		1.67	PW to LW	Helland 1896
Dried Icelandic cod	CF relates to dried Icelandic cod	7.7	PW to LW	Jónsson 1998
Dried Newfoundland cod	CF relates to dried Newfoundland cod	4.7	PW to LW	Nicholls,. et al. 2021
Filleted cod		2.45	PW to LW	FAO 2020
Canned fish	Average of FAO canned fish products	1.4	EM to LW	FAO 2020
Shellfish & molluscs	Average of FAO shellfish and molluscs	6.53	PW to LW	FAO 2020

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Extended Methods for Summary Periods

This section provides additional information on how summary consumption estimates were generated for this study. We categorise our figures for human consumption into three tranches; apparent, observed and approximated estimates. Apparent consumption provides estimates based on historical records of consumption, landings, catches, imports, exports and domestic trade. We use these records to estimate the supply of seafood to a population and then divide the supply by the population to estimate per capita consumption (Weisell & Dop 2012). Observed consumption is based on direct records of the intake of individuals or defined groups, largely taken from representative household expenditure records. Approximated consumption figures are estimates derived from incomplete or partial evidence and may involve elements of interpretation or estimation. A distinction is also made between "National Estimates" and "Partial Estimates" to highlight where figures represent total seafood consumption at a national level and where they only represent a limited number of species or a smaller section of society.

The details of how each individual national and partial consumption estimates were calculated are presented in the country specific sections below. However, to summarise our data, we calculate average per capita consumption figures for each country over 50-year periods from 1500 to 1899. From 1900 to 2019 we use 20-year summary periods. We leave out the years 1914-19 and 1939-45 due to the disruption of the First and Second World Wars.

The methods used for these summary estimates are consistent across all countries. Each summary estimate was also assigned a Evidence Quality Level (EQL) to provide an assessment of how reliable and accurate it is. The flowchart below (Figure 1) outlines how estimates were divided into these EQL.

- An EQL of 1 indicates that the summary estimate was generated from one or more national consumption figures based on apparent or observed data. This is the highest quality estimate and if we had more than one national figure of this kind the summary figure was an average of these.

- An EQL of 2 indicates that the summary estimate was based on an approximated national consumption figure. These are figures that still represent the consumption of a whole country, but may include some assumptions or estimates on the part of the authors.

- In the case of estimates with an EQL of 1 and 2 the 'Consumption Low/High (kg)' field is the same as 'Average Consumption (kg)' - this is because these figures represent national consumption and have less uncertainty.

- An EQL of 3 or 4 indicates that there were no national level figures available for this summary period and therefore partial figures were used in the calculation. An EQL of 3 indicates that only Apparent and Observed figures were used in the calculation, while an EQL of 4 means that Approximated figures were employed. For example, in the case of Germany we have 4 partial figures for the period 1750-1799, but no national figures. To estimate national consumption we calculate the average of the 4 partial figures that are available (5.11 kg) and then use the nearest national estimate, which in this case is an approximated figure of 6 kg from 1800-1849. Within the 'Consumption Low/High (kg)' field we use these figures to generate a likely range in which consumption fell, in this case from 5.11-6 kg. In the field 'Average Consumption (kg'), we indicate the average of this range, 5.56 kg in this case. Because this summary estimate relies on Approximated figures it was given an EQL of 4. If the same calculation used only Apparent or Observed figures then it would get an EWL of 3.

- Finally, a EQI of 5 means that there were no national or partial estimates available for that period. In the cases where there are estimates before and after the period(s) with a data gap we fill these gaps using interpolated step values. For example, in the case of Denmark we have an estimate of 23.03 kg for 1960-1979 and 10.33 kg for 1920-1938 but no available data for the summary period between these (1946-1959). To fill this data gap we assume a linear growth of consumption and estimate 16.68 kg for the 1946-1959 summary period. These estimates are the least accurate as they do not utilise any related data for the summary period.

- Summary periods are left blank if there are no supporting summary estimates in which to fill a gap. For example, we have no data for England before 1850-1899, so any summary periods before this are blank.

There are some exceptions to these rules in the dataset. For instance, in cases where there are no national estimates but extensive partial estimates we sometimes use these partial figures to estimate national consumption. These cases are detailed in the 'Basis' field in the summary data tables and only occur when the partial figures are extensive and provide a good representation of a whole country's consumption.

Figure 1. Evidence Quality Level Flowchart.

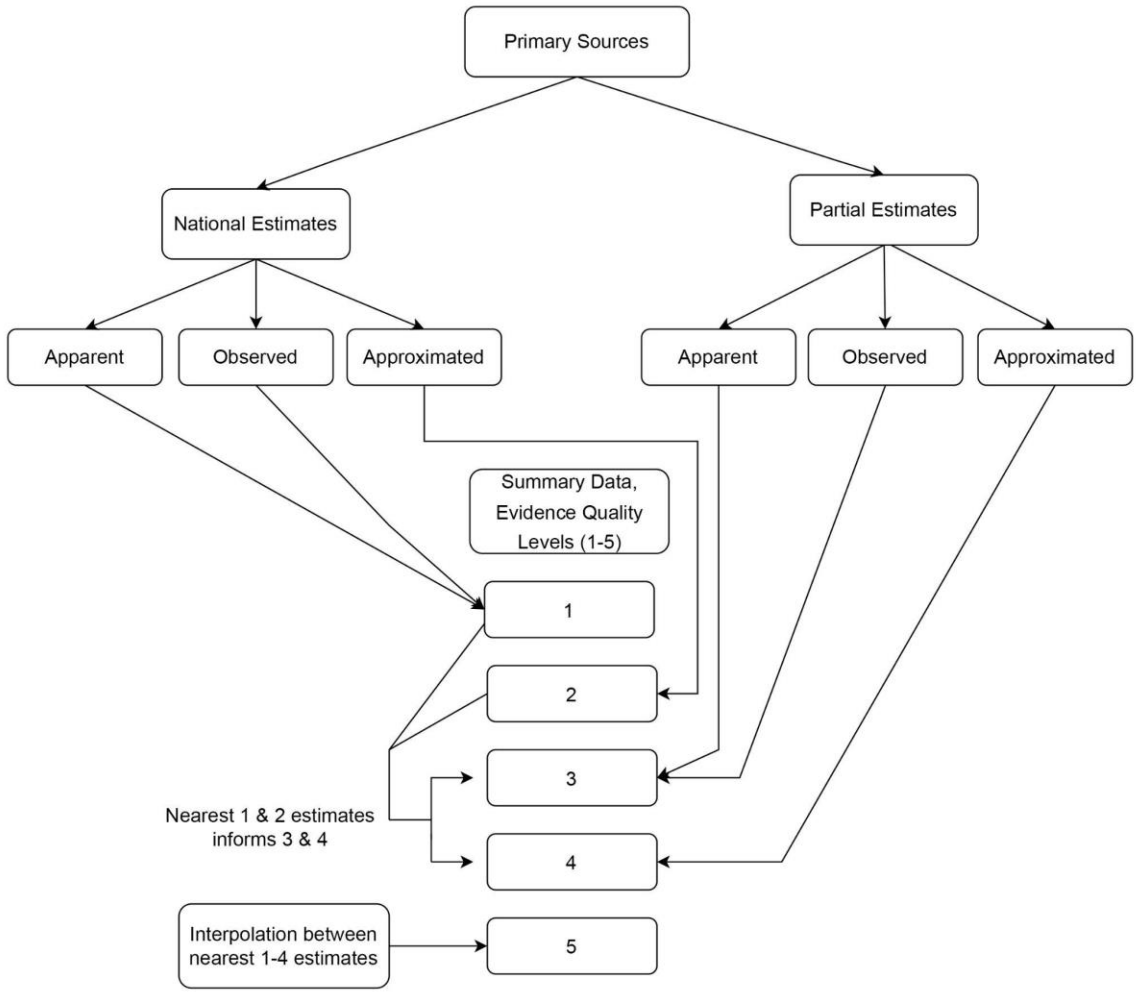

Table 1 below outlines the total count of EQL's in the dataset, while Figure 2 shows how this differs between summary periods. The chart demonstrates that we can make more estimates in the modern period compared to centuries past. For instance, in only two countries (Germany and France) did we have solid data to make an estimate for 1500-1550. From 1850 onwards, we make estimates for every country we studied, but some of these are interpolated figures (with an EQL 5). The chart shows that the interim period of 1946-59 had the highest number of interpolated figures. Whereas the earlier periods of 1750-1799 and 1600-49 had no level 5 figures at all.

Table 1 - Count of Total EQL

EQL	Count of EQL
1	51
2	29
3	19
4	12
5	25

Figure 2 - Count of EQL

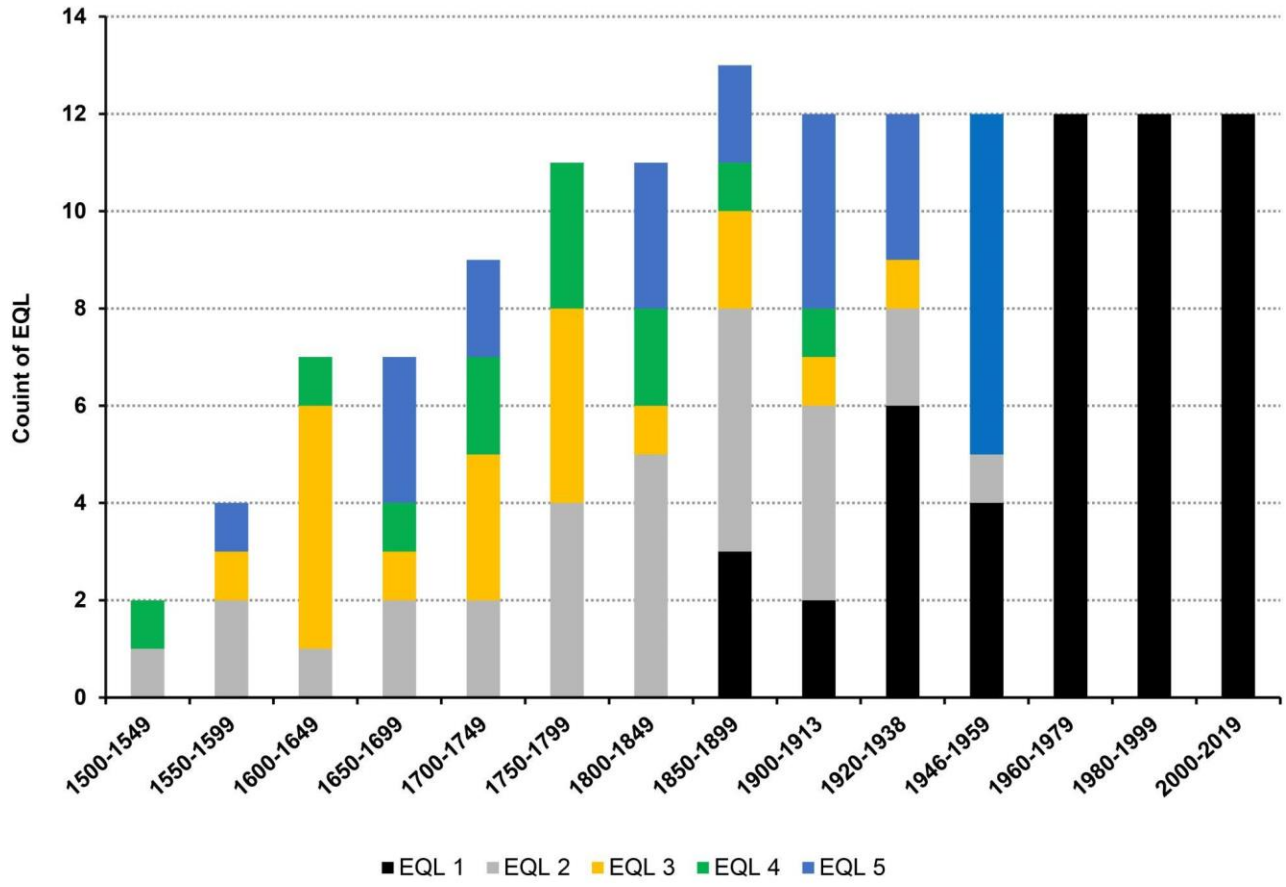

Figure 3 below compares the overall trend of consumption weighted by population between the different EQLs. The black line (EQL 1-5) is the average figure used in the paper (See Figure 6 in the main article), the red line (EQL 1-4) excludes any interpolated figures, the blue line shows data with an EQL of 1 or 2 and the orange line shows data points with an EQL of 3 or 4. The EQL 1-5 series starts off higher in 1500 because it includes interpolated figures; the other series shows much lower values due to the paucity of data in these early summary periods. For the remainder of the series, the different quality levels show a generally similar trend, with most differences due to limited data in certain periods. The largest divergence comes after 1850, when the EQL 3-4 series shows a marked increase compared to the other series. This is due to limited data in that band; in 1850-99, only three data points have an EQL of 3 or 4; in 1900-13, it drops to 2 and then only 1 in 1920-38. The latter value from 1920-38 relates only to Norway, which had an average consumption of 28.15 kg – this is above average but appropriate for the country. The limited amount of data in the lower quality levels means they don't show an accurate picture of average consumption across the continent. Overall, Figure 3 demonstrates the different EQLs show a similar trend but are best understood when combined to provide a complete picture of average consumption.

Figure 3 – EQL Level Comparison

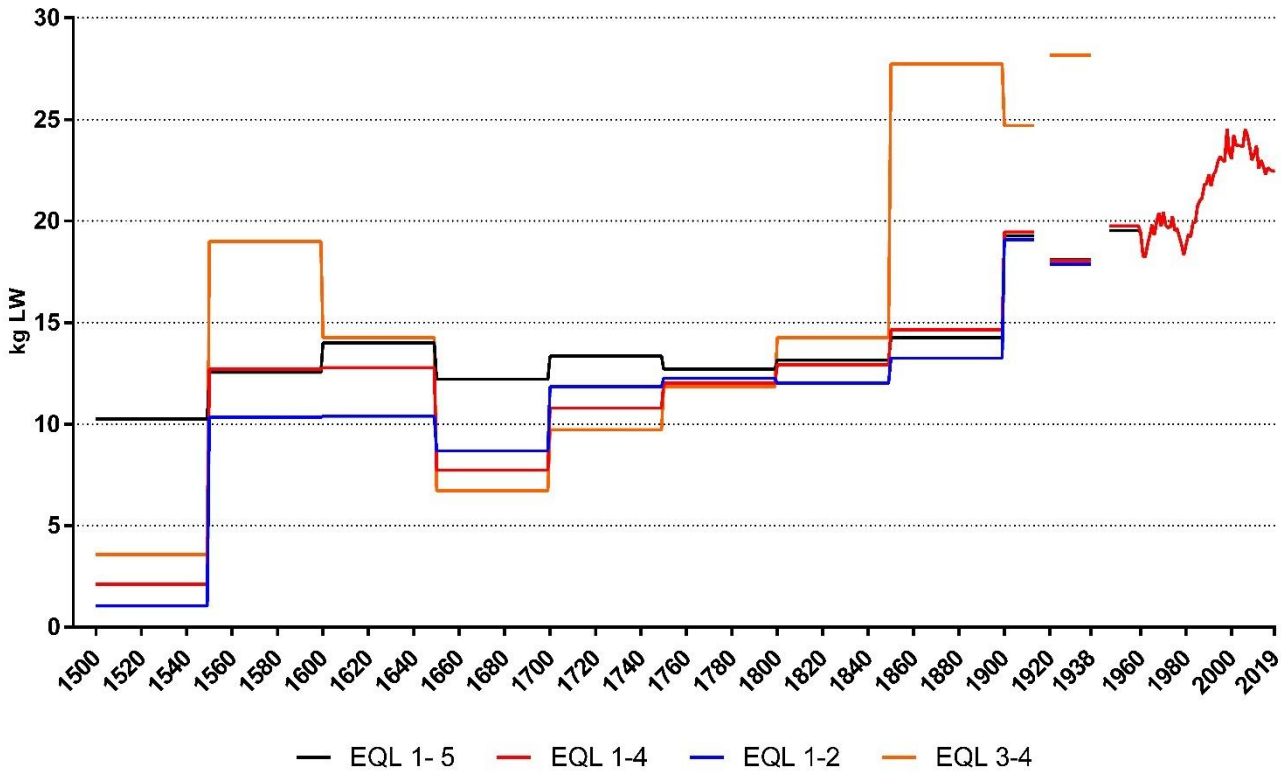

Table 2. Summary Data Table Explanation

Fields	Explanation	Example
Basis	How data were derived, including sources	Low estimate partial value (Pontoppidan 1764), high estimate (Hyldtoft 2019)
Period	Period in years, typically 50 years except for the 20th century which includes several periods of roughly two decades each. The two world war periods are deliberately excluded.	1750-1799
Consumption Low/High (kg)	Low and High points of available data, from sources, calculations, interpolations and/or estimates	17-30
Average Consumption (kg)	Average calculated (or given value) between the low and high consumption points. This value is used as the primary figure to indicate estimated consumption.	23.5
Evidence Quality Level (1-5)	Evidence quality level (between 1 and 5) determined using the flowchart in Figure 1 above. 1 = high confidence (trusted source), 5 = low confidence (rough estimate).	3
Related Data Points	Reports how many national and partial figures are behind each summary estimate. When combined with the EQL this field lets the reader judge how reliable and how extensive the data behind each estimate is. A figure with a high EQL and large number of supporting data points is the most reliable.	1 national 1 partial

Country Level Consumption Estimates

Iceland

Summary Data for Iceland 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	87.67	87.67	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	86.91	86.91	1	20 national
Average of national estimates (FAOSTAT 2021)	1960-1979	71.2	71.2	1	20 national
Interpolated value	1946-1959	104.27	104.27	5	0
Average of national estimate (Jónsson, 1998)	1920-1938	137.33	137.33	2	3 national
Average of national estimate (Jónsson, 1998)	1900-1913	147.5	147.5	2	2 national
Average of national estimate (Jónsson, 1998)	1850-1899	197.4	197.4	2	5 national
Average of national estimate (Jónsson, 1998)	1800-1849	230.3	230.3	2	3 national
Average of national estimate (Jónsson, 1998)	1750-1799	221.6	221.6	2	3 national
No estimate available.	1700-1749				0
No estimate available.	1650-1699				0
No estimate available.	1600-1649				0
No estimate available.	1550-1599				0
No estimate available.	1500-1549				0

Table 1. National annual Icelandic fish consumption per capita in kg.

Year	Live Weight (kg)	Source	Type	Basis
2019	81.41	FAO 2022	Apparent Consumption	Food supply and population data
2018	81.89	FAO 2022	Apparent Consumption	Food supply and population data
2017	82.64	FAO 2022	Apparent Consumption	Food supply and population data
2016	84.44	FAO 2022	Apparent Consumption	Food supply and population data
2015	89.09	FAO 2022	Apparent Consumption	Food supply and population data
2014	85.39	FAO 2022	Apparent Consumption	Food supply and population data
2013	86.75	FAO 2022	Apparent Consumption	Food supply and population data
2012	86.7	FAO 2022	Apparent Consumption	Food supply and population data
2011	89.79	FAO 2022	Apparent Consumption	Food supply and population data
2010	89.49	FAO 2022	Apparent Consumption	Food supply and population data
2009	90.42	FAO 2021	Apparent Consumption	Food supply and population data
2008	90.42	FAO 2021	Apparent Consumption	Food supply and population data
2007	91.21	FAO 2021	Apparent Consumption	Food supply and population data
2006	90.31	FAO 2021	Apparent Consumption	Food supply and population data
2005	89.42	FAO 2021	Apparent Consumption	Food supply and population data

2004	88.47	FAO 2021	Apparent Consumption	Food supply and population data
2003	89.64	FAO 2021	Apparent Consumption	Food supply and population data
2002	90.01	FAO 2021	Apparent Consumption	Food supply and population data
2001	87.79	FAO 2021	Apparent Consumption	Food supply and population data
2000	88.21	FAO 2021	Apparent Consumption	Food supply and population data
1999	86.4	FAO 2021	Apparent Consumption	Food supply and population data
1998	87.75	FAO 2021	Apparent Consumption	Food supply and population data
1997	87.53	FAO 2021	Apparent Consumption	Food supply and population data
1996	86.59	FAO 2021	Apparent Consumption	Food supply and population data
1995	86.26	FAO 2021	Apparent Consumption	Food supply and population data
1994	86.18	FAO 2021	Apparent Consumption	Food supply and population data
1993	84.49	FAO 2021	Apparent Consumption	Food supply and population data
1992	86.44	FAO 2021	Apparent Consumption	Food supply and population data
1991	87.06	FAO 2021	Apparent Consumption	Food supply and population data
1990	89.46	FAO 2021	Apparent Consumption	Food supply and population data
1989	87.14	FAO 2021	Apparent Consumption	Food supply and population data

1988	87.62	FAO 2021	Apparent Consumption	Food supply and population data
1987	87.57	FAO 2021	Apparent Consumption	Food supply and population data
1986	87.73	FAO 2021	Apparent Consumption	Food supply and population data
1985	89.4	FAO 2021	Apparent Consumption	Food supply and population data
1984	89.76	FAO 2021	Apparent Consumption	Food supply and population data
1983	86.4	FAO 2021	Apparent Consumption	Food supply and population data
1982	85.49	FAO 2021	Apparent Consumption	Food supply and population data
1981	85.33	FAO 2021	Apparent Consumption	Food supply and population data
1980	83.52	FAO 2021	Apparent Consumption	Food supply and population data
1979	85.49	FAO 2021	Apparent Consumption	Food supply and population data
1978	82.06	FAO 2021	Apparent Consumption	Food supply and population data
1977	84.35	FAO 2021	Apparent Consumption	Food supply and population data
1976	80.96	FAO 2021	Apparent Consumption	Food supply and population data
1975	78.48	FAO 2021	Apparent Consumption	Food supply and population data
1974	76.5	FAO 2021	Apparent Consumption	Food supply and population data
1973	73.68	FAO 2021	Apparent Consumption	Food supply and population data

1972	75.09	FAO 2021	Apparent Consumption	Food supply and population data
1971	71.89	FAO 2021	Apparent Consumption	Food supply and population data
1970	70.41	FAO 2021	Apparent Consumption	Food supply and population data
1969	65.15	FAO 2021	Apparent Consumption	Food supply and population data
1968	68.45	FAO 2021	Apparent Consumption	Food supply and population data
1967	64.17	FAO 2021	Apparent Consumption	Food supply and population data
1966	71.11	FAO 2021	Apparent Consumption	Food supply and population data
1965	65.98	FAO 2021	Apparent Consumption	Food supply and population data
1964	62.37	FAO 2021	Apparent Consumption	Food supply and population data
1963	59.22	FAO 2021	Apparent Consumption	Food supply and population data
1962	59.4	FAO 2021	Apparent Consumption	Food supply and population data
1961	57.98	FAO 2021	Apparent Consumption	Food supply and population data
1938	124	Jónsson 1998	Approximated Consumption	
1930	137	Jónsson 1998	Approximated Consumption	
1920	151	Jónsson 1998	Approximated Consumption	
1910	150	Jónsson 1998	Approximated Consumption	

1900	145	Jónsson 1998	Approximated Consumption	
1890	148	Jónsson 1998	Approximated Consumption	
1880	174	Jónsson 1998	Approximated Consumption	
1870	199	Jónsson 1998	Approximated Consumption	
1863	231	Jónsson 1998	Approximated Consumption	
1855	235	Jónsson 1998	Approximated Consumption	
1849	234	Jónsson 1998	Approximated Consumption	
1840	237	Jónsson 1998	Approximated Consumption	
1819	220	Jónsson 1998	Approximated Consumption	
1795	208	Jónsson 1998	Approximated Consumption	
1784	219	Jónsson 1998	Approximated Consumption	
1770	238	Jónsson 1998	Approximated Consumption	

Table 2. Partial annual Icelandic fish consumption values per capita in kg.

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1401-1800	973.5	Jónsson 1998, p. 27	Approximated Consumption	Icelandic Búalög by-laws estimated rations	Household Servants

Explanatory Notes for Iceland 1500-2019

Figures from 1961 to 2019 come from the food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

The historian Guðmundur Jónsson estimates Icelandic fish consumption from 1770 to 1938 (Table 1) (Jónsson 1998, p. 25). The figures are split into two main blocks, from 1770 to 1869, and from 1870 to 1938. The figures from 1870-1938 are in part extrapolated from Icelandic consumption surveys conducted in 1939 and 1940 and a food basket study by Þorsteinn Þorsteinsson from 1922 (Jonsson p. 38). Jónsson directly employs Þorsteinsson's figures for urban areas but estimates lower consumption in rural regions. The ratio of rural and urban population was determined by population data from 1920 to 1940. Due to increasing food imports in the years from 1870 to 1920, Jónsson also assumes a 0.25% drop in fresh and salt fish consumption, and a 2% drop in dry fish over the period. Jónsson provides his figures in LW, having employed CFs from the book Icelandic Historical Statistics (Jónsson & Magnússon 1997, p. 305). Jónsson utilises various sources, including the old Icelandic Búalög by-law, to estimate that consumption remained unchanged from 1770 to 1869. However, he employs seasonal fish catch data to adjust consumption over this period (Jónsson 1998, p. 32).

Jónsson's 1770 to 1938 figures relate to daily adult male consumption in LW. To calculate yearly consumption, we multiply the daily figure by 365. To estimate women's consumption, we use an adult male equivalent figure of 0.85. This figure is based on the ratio of fish served to male and female servants in the Icelandic Búalög laws (Jonsson, 1998, p. 27). The figure of 0.85 is similar to AME estimates used for adult women in several modern studies (Weisell and Dop 2012; Coates et al., 2017; FAO, 2004). Final consumption figures are an average of male and female consumption. Because the consumption of other groups (such as children) is excluded, our estimate may be higher than reality. However, without precise demographic data, this is the best estimate we can generate.

Gunnar Karlsson (2007) suggested that Jónsson's eighteenth-century estimates were too low, instead suggesting that fish consumption was around 300 kg LW per year until 1800 before dropping by about 1 kg LW a year until 1900 when the average was around 200 kg LW. However, he also writes that Jónsson had good reason for reducing fish consumption in the second half of the nineteenth century as he agrees that imported plant foods had a significant impact on the Icelandic diet. Ultimately, Jónsson's figure has a more solid evidential and methodological foundation, so the current study uses Jónsson's estimate over Karlssons.

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Sweden

Summary Data for Sweden 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	24.61	24.61	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	24.84	24.84	1	20 national
Average of national estimates (FAOSTAT 2021; Wikberger 2000) - latter for 1960 only	1960-1979	25.64	25.64	1	20 national
National estimate (Wikberger 2000)	1946-1959	22.27	22.27	1	1 national
Average national estimate (Hushållsbudgeter 1943; Neset 2004)	1920-1938	28.94	28.94	1	2 national
National estimate based on extensive partial figures (Neset 2004)	1900-1913	33.22	33.22	3	18 partial
National estimate based on extensive partial figures (Neset 2004)	1850-1899	33.22	33.22	3	12 partial
National estimate based on extensive partial figures (Morell, 1989)	1800-1849	36.82	36.82	2	11 partial
National estimate based on extensive partial figures (Morell 1989; Utterström 1959).	1750-1799	48.47	48.47	2	18 partial
National estimate based on extensive partial figures (Morell 1989)	1700-1749	31.33	31.33	2	15 partial

National estimate based on extensive partial figures (Morell 1989)	1650-1699	47.82	47.82	2	11 partial
Low estimate average of partial values, high estimate (Morell 1987) - 1550 to 1599	1600-1649	53.33-114.66	84	3	1 national 3 partial
National estimate (Morell 1987).	1550-1599	114.66	114.66	2	1 national
No estimate available.	1500-1549				

Table 1. National annual Swedish fish consumption values per capita in kg.

Year	Live Weight (kg)	Source	Type	Basis
2019	23.62	FAO 2022	Apparent Consumption	Food supply and population data
2018	23.75	FAO 2022	Apparent Consumption	Food supply and population data
2017	23.92	FAO 2022	Apparent Consumption	Food supply and population data
2016	23.23	FAO 2022	Apparent Consumption	Food supply and population data
2015	22.93	FAO 2022	Apparent Consumption	Food supply and population data
2014	24.2	FAO 2022	Apparent Consumption	Food supply and population data
2013	24.43	FAO 2022	Apparent Consumption	Food supply and population data
2012	22.63	FAO 2022	Apparent Consumption	Food supply and population data
2011	23.89	FAO 2022	Apparent Consumption	Food supply and population data
2010	23.57	FAO 2022	Apparent	Food supply and population

			Consumption	data
2009	21.99	FAO 2021	Apparent Consumption	Food supply and population data
2008	24.74	FAO 2021	Apparent Consumption	Food supply and population data
2007	25.28	FAO 2021	Apparent Consumption	Food supply and population data
2006	25.55	FAO 2021	Apparent Consumption	Food supply and population data
2005	26.61	FAO 2021	Apparent Consumption	Food supply and population data
2004	27.2	FAO 2021	Apparent Consumption	Food supply and population data
2003	27.67	FAO 2021	Apparent Consumption	Food supply and population data
2002	26.34	FAO 2021	Apparent Consumption	Food supply and population data
2001	25.44	FAO 2021	Apparent Consumption	Food supply and population data
2000	25.29	FAO 2021	Apparent Consumption	Food supply and population data
1999	25.19	Wikberger 2000	Apparent Consumption	Official statistics
1999	24.97	FAO 2021	Apparent Consumption	Food supply and population data
1999	28.5	Wikberger 2000	Apparent Consumption	Official statistics
1998	24.82	FAO 2021	Apparent Consumption	Food supply and population data
1998	28.2	Wikberger 2000	Apparent Consumption	Official statistics
1997	25.84	FAO 2021	Apparent	Food supply and population

			Consumption	data
1997	27.4	Wikberger 2000	Apparent Consumption	Official statistics
1996	22.42	FAO 2021	Apparent Consumption	Food supply and population data
1995	25.37	FAO 2021	Apparent Consumption	Food supply and population data
1995	26.6	Wikberger 2000	Apparent Consumption	Official statistics
1994	25.13	FAO 2021	Apparent Consumption	Food supply and population data
1993	25.48	FAO 2021	Apparent Consumption	Food supply and population data
1992	25.04	FAO 2021	Apparent Consumption	Food supply and population data
1991	25.14	FAO 2021	Apparent Consumption	Food supply and population data
1990	25	FAO 2021	Apparent Consumption	Food supply and population data
1990	30.2	Wikberger 2000	Apparent Consumption	Official statistics
1989	25.32	FAO 2021	Apparent Consumption	Food supply and population data
1988	25.71	FAO 2021	Apparent Consumption	Food supply and population data
1987	25.11	FAO 2021	Apparent Consumption	Food supply and population data
1986	24.35	FAO 2021	Apparent Consumption	Food supply and population data
1985	24.08	FAO 2021	Apparent Consumption	Food supply and population data
1984	24.44	FAO 2021	Apparent	Food supply and population

			Consumption	data
1983	24.64	FAO 2021	Apparent Consumption	Food supply and population data
1982	24.62	FAO 2021	Apparent Consumption	Food supply and population data
1981	23.64	FAO 2021	Apparent Consumption	Food supply and population data
1980	25.62	FAO 2021	Apparent Consumption	Food supply and population data
1980	28.50	Wikberger 2000	Apparent Consumption	Official statistics
1979	25.01	FAO 2021	Apparent Consumption	Food supply and population data
1978	25.41	FAO 2021	Apparent Consumption	Food supply and population data
1977	26.27	FAO 2021	Apparent Consumption	Food supply and population data
1976	25.69	FAO 2021	Apparent Consumption	Food supply and population data
1975	26.4	FAO 2021	Apparent Consumption	Food supply and population data
1974	25.35	FAO 2021	Apparent Consumption	Food supply and population data
1973	25.01	FAO 2021	Apparent Consumption	Food supply and population data
1972	26.24	FAO 2021	Apparent Consumption	Food supply and population data
1971	26.96	FAO 2021	Apparent Consumption	Food supply and population data
1970	27.39	FAO 2021	Apparent Consumption	Food supply and population data
1970	26.7	Wikberger 2000	Apparent	Official statistics

			Consumption	
1969	25.65	FAO 2021	Apparent Consumption	Food supply and population data
1968	26	FAO 2021	Apparent Consumption	Food supply and population data
1967	25.24	FAO 2021	Apparent Consumption	Food supply and population data
1966	25.59	FAO 2021	Apparent Consumption	Food supply and population data
1965	24.43	FAO 2021	Apparent Consumption	Food supply and population data
1964	24.18	FAO 2021	Apparent Consumption	Food supply and population data
1963	24.89	FAO 2021	Apparent Consumption	Food supply and population data
1962	26.69	FAO 2021	Apparent Consumption	Food supply and population data
1961	26.02	FAO 2021	Apparent Consumption	Food supply and population data
1960	24.3	Wikberger 2000	Apparent Consumption	Official statistics
1950	22.00	Wikberger 2000	Apparent Consumption	Official statistics
1940	30.08	Hushållsbudgeter 1943	Observed Consumption	Household surveys
1933	25.33	Hushållsbudgeter 1943	Observed Consumption	Household surveys
1930/1940	32.55	Neset 2004, p. 162	Observed Consumption	Official statistics
1550	114.66	Morell 1987	Approximated Consumption	Average of servant, court, farm and craftsperson consumption.

Table 2. Partial annual Swedish fish consumption values per capita in kg.

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1915-28	28.56	Neset 2004, p. 162	Observed Consumption	Hospital dietary regulations	Hospital patients
1900-1906	33.22	Neset 2004, p. 162	Observed Consumption	Hospital dietary regulations	Hospital patients
1871-1890	33.22	Neset 2004, p. 162	Observed Consumption	Hospital dietary regulations	Hospital patients
1830	10	Morell 1989	Observed Consumption	Hospital records	Falu
1830	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1820	20	Morell 1989	Observed Consumption	Hospital records	Falu
1820	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1820	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1810	20	Morell 1989	Observed Consumption	Hospital records	Falu
1810	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1810	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1800	60	Morell 1989	Observed Consumption	Hospital records	Falu
1800	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1800	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1790	80	Morell 1989	Observed Consumption	Hospital records	Falu
1790	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1790	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1780	80	Morell 1989	Observed	Hospital records	Falu

			Consumption		
1780	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1780	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1770	80	Morell 1989	Observed Consumption	Hospital records	Falu
1770	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1770	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1770	16	Morell 1989	Observed Consumption	Hospital records	Enköping
1760	90	Morell 1989	Observed Consumption	Hospital records	Falu
1760	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1760	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1760	14	Morell 1989	Observed Consumption	Hospital records	Enköping
1750	70	Morell 1989	Observed Consumption	Hospital records	Falu
1750	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1750	40	Morell 1989	Observed Consumption	Hospital records	Weckholm
1750	17.5	Utterström 1959	Apparent Consumption	Records of domestic trade of herring	Herring only
1740	65	Morell 1989	Observed Consumption	Hospital records	Falu
1740	45	Morell 1989	Observed Consumption	Hospital records	Västerås
1740	25	Morell 1989	Observed Consumption	Hospital records	Weckholm
1730	45	Morell 1989	Observed Consumption	Hospital records	Falu
1730	45	Morell 1989	Observed Consumption	Hospital records	Västerås

1730	25	Morell 1989	Observed Consumption	Hospital records	Weckholm
1720	10	Morell 1989	Observed Consumption	Hospital records	Falu
1720	20	Morell 1989	Observed Consumption	Hospital records	Västerås
1720	15	Morell 1989	Observed Consumption	Hospital records	Weckholm
1710	30	Morell 1989	Observed Consumption	Hospital records	Falu
1710	20	Morell 1989	Observed Consumption	Hospital records	Västerås
1710	25	Morell 1989	Observed Consumption	Hospital records	Weckholm
1700	50	Morell 1989	Observed Consumption	Hospital records	Falu
1700	25	Morell 1989	Observed Consumption	Hospital records	Västerås
1700	25	Morell 1989	Observed Consumption	Hospital records	Weckholm
1690	7	Morell 1989	Observed Consumption	Hospital records	Falu
1690	20	Morell 1989	Observed Consumption	Hospital records	Västerås
1690	25	Morell 1989	Observed Consumption	Hospital records	Weckholm
1680	65	Morell 1989	Observed Consumption	Hospital records	Falu
1680	20	Morell 1989	Observed Consumption	Hospital records	Västerås
1670	182	Morell 1989	Observed Consumption	Hospital records	Falu
1670	20	Morell 1989	Observed Consumption	Hospital records	Västerås
1660	65	Morell 1989	Observed Consumption	Hospital records	Falu
1660	50	Morell 1989	Observed Consumption	Hospital records	Västerås
1650	12	Morell 1989	Observed Consumption	Hospital records	Falu

1650	60	Morell 1989	Observed Consumption	Hospital records	Västerås
1640	60	Morell 1989	Observed Consumption	Hospital records	Västerås
1630	70	Morell 1989	Observed Consumption	Hospital records	Västerås
1620	30	Morell 1989	Observed Consumption	Hospital records	Västerås

Table 3. Patients' fish consumption by hospital in kg LW - same as Table 2 data

Year	Falu	Västerås	Weckholm	Enköping
1830	10		40	
1820	20	45	40	
1810	20	45	40	
1800	60	45	40	
1790	80	45	40	
1780	80	45	40	
1770	80	45	40	16
1760	90	45	40	14
1750	70	45	40	
1740	65	45	25	
1730	45	45	25	
1720	10	20	15	
1710	30	20	25	
1700	50	25	25	
1690	7	20	25	
1680	65	20		
1670	182	20		
1660	65	50		
1650	12	60		
1640		60		
1630		70		

1620		30		

Explanatory Notes for Sweden 1500-2019

Figures from 1961 to 2019 come from the Food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

Intermittent yearly consumption figures are available from 1950 to 1999 from Sweden's national statistics agency (Wikberger 2000, p. 13). These figures are already in LW so required no conversion. All available figures are included in Table 1, but only the 1950 and 1960 estimates are used in our summary data as the available FAO figures are preferred from 1961 onwards. Other detailed national consumption figures from 1960 to 2021 are available from Jordbruksverkets statistikdatabas (2022), but these are not included here as again we use the FAO estimates to be consistent with other examples.

The Swedish National Board of Health and Welfare (Household Budgets) survey looked at 1,897 households from 1933 and 1940 (Kungl. Socialstyrelsen 1943). The average Household size was 4.09 persons (Kungl. Socialstyrelsen 1943, p. 6). The survey was conducted over two-week periods and was originally in hectogram PW, but we have converted it to kg LW using Helland's general CF of 1.82 (Kungl. Socialstyrelsen 1943, p. 40; Helland 1896). The survey data give us figures of 25.33 kg LW per capita in 1933 and 30.08 kg LW per capita in 1940. The figures indicate that 54% of consumption was herring, while the rest is listed as other fresh fish, shellfish, salt fish, and tinned products.

Tina-Simone Schmid Neset estimated daily fish consumption in Sweden from a variety of sources from 1871 to 2000 (Neset 2004, p. 162). Figures from 1871 to 1928 are based on hospital dietary regulations. For the period 1871 to 1890, Neset averaged 12 hospital consumption figures to reach an average daily intake of 0.05 kg of PW fish. For 1900 to 1906, 18 separate estimates resulted in the same figure of 0.05 kg (PW). An average of 9 figures for the period 1915 to 1928 results in an average daily intake of 0.043 kg (PW). To estimate yearly consumption, we multiplied these daily figures by 365 and then applied Helland's general CF of 1.82 (Helland 1896). This results in an average yearly intake of 33.22 kg LW in 1871-90 & 1900-06 and 28.56 kg LW in 1915-28.

Although these figures are classified as partial in our data, due to their extensive nature we have used them to represent national consumption in our summary estimates. For the summary period 1920-1938, Nesets figure for 1915-28 was combined with an estimate from Hushållsbudgeter to calculate national consumption. For the periods 1900-1913 and 1850-1899 Neset's figures were used alone to represent national consumption.

Neset's data for 1930/40 is derived from official statistics and shows a daily intake of 0.049 kg of PW fish. To estimate yearly consumption this daily figure was first multiplied by 365 and then multiplied by Helland's CF of 1.82 (Helland 1896) to reach a yearly intake of 32.55 kgLW.

Based on demographic records and records of domestic trade of herring, Gustav Utterström (1959) estimated a Swedish per capita consumption of herring in the latter half of the eighteenth century of 10.5 kg PW, or 17.5 kg LW using a conversion factor of 1.67 (Helland, 1896).

Prior to the work of Neset, Mats Morell also calculated Swedish food consumption from hospital records from the seventeenth to nineteenth centuries (Morell 1989). Calorie provisions in these hospitals were generally adequate, except for the period 1690-1727 when all food items except for butter and milk were in short supply. Inmates were overwhelmingly female above 60 years of age and Morell estimates a basic nutritional need around 1,900 kcal per person per day. Through the centuries, the diet was rich in carbohydrates and low in fat and proteins. Fish and meat decreased in importance through time as there was a move toward a more plant-based diet. Seventeenth-century regulations stipulated that fish be served four days a week, while eighteenth- and particularly nineteenth-century regulations became steadily more one-sidedly based on cereals. Salted herring was the only fish in continuous supply over the centuries, while a mix of marine and freshwater dried and salted fish were served on and off. Dried fish was a major component in the earlier years but did not appear after 1813 (Morell 1989, pp. 169, 177-192, 203, 272).

Fish consumption varied considerably through time, reflecting availability. Morell provided consumption figures in weights of edible matter, which we have converted to LW using Helland's CF for fresh sea fish of 1.82 (Helland 1896). The low opening figure for Falu hospital is based on a single year, 1659, when the fisheries may have been disturbed due to the Swedish-Danish war. All hospitals relied predominantly on herring, preferably from the Swedish west coast of Bohuslän, and when it was not available substituted with smaller Baltic herring. The records show an increase of consumption in the eighteenth century. This was no doubt driven by the Bohuslän herring phenomenon, which brought vast amounts of cheap fish protein to the Swedish market between 1747 and 1808. Morell calculated the energy provided by fish as a percentage of overall diet. At the hospital of Falu, fish provided about 10% of all energy in the late seventeenth century, declined to 5% 1700-1746, and rose to 8-9% in the latter

half of the eighteenth century. Overall, grain increased in importance at all hospitals while animal products of all kinds declined. Nevertheless, the records show a remarkable continuity of high fish consumption. Morell's studies show year-on year variability, reflecting changing availability, but the decadal averages show that hospitals maintained strict regulations of the weekly dietary routine. All these figures have been added to Table 2, but are also shown separated by hospital in Table 3. These figures are so extensive we decided to use them alone to estimate national consumption in the summary periods 1800-1849, 1700-1749 and 1650-1699. Morrel's figure's were also used in combination with Utterström for the summary period 1750-1799.

The boom in fish consumption during the second half of the eighteenth century was most likely due to the Bohuslän herring phenomenon which saw large volumes of cheap fish flooding the markets from 1747 to 1808 (Holm et al 2020).

Around 1550, household accounts provide information of fish consumption in diverse social settings (crown estate, servants, guards, court, foundry workers, builders, and master joiner's servants) (Morell 1987). Fish consumption varied from 16 to 234 kg per year with an average of 101 kg PW. This equated to 184 kg of LW fish using Helland's general CF of 1.82 (Helland 1896). Farm workers ate the most fish, followed by servants, while court followers and craftspeople consumed a higher ratio of meat to fish. We do not know how much of this fish intake came from lakes and rivers. The eighteenth-century hospital records (Morell 1989) show the bulk of fish was herring, so we estimate that marine fish consumption was at least 60%, or 110 kg LW marine fish consumption.

Bibliography for Sweden 1500-2019

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Denmark

Summary Data for Denmark 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021a; 2022)	2000-2019	24.88	24.88	1	20 national
Average of national estimates (FAOSTAT 2022)	1980-1999	23.34	23.34	1	20 national
Average of national estimates (FAOSTAT 2022)	1960-1979	23.03	23.03	1	19 national
Interpolated value	1946-1959	16.68	16.68	5	0
Average of national estimates (Statistiske Meddelelser 1944)	1920-1938	10.33	10.33	1	2 national
Interpolated value	1900-1913	13.67	13.67	5	0
Average of national estimates (Danske arbejderfamiliers forbrug 1901; Hyldtoft 2019)	1850-1899	13-21	17	2	1 national
Interpolated value	1800-1849	20.25	20.25	5	0
Low estimate partial value (Pontoppidan 1764), high estimate (Danske arbejderfamiliers forbrug 1901; Hyldtoft 2019) from 1897	1750-1799	17-30	23.5	3	1 national 1 partial
Interpolated value	1700-1749	46.00	46.00	5	0
Interpolated value	1650-1699	68.50	68.50	5	0

Low estimate partial value (Dedenroth-Schou 1984), high estimate (Danske arbejderfamiliers forbrug 1901; Hyldtoft 2019) from 1897	1600-1649	17-165	91.00	3	1 national 1 partial
No estimate available	1550-1599				0
No estimate available	1500-1549				0

Table 1. National annual Danish fish consumption values per capita in kg.

Year	Live Weight (kg)	Source	Type	Basis
2019	20.17	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2018	26.91	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2017	26.99	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2016	26.12	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2015	26.93	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2014	25.51	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2013	26.07	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2012	25.04	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2011	25.34	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2010	24.52	FAOSTAT 2022	Apparent Consumption	Food supply and population data
2009	24.44	FAOSTAT 2021a	Apparent	Food supply and

			Consumption	population data
2008	22.03	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2007	24.28	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2006	23.99	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2005	24.61	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2004	24.86	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2003	25.63	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2002	23.5	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2001	23.28	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
2000	22.02	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1999	26.37	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1998	26.49	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1997	27.25	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1996	24.26	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1995	25.96	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1994	27.54	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1993	27.13	FAOSTAT 2021a	Apparent	Food supply and

			Consumption	population data
1992	26.94	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1991	21.24	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1990	21.06	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1989	21.99	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1988	21.5	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1987	21.74	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1986	21.63	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1985	21.82	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1984	20.99	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1983	21.01	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1982	20.5	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1981	20.9	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1980	20.51	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1979	20.02	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1978	19.82	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1977	21.24	FAOSTAT 2021a	Apparent	Food supply and

			Consumption	population data
1976	20.37	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1975	22.79	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1974	24.81	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1973	24.09	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1972	24.04	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1971	25.76	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1970	27.71	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1969	26.96	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1968	24.11	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1967	21.79	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1966	22.49	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1965	23.49	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1964	23.3	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1963	22.42	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1962	21.41	FAOSTAT 2021a	Apparent Consumption	Food supply and population data
1961	20.99	FAOSTAT 2021a	Apparent	Food supply and

			Consumption	population data
1939/40	13.67	Statistiske Meddelelser 1944	Observed Consumption	Household surveys
1931	9.56	Statistiske Meddelelser 1936	Observed Consumption	Household surveys
1922	11.1	Statistiske Meddelelser 1922	Observed Consumption	Household surveys
1897	13-21	Danske arbejderfamiliers forbrug 1901; Hyldtoft 2016, p.40; 2019, pp.42-43	Approximated Consumption	Original data for male consumption only, AME figures used to calculate women's intake.

Table 2. Partial annual Danish fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
1764	30	Pontoppidan 1764	Apparent Consumption	City of Copenhagen only, based on figures from Table 3
1610	165	Dedenroth-Schou 1984	Apparent Consumption	Figures from a single Estate

Table 3. Per capita fish consumption in Copenhagen, 1939

Species / Product	PW (kg & salt herring in pieces)	CF	Live Weight (kg)
Cod	2.35	1.82	4.28
Plaice	1.49	1.82	2.71
Fresh herring	1.62	1.82	2.95
Mackerel	0.41	1.82	0.75
Hornfish	0.42	1.82	0.76
Eel	0.27	1.82	0.49
Salt cod	0.6	4.7	2.82
Salt herring (pieces)	5.12	0.1	0.51
Fish mince	0.41	1.82	0.75

Smoked herring	0.8	1.82	1.46
Total	**13.49**		**17.47**

Table 4. Per capita fish consumption in provincial towns, 1939

Species / Product	PW (kg & salt herring in pieces)	CF	Live Weight (kg)
Cod	2	1.82	3.64
Plaice	1.83	1.82	3.33
Fresh herring	1.91	1.82	3.48
Mackerel	0.34	1.82	0.62
Hornfish	0.26	1.82	0.47
Eel	0.34	1.82	0.62
Salt cod	0.36	4.7	1.69
Salt herring (pieces)	3.96	0.1	0.4
Fish mince	0.04	1.82	0.07
Smoked herring	0.17	1.82	0.31
Total	**11.21**		**14.63**

Table 5. Per capita fish consumption in rural district towns, 1939

Species / Product	PW (kg & salt herring in pieces)	CF	Live Weight (kg)
Cod	1.34	1.82	2.4388
Plaice	1.4	1.82	2.548
Fresh herring	1.7	1.82	3.094
Mackerel	0.46	1.82	0.8372
Hornfish	0.24	1.82	0.4368
Eel	0.32	1.82	0.5824
Salt cod	0.25	4.7	1.175
Salt herring, pieces	2.63	0.1	0.263
Fish mince	0	1.82	0
Smoked herring	0.04	1.82	0.0728

Total	**8.38**		**11.448**

Table 6. Per capita fish consumption in In rural districts with no towns, 1939

Species / Product	PW (kg & salt herring in pieces)	CF	Live Weight (kg)
Cod	1.34	1.82	2.44
Plaice	1.4	1.82	2.55
Fresh herring	1.7	1.82	3.09
Mackerel	0.46	1.82	0.84
Hornfish	0.24	1.82	0.44
Eel	0.32	1.82	0.58
Salt cod	0.25	4.7	1.18
Salt herring, pieces	2.63	0.1	0.26
Fish mince	0	1.82	0
Smoked herring	0.04	1.82	0.07
Total	**8.38**		**11.448**

Table 7. Total fish supplied to Copenhagen in 1764

Product	barrels	pieces	skippund	metric tonnes LW
salted herring	5000			500
salted cod	300			141
salted eel	200			40
salmon	300			60
flatfish		400000		50
Bergen cod			2000	1504
Oyster	400	[640,000?]		?
Total seafood				**2295**

Explanatory Notes for Denmark 1500-2019

Figures from 1961 to 2019 come from the Food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

In 1939/40 a survey of 884 Danish families, with an average size of 4.01 persons, was conducted (Statistiske Meddelelser 1944). The survey showed that Copenhagen had an average per capita fish consumption of 17.47 kg LW. The full breakdown of species and the CFs used are shown in Table 3. In provincial towns the average per capita consumption was 14.63 kg LW. Again, the full breakdown is shown in Table 4. In towns in rural districts the average per capita consumption was 11.77 kg LW (See Table 5 for more). Finally, the average consumption in rural districts with no towns was 11.45 kg LW per capita. You can see Table 6 for a breakdown of these figures. According to the Danish national census of 1940, Copenhagen accounted for 23.15% of the total population. Provincial towns accounted for 24.26%, towns in rural districts for 16.48% and rural districts 36.1% (Statistiske Meddelelser 1944). Given these figures, we estimate national seafood consumption was 13.67 kg LW.

A 1931 survey of 484 families with an average size of 3.86 persons indicates the per capita consumption in different parts of Denmark (Statistiske Meddelelser 1936, p. 44). For the remainder of these estimates we assume that individual herring weighed 100g each and for every other species we apply Helland's general CF of 1.82 (Helland 1896). In Copenhagen the average family size was 3.59 persons. On average citizens consumed 9.99 kg PW cod, 7.31 kg PW plaice, 6.68 kg fresh herring, and 23.72 pieces of salted herring. This equates to a per capita seafood consumption of 12.82 kg LW. In provincial towns (average family size 3.89 persons) people ate 9.37 kg PW cod, 6.3 kg PW plaice, 6.39 kg PW fresh herring, and 15.86 pieces of salted herring. This equals a per capita seafood consumption of 10.73 kg LW. In rural districts (average family size 4.22 persons), on average people consumed 5.12 kg cod, 5.42 kg plaice, 6.64 kg fresh herring, and 18.36 pieces of salted herring. This gives us a per capita seafood consumption of 7.84 kg. According to the national census of 1930 Copenhagen accounted for 21.72% of the Danish population, Provincial towns for 22.19% and Rural districts 56.1% (Statistiske Meddelelser 1931). Based on these figures national per capita seafood consumption was 9.56 kg per capita. The decline from the 11.1 kg in 1922 probably reflects declining living standards due to the economic depression in the 1930s.

A 1922 survey of 287 families with an average size of 3.75 persons showed an average consumption of 46.56 pieces of herring, 6.71 pieces of mackerel, 31.03 kg fish, of which 11.76 fresh cod, 5.49 fresh plaice, 1.08 salt cod and 12.7 other species (Statistiske Meddelelser 1922, p. 40). Counting one herring as 100 g and a mackerel 300 g, and a CF of 4.7 for salt cod (Nicholls 2021), this amounts to a total consumption of (4.656 + 2.013 + 5.076) + (11.76 + 5.49 + 12.7) = 41.695 kg LW per family, and 11.119 kg LW per capita.

In 1897 the Danish National Bureau of Statistics conducted a survey of annual expenditure by 258 urban and rural working-class families across the country. The accounts document socially and geographically distinct consumption patterns of the monetised economy. Average expenditure on fish per person amounted to 2.5 DKK, which would have bought about 5 kg LW of cod (Danske arbejderfamiliers forbrug 1901). There are no detailed statistics for retail fish prices for the time so purchasing power is estimated on the known landing price per kg cod of around 0.20 DKK (Fiskeri-Beretning for Finantsaaret 1897-1898 1899) and applying a typical retail price increase of 2.5 times higher. In addition to the survey of the working class, there are a number of accounts from other social contexts collected between 1860 and 1914. Peasants and smallholders seem not to have had much fish at all. The urban middle-class had a higher consumption of fresh fish than any other social group, while some working-class families regularly spent money on fish, amounting to as much as 3 and 4 % of their total food expenditure. Fish eating was calculated in standard units of consumption per adult male and ranged between 8 and 13 kg PW (Hyldtoft 2016, p.40; 2019, pp.42-43). To calculate women's consumption, we use a standard AME of 0.806 (Weisell and Dop, 2012, p. 159), which gives us a range of 6.5 to 10.5 kg PW (Weisell & Dop, 2012). To calculate average LW consumption we use Helland's general CF of 1.82 and average consumption between men and women. This gives us an average consumption range of 13-21 kg LW per capita around the year 1900.

On the island of Sjælland, the annual land labourer's pay included a quarter-barrel equivalent to 20 kg PW or 33.4 kg LW (applying a CF of 1.67 (Helland 1896)) of herring which again could be had cheaply off local fishers (Friis 1969, pp. 33-68). By contrast, in 1830 farm labourers in the Vejle region (near Koldinghus) had no fish at all. Their diet of more than 4,500 kcal was 80% vegetables, largely grain, 16% dairy products, and less than 4% meat (Hyldtoft 2016, p. 153). Social surveys of the late nineteenth century showed little or no seafood consumption among rural workers. Thus, it seems that the rural diet in Denmark no longer included seafood unless locally available.

In 1764, the topographer Erich Pontoppidan reported on the trade of fish in Copenhagen. He seems to have based his figures on reports by customs officers at the city gates as well as by the harbour and therefore provides good and detailed data (Table 7) (Pontoppidan 1764). The figures indicate that the inhabitants of the city had an annual per capita consumption of 30 kg LW. Oysters were a common

food. If we assume that a barrel contained 1,600 shells, as we know it did in London, a supply of 640,000 oysters would have ensured each citizen a yearly feast of 6 oysters - or 12 oysters every fortnight for 2,000 people of the social and economic elite.

There are additional estimates of dried fish consumption provided for 1802-1804 (Hyldtoft 2012, p 161). However, the author states that this is a guess, and then converted to LW consumption equals 148 kg p/c which seems highly unlikely. Therefore, we have elected to not use these figures.

Thestrup (1971) also provides figures for this period, but his figures do not include fresh or salted fish, so we have not used them in this study.

Danish seventeenth-century records of rural consumption indicate a fish-rich diet. Accounts for the year 1610 from the estate of Koldinghus provide details of year-round consumption by sixty adults at the manor house and outlying farm. Fish consumption on the estate averaged 165 kg of LW fish per person, about 10% of all foodstuffs per person, or 28% of PW animal food. The figure is based on the conversion of historical units back to modern equivalents from Berntsen 1656. Norwegian cod ("Bergen cod") made up 56% of the total fish eaten, while haddock and flatfish held an equal share of 30% each. Eel, salmon and imported Flemish herring were eaten at the governor's table. The averages disguise the social difference indicated by the fact that only 14 people ate at the governor's table while 33 working people got the second servings of the lord's table, and therefore probably missed out on the choicest food such as imported Flemish herring. An additional 12 people at the outfarm had a marine diet as well, but only consisting of local seafish (Dedenroth-Schou, 1984). Overall, the account shows a high degree of monetisation of the seafood diet, considering that little of the documented fish consumption was provided from local resources despite Koldinghus being by a Baltic fjord (Dedenroth-Schou 1984).

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Norway

Summary Data for Norway 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	42.32	42.32	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	41.98	41.98	1	20 national
Average of national estimates (FAOSTAT 2021)	1960-1979	40.58	40.58	1	19 national
Interpolated value	1946-1959	34.37	34.37	5	0
Low estimate (Norges offisielle statistikk 1929), high estimate (Norges offisielle statistikk 1921) - both partial figures but used based on extensive coverage.	1920-1938	24.1-32.19	28.15	3	2 partial
Interpolated value.	1900-1913	47.68	47.68	5	0
Average of national estimates (Helland 1896; Broch 1876)	1850-1899	67.2	67.2	2	2 national
Interpolated value	1800-1849	76.60	76.60	5	0
Low estimate based on 1850-1899, high estimate (Døssland 1996)	1750-1799	57-115	86	4	1 national 1 partial
Low estimate based on 1850-1899, high estimate (Lindanger 1996)	1700-1749	57-115	86	4	1 national 1 partial

No estimate available.	1650-1699				
No estimate available.	1600-1649				
No estimate available.	1550-1599				
No estimate available.	1500-1549				

Table 1. National annual Norwegian fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
2019	39.89	FAO 2022	Apparent Consumption	Food supply and population data
2018	40.19	FAO 2022	Apparent Consumption	Food supply and population data
2017	40.51	FAO 2022	Apparent Consumption	Food supply and population data
2016	41.43	FAO 2022	Apparent Consumption	Food supply and population data
2015	39.9	FAO 2022	Apparent Consumption	Food supply and population data
2014	42.27	FAO 2022	Apparent Consumption	Food supply and population data
2013	44.75	FAO 2022	Apparent Consumption	Food supply and population data
2012	43.66	FAO 2022	Apparent Consumption	Food supply and population data
2011	43.19	FAO 2022	Apparent Consumption	Food supply and population data
2010	46.41	FAO 2022	Apparent Consumption	Food supply and population data
2009	48.18	FAO 2021	Apparent Consumption	Food supply and population data
2008	48.64	FAO 2021	Apparent Consumption	Food supply and population data
2007	46.99	FAO 2021	Apparent Consumption	Food supply and population data
2006	45.18	FAO 2021	Apparent Consumption	Food supply and population data

2005	47	FAO 2021	Apparent Consumption	Food supply and population data
2004	45.89	FAO 2021	Apparent Consumption	Food supply and population data
2003	38.04	FAO 2021	Apparent Consumption	Food supply and population data
2002	36.18	FAO 2021	Apparent Consumption	Food supply and population data
2001	33.23	FAO 2021	Apparent Consumption	Food supply and population data
2000	34.82	FAO 2021	Apparent Consumption	Food supply and population data
1999	38.01	FAO 2021	Apparent Consumption	Food supply and population data
1998	40.72	FAO 2021	Apparent Consumption	Food supply and population data
1997	41.87	FAO 2021	Apparent Consumption	Food supply and population data
1996	45.98	FAO 2021	Apparent Consumption	Food supply and population data
1995	41.33	FAO 2021	Apparent Consumption	Food supply and population data
1994	46.1	FAO 2021	Apparent Consumption	Food supply and population data
1993	43.33	FAO 2021	Apparent Consumption	Food supply and population data
1992	43	FAO 2021	Apparent Consumption	Food supply and population data
1991	42.2	FAO 2021	Apparent Consumption	Food supply and population data
1990	42.47	FAO 2021	Apparent Consumption	Food supply and population data
1989	41.61	FAO 2021	Apparent Consumption	Food supply and population data
1988	40.82	FAO 2021	Apparent Consumption	Food supply and population data

1987	42.57	FAO 2021	Apparent Consumption	Food supply and population data
1986	40.9	FAO 2021	Apparent Consumption	Food supply and population data
1985	40.88	FAO 2021	Apparent Consumption	Food supply and population data
1984	40.76	FAO 2021	Apparent Consumption	Food supply and population data
1983	41.12	FAO 2021	Apparent Consumption	Food supply and population data
1982	42.52	FAO 2021	Apparent Consumption	Food supply and population data
1981	41.13	FAO 2021	Apparent Consumption	Food supply and population data
1980	42.26	FAO 2021	Apparent Consumption	Food supply and population data
1979	40.88	FAO 2021	Apparent Consumption	Food supply and population data
1978	40.03	FAO 2021	Apparent Consumption	Food supply and population data
1977	38.74	FAO 2021	Apparent Consumption	Food supply and population data
1976	38.45	FAO 2021	Apparent Consumption	Food supply and population data
1975	41.75	FAO 2021	Apparent Consumption	Food supply and population data
1974	42.52	FAO 2021	Apparent Consumption	Food supply and population data
1973	43.3	FAO 2021	Apparent Consumption	Food supply and population data
1972	43.01	FAO 2021	Apparent Consumption	Food supply and population data
1971	35.32	FAO 2021	Apparent Consumption	Food supply and population data
1970	42.97	FAO 2021	Apparent Consumption	Food supply and population data

1969	41.71	FAO 2021	Apparent Consumption	Food supply and population data
1968	40.69	FAO 2021	Apparent Consumption	Food supply and population data
1967	35.65	FAO 2021	Apparent Consumption	Food supply and population data
1966	41.32	FAO 2021	Apparent Consumption	Food supply and population data
1965	42.93	FAO 2021	Apparent Consumption	Food supply and population data
1964	40.17	FAO 2021	Apparent Consumption	Food supply and population data
1963	41.78	FAO 2021	Apparent Consumption	Food supply and population data
1962	39.57	FAO 2021	Apparent Consumption	Food supply and population data
1961	40.25	FAO 2021	Apparent Consumption	Food supply and population data
1893	77.4	Helland 1896	Apparent Consumption	
1867-1871	57	Broch 1876	Approximated Consumption	

Table 2. Partial annual Norwegian fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1927-1928	24.1	Norges offisielle statistikk 1929	Observed Consumption	Household surveys from four south Norwegian cities	Manual labourer and functionaries families in Southern Norway
1918-19	32.19	Norges offisielle statistikk 1921	Observed Consumption	Household surveys in Oslo and Bergen	Families in Oslo and Bergen
1787	100-130	Døssland 1996	Approximated Consumption	County survey of coastal farmers; adult only	Coastal farmers

1700	100-130	Lindanger 1996	Approximated Consumption	Household survey	Single family

Table 3. Additional annual Norwegian fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1620	45	Semmingsen 1939	Observed Consumption	Oslo hospital records	Hospital patients

Table 4 - Per capita fish consumption of working families in Southern Norway, 1927-1928 (kg LW)

Species / Product	PW	CF	Live Weight (kg)
whale meat	0.87	20	17.4
cod	4.71	1.82	8.57
saithe	11.15	1.82	20.29
haddock	0.98	1.82	1.78
mackerel	3.65	1.82	6.64
halibut	0.71	1.82	1.29
flounder	0.2	1.82	0.36
small herring	1.66	1.82	3.02
other herring	2.13	1.82	3.88
other fish	3	1.82	5.46
salt cod	3.45	4.7	16.22
salt herring	1.5	1.82	2.73
salt golden redfish	1.52	1.82	2.77
other salt fish	1.09	1.82	1.98
dried fish	1.07	7.7	8.24
smoked fish	1.1	1.82	2
lutefisk (dried cod)	2.26	4.7	10.62
shellfish	0.14	10	1.4

other fish goods	2.87	1.82	5.22
tinned fish balls	2.47	1.82	4.5
tinned sardines	1	1.82	1.82
Total	**47.53**		**126.2**
Per Capita Consumption			**28.05**

Table 5 - Per capita fish consumption of functionaries families in Southern Norway, 1927-1928 (kg LW)

Species / Product	PW	CF	Live Weight (kg)
whale meat	1.22	20	24.4
cod	4.67	1.82	8.5
saithe	0.48	1.82	0.87
haddock	0.24	1.82	0.44
mackerel	5.09	1.82	9.26
kveite	1.21	1.82	2.2
flounder	0.13	1.82	0.24
small herring	0.96	1.82	1.75
other herring	1.08	1.82	1.97
other fish	0.82	1.82	1.49
salt cod	2.26	4.7	10.62
salt herring	2.04	1.82	3.71
salt golden redfish	0.04	1.82	0.07
other salt fish	0.01	1.82	0.02
dried fish	0.41	7.7	3.16
smoked fish	0.52	1.82	0.95
lutefish (dried cod)	0.88	4.7	4.14
shellfish	0.25	10	2.5
other fish goods	2.92	1.82	5.31
tinned fish balls	3.36	1.82	6.12

tinned sardines	1.35	1.82	2.46
Total	**29.94**		**90.17**
Per Capita Consumption			**20.04**

Table 6. Daily adult consumption, Melchior Falch's observations, SW Norway, 1787 (Døssland 1996)

Food	Kcal per day/person	% of total calories
Oats	897	35
Barley	600	23
Milk	340	13
Butter	87	3
Meat (beef, lamb)	42	2
Pork	52	2
Cheese	28	1
Herring	166	7
Dried cod/saithe	360	14
Total	**2572**	**100**

Explanatory Notes for Norway 1500-2019

Figures from 1961 to 2019 come from the Food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

The 1927-1928 figure is based on 166 accounts, of which 135 accounts by manual labourers and 31 accounts by functionaries (clerks and civil servants), resident in four south Norwegian cities in 1927-1928 (Norges offisielle statistikk 1929). Total number of individuals 747, average family size 4.5 in working families, 4.1 in functionaries. The socially distinct per capita figures are interesting. The full breakdown of consumption and the CF used can be viewed in Tables 4 and 5. We estimate the consumption for working families at 28.05 kg LW per capita, while functionaries families had a

consumption of 20.04 kg LW per capita. An average of these two gives us a per capita consumption of 24.1 kg LW for Southern Norway.

Based on 82 accounts of 82 families of a total of 444 individuals in Oslo and Bergen in the year Sep 1918 to Sep 1919, the reported consumption of fish in this year was 53.47 kg PW per family, consisting of 5.414 individuals (Norges offisielle statistikk 1921). The composition of the fish is only given by value, showing that poorer families had a somewhat higher consumption of salted products than wealthier families but not a huge difference. The money spent on fish was roughly evenly divided between fresh and salted/cured fish. The fresh amounts will have been considerably more expensive than the salted. However, for reasons of being cautious we assume that the fish was evenly divided between fresh fish (CF 1.82) and salted (CF 4.7). Accordingly, families in the cities of Oslo and Bergen consumed 174.3 kg LW or 32.19 kg per capita in 1921.

In 1893, the cultural geographer Amund Helland provided the apparent consumption of fish in Norway at 18.63 kg CW or 42.5 kg PW per capita, based on a review of landings, exports and domestic trade. We used this information to calculate per capita consumption of 77.4 LW using a CF of 1.82 (Helland, 1896).

The first survey of national consumption was published by the statistician O. J. Broch (1876). He based his results on statistics for 1867-1871 which did not include seafood. He estimated that the consumption of fish was no less than that of meat, 25 kg p/c (Broch 1876, p.29). If Broch's figure is in CW, similar to Helland's calculation, we may estimate a national consumption in the order of 57 kg LW p/c.

The western Atlantic districts of Norway ate a lot of fish. An impression may be derived from Melchior Falch's 1787 observations of household consumption. Falch was a landholder and district magistrate of Sunnmøre in southwest Norway (Døssland 1996). Table 6 summarises the composition of daily adult consumption in the district. Fish alone accounted for about 20% of the family's energy needs. A typical family of seven people consumed 37 kg PW of dried cod, 296 kg PW of dried saithe, and 300 kg PW of salted herring every year. Eighteenth-century CF's for cod and saithe PW to LW varied between 3.3 and 4.5, meaning a typical family needed between 1,100 and 1,500 kg LW of cod and saithe or between 160 kg and 215 kg LW per person per year. We use a CF for herring of 1.2, meaning each family member ate 90 kg LW of herring per year. (Døssland et al. 2014, p.161). These figures equate to an average annual consumption of 200-260 kg LW of cod, saithe, and herring. Fish consumption in the northern counties of Finnmark and Nordland was probably significantly higher, while it was very low in some inland parts of Norway. The national average is therefore likely to have been significantly lower than Falch's observed consumption at an estimated 100-130 kg per capita.

From around 1700, we have an assessment of the caloric expenses in one coastal farmhouse of three adults, two children under ten years of age, and the grandmother (Lindanger, 1996, pp. 82-95). They consumed 280 kg of grain in a year and 2.2 tonnes of milk. This grain consumption may be estimated to be about 1,500 kcal per adult per day and 1,000 kcal of grain for the children and the elderly female. The milk would have covered 600 kcal per person. By an average need of at least 2,500-2,700 kcal per adult, the remainder would have been covered by a mix of 400-600 kcal of eggs, fish, and meat, very similar to Melchior Falch's observations. Overall, these figures indicate that seafood consumption in 1700 was likely very similar to that in 1780 at an estimated 100-130 kg per person.

Unfortunately, it seems impossible to estimate consumption in earlier centuries. A study of the accounts of the Oslo hospital found that in 1620 patients received a diet of 95 kg meat, 5 kg dried fish and 1.5 kg salted fish, equalling 45 kg LW fish (Semmingsen et al. 1939). By 1654 rations had been cut decisively. However, this figure is a poor representation of fish consumption across the whole of Norway as it is limited to Oslo. For this reason, we have not included it in our summary figures (see Table 3).

The inhabitants of the Faroe Islands had a very similar pattern of consumption to people in western Norway, with a heavy reliance on fish in their daily diets. It seems reasonable therefore to estimate per capita consumption of 200-260 kg LW (Landt 1800, pp. 419-421).

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Germany

Summary Data for Germany 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	10.05	10.05	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	10.87	10.87	1	20 national
Average of national estimates (FAOSTAT 2021; Teuteberg 1988) - later for 1960-61	1960-1979	10.34	10.34	1	20 national
Average of national estimates (Teuteberg 1988)	1946-1959	12.05	12.05	1	10 national
Average of national estimates (Teuteberg 1988)	1920-1938	11	11	1	14 national
Average of national estimates (Teuteberg 1988; Saalfeld 1984)	1900-1913	8.37	8.37	1	15 national
Average of national estimates (Teuteberg 1988; Saalfeld 1984)	1850-1899	4.62	4.62	1	51 national
Average of national estimates (Saalfeld 1984)	1800-1849	6	6	2	1 national
Low from 1800-1849, high average of figures (Saalfeld 1964; Hitzbleck 1971; Israel 1995; Wubs-Mrozewicz 2009; Nedkvitne 2014; Rössner 2008)	1750-1799	5.11-6	5.56	4	1 national 4 partial
Low (Hitzbleck 1971), high from 1800-1849.	1700-1749	3.4-6	4.7	3	1 national 1 partial

Low (Israel 1995; Wubs-Mrozewicz 2009; Nedkvitne 2014; Rössner 2008), high from 1800-1849	1650-1699	2.43-6	4.22	4	1 national 1 partial
Low (Israel 1995; Wubs-Mrozewicz 2009; Nedkvitne 2014; Rössner 2008), high from 1800-1849.	1600-1649	3.49-6	4.75	4	1 national 1 partial
Interpolated value	1550-1599	4.17	4.17	5	0
Low (Hitzbleck 1971; Israel 1995; Wubs-Mrozewicz 2009; Nedkvitne 2014; Rössner 2008), high from 1800-1849.	1500-1549	1.16-6	3.58	4	1 national 1 partial

Table 1. National annual German fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
2019	8.26	FAO *2022*	Apparent Consumption	Food supply and population data
2018	8.3	FAO *2022*	Apparent Consumption	Food supply and population data
2017	8.34	FAO *2022*	Apparent Consumption	Food supply and population data
2016	9.04	FAO *2022*	Apparent Consumption	Food supply and population data
2015	8.43	FAO *2022*	Apparent Consumption	Food supply and population data
2014	8.39	FAO *2022*	Apparent Consumption	Food supply and population data
2013	8.35	FAO *2022*	Apparent Consumption	Food supply and population data
2012	9.8	FAO *2022*	Apparent Consumption	Food supply and population data

2011	10.34	FAO *2022*	Apparent Consumption	Food supply and population data
2010	10	FAO *2022*	Apparent Consumption	Food supply and population data
2009	9.94	FAO *2021*	Apparent Consumption	Food supply and population data
2008	10.99	FAO *2021*	Apparent Consumption	Food supply and population data
2007	11.77	FAO *2021*	Apparent Consumption	Food supply and population data
2006	11.41	FAO *2021*	Apparent Consumption	Food supply and population data
2005	10.72	FAO *2021*	Apparent Consumption	Food supply and population data
2004	10.66	FAO *2021*	Apparent Consumption	Food supply and population data
2003	11.21	FAO *2021*	Apparent Consumption	Food supply and population data
2002	11.28	FAO *2021*	Apparent Consumption	Food supply and population data
2001	12.45	FAO *2021*	Apparent Consumption	Food supply and population data
2000	11.29	FAO *2021*	Apparent Consumption	Food supply and population data
1999	9.77	FAO *2021*	Apparent Consumption	Food supply and population data
1998	12.34	FAO *2021*	Apparent Consumption	Food supply and population data
1997	11.15	FAO *2021*	Apparent Consumption	Food supply and population data
1996	11.04	FAO *2021*	Apparent Consumption	Food supply and population data

1995	11.58	FAO *2021*	Apparent Consumption	Food supply and population data
1994	11.76	FAO *2021*	Apparent Consumption	Food supply and population data
1993	11.3	FAO *2021*	Apparent Consumption	Food supply and population data
1992	11.8	FAO *2021*	Apparent Consumption	Food supply and population data
1991	11.55	FAO *2021*	Apparent Consumption	Food supply and population data
1990	12.38	FAO *2021*	Apparent Consumption	Food supply and population data
1989	10.94	FAO *2021*	Apparent Consumption	Food supply and population data
1988	10.03	FAO *2021*	Apparent Consumption	Food supply and population data
1987	9.68	FAO *2021*	Apparent Consumption	Food supply and population data
1986	10.82	FAO *2021*	Apparent Consumption	Food supply and population data
1985	9.79	FAO *2021*	Apparent Consumption	Food supply and population data
1984	10.52	FAO *2021*	Apparent Consumption	Food supply and population data
1983	10.49	FAO *2021*	Apparent Consumption	Food supply and population data
1982	9.99	FAO *2021*	Apparent Consumption	Food supply and population data
1981	10.19	FAO *2021*	Apparent Consumption	Food supply and population data
1980	10.3	FAO *2021*	Apparent Consumption	Food supply and population data

1979	9.6	FAO *2021*	Apparent Consumption	Food supply and population data
1978	9.63	FAO *2021*	Apparent Consumption	Food supply and population data
1977	9.64	FAO *2021*	Apparent Consumption	Food supply and population data
1976	10.87	FAO *2021*	Apparent Consumption	Food supply and population data
1975	11.03	FAO *2021*	Apparent Consumption	Food supply and population data
1974/75	10.9	Teuteberg 1988	Apparent Consumption	Food supply and population data
1974	11.68	FAO *2021*	Apparent Consumption	Food supply and population data
1973/74	11	Teuteberg 1988	Apparent consumption	
1973	11.54	FAO *2021*	Apparent Consumption	Food supply and population data
1972/73	9.5	Teuteberg 1988	Apparent consumption	
1972	9.79	FAO *2021*	Apparent Consumption	Food supply and population data
1971/72	9.8	Teuteberg 1988	Apparent consumption	
1971	10.55	FAO *2021*	Apparent Consumption	Food supply and population data
1970/71	11.4	Teuteberg 1988	Apparent consumption	
1970	10.98	FAO *2021*	Apparent Consumption	Food supply and population data
1969/70	10.5	Teuteberg 1988	Apparent consumption	

1969	10.58	FAO *2021*	Apparent Consumption	Food supply and population data
1968/69	11	Teuteberg 1988	Apparent consumption	
1968	10.83	FAO *2021*	Apparent Consumption	Food supply and population data
1967/68	10.7	Teuteberg 1988	Apparent consumption	
1967	10.29	FAO *2021*	Apparent Consumption	Food supply and population data
1966/67	10.4	Teuteberg 1988	Apparent consumption	
1966	9.81	FAO *2021*	Apparent Consumption	Food supply and population data
1965/66	11.4	Teuteberg 1988	Apparent consumption	
1965	10.68	FAO *2021*	Apparent Consumption	Food supply and population data
1964/65	11	Teuteberg 1988	Apparent consumption	
1964	10.16	FAO *2021*	Apparent Consumption	Food supply and population data
1963/64	11.3	Teuteberg 1988	Apparent consumption	
1963	10.14	FAO *2021*	Apparent Consumption	Food supply and population data
1962/63	12.1	Teuteberg 1988	Apparent consumption	
1962	9.48	FAO *2021*	Apparent Consumption	Food supply and population data
1961/62	12.4	Teuteberg 1988	Apparent consumption	

1961	9.26	FAO *2021*	Apparent Consumption	Food supply and population data
1960/61	11.6	Teuteberg 1988	Apparent consumption	
1959/60	12.2	Teuteberg 1988	Apparent consumption	
1958/59	11.4	Teuteberg 1988	Apparent consumption	
1957/58	12.1	Teuteberg 1988	Apparent consumption	
1956/57	12	Teuteberg 1988	Apparent consumption	
1955/56	12.7	Teuteberg 1988	Apparent consumption	
1954/55	12.3	Teuteberg 1988	Apparent consumption	
1953/54	11.7	Teuteberg 1988	Apparent consumption	
1952/53	11.9	Teuteberg 1988	Apparent consumption	
1951/52	12.3	Teuteberg 1988	Apparent consumption	
1950/51	11.9	Teuteberg 1988	Apparent consumption	
1938	13.55	Teuteberg 1988	Apparent consumption	
1937	13.64	Teuteberg 1988	Apparent consumption	
1936	13.16	Teuteberg 1988	Apparent consumption	
1935	11.28	Teuteberg 1988	Apparent consumption	

1934	9.83	Teuteberg 1988	Apparent consumption	
1933	10.12	Teuteberg 1988	Apparent consumption	
1932	9.94	Teuteberg 1988	Apparent consumption	
1931	10.7	Teuteberg 1988	Apparent consumption	
1930	10.99	Teuteberg 1988	Apparent consumption	
1929	11.03	Teuteberg 1988	Apparent consumption	
1928	10.31	Teuteberg 1988	Apparent consumption	
1927	10.01	Teuteberg 1988	Apparent consumption	
1926	9.84	Teuteberg 1988	Apparent consumption	
1925	9.61	Teuteberg 1988	Apparent consumption	
1913	9.29	Teuteberg 1988	Apparent consumption	
1912	9.13	Teuteberg 1988	Apparent consumption	
1910-1913	9	Saalfeld 1984	Approximated Consumption	
1911	8.83	Teuteberg 1988	Apparent consumption	
1910	8.98	Teuteberg 1988	Apparent consumption	
1909	8.9	Teuteberg 1988	Apparent consumption	

1908	8.51	Teuteberg 1988	Apparent consumption	
1907	8.8	Teuteberg 1988	Apparent consumption	
1906	8.14	Teuteberg 1988	Apparent consumption	
1905	8.54	Teuteberg 1988	Apparent consumption	
1904	7.84	Teuteberg 1988	Apparent consumption	
1903	7.81	Teuteberg 1988	Apparent consumption	
1902	8.1	Teuteberg 1988	Apparent consumption	
1901	7.4	Teuteberg 1988	Apparent consumption	
1900	6.24	Teuteberg 1988	Apparent consumption	
1899	6.05	Teuteberg 1988	Apparent consumption	
1898	7.3	Teuteberg 1988	Apparent consumption	
1897	6.14	Teuteberg 1988	Apparent consumption	
1896	6.82	Teuteberg 1988	Apparent consumption	
1895	6.98	Teuteberg 1988	Apparent consumption	
1894	7.4	Teuteberg 1988	Apparent consumption	
1893	7.51	Teuteberg 1988	Apparent consumption	

1892	6.6	Teuteberg 1988	Apparent consumption	
1891	6.23	Teuteberg 1988	Apparent consumption	
1890	7.09	Teuteberg 1988	Apparent consumption	
1889	6.75	Teuteberg 1988	Apparent consumption	
1888	6.25	Teuteberg 1988	Apparent consumption	
1887	6.32	Teuteberg 1988	Apparent consumption	
1886	6.28	Teuteberg 1988	Apparent consumption	
1885	5.78	Teuteberg 1988	Apparent consumption	
1884	5.37	Teuteberg 1988	Apparent consumption	
1883	5.04	Teuteberg 1988	Apparent consumption	
1882	5.1	Teuteberg 1988	Apparent consumption	
1881	5.02	Teuteberg 1988	Apparent consumption	
1880	4.7	Teuteberg 1988	Apparent consumption	
1879	4.05	Teuteberg 1988	Apparent consumption	
1878	4.51	Teuteberg 1988	Apparent consumption	
1877	4.29	Teuteberg 1988	Apparent consumption	

1876	4.53	Teuteberg 1988	Apparent consumption	
1875	4.33	Teuteberg 1988	Apparent consumption	
1874	5.02	Teuteberg 1988	Apparent consumption	
1873	5.08	Teuteberg 1988	Apparent consumption	
1872	4.66	Teuteberg 1988	Apparent consumption	
1871	3.9	Teuteberg 1988	Apparent consumption	
1870	3.92	Teuteberg 1988	Apparent consumption	
1869	4.52	Teuteberg 1988	Apparent consumption	
1868	3.85	Teuteberg 1988	Apparent consumption	
1867	3.37	Teuteberg 1988	Apparent consumption	
1866	3.27	Teuteberg 1988	Apparent consumption	
1865	3.36	Teuteberg 1988	Apparent consumption	
1864	3.34	Teuteberg 1988	Apparent consumption	
1863	3.79	Teuteberg 1988	Apparent consumption	
1862	3.47	Teuteberg 1988	Apparent consumption	
1861	3.03	Teuteberg 1988	Apparent consumption	

1860	3.08	Teuteberg 1988	Apparent consumption	
1859	2.8	Teuteberg 1988	Apparent consumption	
1858	2.77	Teuteberg 1988	Apparent consumption	
1857	2.85	Teuteberg 1988	Apparent consumption	
1856	3.01	Teuteberg 1988	Apparent consumption	
1855	3.15	Teuteberg 1988	Apparent consumption	
1854	3.16	Teuteberg 1988	Apparent consumption	
1853	2.75	Teuteberg 1988	Apparent consumption	
1852	2.73	Teuteberg 1988	Apparent consumption	
1851	2.78	Teuteberg 1988	Apparent consumption	
1850	2.72	Teuteberg 1988	Apparent consumption	
1850	3	Saalfeld 1984	Approximated Consumption	
1800	6	Saalfeld 1984	Approximated Consumption	

Table 2. Partial annual German fish consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis	Group Covered
1790	4.17	Israel 1995, p.305; Wubs-Mrozewicz 2009,	Approximated Consumption	Cod and herring	Cod and herring only

		pp.187-208; Nedkvitne 2014; Rössner 2008; Calculated by authors		imports	
1764	6.68	Saalfeld 1964	Approximated Consumption	??	Herring in Berlin only
1728-1755	5.69	Hitzbleck 1971	Apparent Consumption	Poor House records	Herring only for poor house residents
1750	3.9	Israel 1995, p.305; Wubs-Mrozewicz 2009, pp.187-208; Nedkvitne 2014; Rössner 2008; Calculated by authors	Approximated Consumption	Cod and herring imports	Cod and herring only
1680	2.43	Israel 1995, p.305; Wubs-Mrozewicz 2009, pp.187-208; Nedkvitne 2014; Rössner 2008; Calculated by authors	Approximated Consumption	Cod and herring imports	Cod and herring only
1610	3.49	Israel 1995, p.305; Wubs-Mrozewicz 2009, pp.187-208; Nedkvitne 2014; Rössner 2008; Calculated by authors	Approximated Consumption	Cod and herring imports	Cod and herring only
1520	1.16	Israel 1995, p.305; Wubs-Mrozewicz 2009, pp.187-208; Nedkvitne 2014; Rössner 2008; Calculated by authors	Approximated Consumption	Cod and herring imports	Cod and herring only
1450-1500	15.5	Hitzbleck 1971	Apparent Consumption	Poor House records	Poor house residents

Table 3 - Cod and Herring Imports to German, 1520-1790

Year	Cod Imports (t LW)	Herring Imports (t LW)	Total Cod and Herring Imports (t LW)	Population	Per Capita Consumption
1520	8000	6800	14800	12800000	1.16
1610	30000	25500	55500	15900000	3.49
1680	20000	17000	37000	15200000	2.43
1750	40000	34000	74000	18993952	3.9
1790	50000	42500	92500	22189113	4.17

Table 4. Relative fish price in Germany in 1465. Values in Heller per pound (Abel 1966)

Fish species	Price
I. fresh fish	
Salmon	36
Pike, trout, perch, grayling	30
Barbel, eelpout (burbot), eel minnow, bullhead, lamprey, stone minnow, bullheads, eel minnows and gobies	24
Big carp	21
Bream	18
Small carp, whitefish, roach, large dace (Heßling), brook fish	16
Blicken, gudgeon, dace	15
1 shock of crayfish, large	30
1 shock crayfish, medium	18
1 shock crayfish, small	15
II. Salted and barrel fish	
Pike	30
Huchen, "stuckwelss" (large catfish cut into pieces), zander	24
Anglerfish, mullet	20
Bream	18
Small catfish	16
Scalefish and all kinds of small barrelfish	15
Large stockfish, main stockfish	24

"Big halpfisch"	12
"Medium (halpfisch)"	9
Herring	12

Table 5. Annual per capita consumption of herring, meat and bacon in the poorhouse and orphanage in Hanover, multi-year averages

Period	Pieces of Herring	Herring kg	Meat kg	Bacon kg
1728-1730	27.1	3.4	16.3	4.8
1731-1734	27.3	3.4	14.7	5.1
1736-1740	29	3.6	11	3.6
1741-1745	29.2	3.7	14.6	6.4
1746-1750	23.9	3	10.1	6
1751-1755	31	3.9		8.2

Explanatory Notes for Germany 1500-2019

Figures from 1961 to 2019 come from the Food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

Teuteberg (1988) conducted a long-term analysis of annual per capita food consumption in Germany from 1850-1938 and from 1950-1974. Quantitative values for a variety of foodstuffs, including seafood, are derived from a range of combined methodologies including observed and recorded quantitative values for fish imports, socio-economic trends, comparative analysis with other foodstuffs and overall dietary caloric intake analysis. Based on household budgets, Teuteberg argues that around the year 1900, fish played a very minor role in the typical household diet despite its high nutritional value. He attributes this primarily to the difficulty in transporting fresh fish inland prior to large scale railway developments. By 1909, with rail development, there was a marked rise in fish consumption as witnessed by over 400 fish canning factories in Germany. In 1928/29 with the abolition of import duties on fish, values increased markedly. The WWII period saw a sharp decline and a slow build up until 1975. Teuteberg's figures for seafood are already in LW, so no conversion was necessary. His figures

also include freshwater fish, so they may slightly overestimate the actual consumption of seafood. The full list of Teuteberg's figures can be seen in Table 1.

Saalfeld (1984, p.240) employs figures from Bittermann (1956) to estimate food consumption in Germany in the nineteenth and early twentieth century. Saalfeld estimates that per capita fish consumption was 6 kg LW in 1800, 3 kg LW in 1850 and 9 kg LW from 1910-1913. As the figures are already in LW no conversion is required. Because we lack any concrete details from Saalfeld on how these figures were calculated, we have designated these estimates as approximated national estimates. Saalfeld's figures from 1910-13 and 1850 compare well with those of Teuteberg 1988, suggesting they are accurate.

G. Wiegelmann & A. Mauss (1986) show that 86% of recipes in German cookbooks around 1800 were for freshwater fish and only 14% for saltwater fish. The recommended ratio of fish/meat in meal plans by cookbook authors also increased from about 10/90 in 1800 to 20/80 by 1900. By 1900 the ratio was 50:50. If anything this indicates that fish consumption was low in 1800 and that therefore the Saalfeld figure of 10.92 in 1800 is unrealistically high.

Saalfeld (1964) estimates that a working family in Berlin in 1764 consumed 4 kg PW of herring per person per year. Using Helland's CF of 1.67 (Helland 1896) we estimate this equated to 6.68 kg LW of herring. Again, due to a lack of detailed methodology, we classify this figure as approximated.

Hitzbleck writes that poor house residents in Hannover between 1728 and 1755 received 3.4 kg of LW herring per year (Hitzbleck 1971, pp.307-312).

Arend (p.103) reported consumption in Berlin based on victuals and merchandise. In 1752 consumption of 381,200 oysters, 85,750 mussels, 9,335 crabs and 9100 t of herring was indicated. In 1753, 394,400 oysters, 57,800 mussels, 13,120 crabs and 9,050 tons of herring were reported. As these were transported to the market, the herring values would have been in PW. Berlin's population was about 126,000 in 1752/53; with an estimate of 900 individual herring per tonne, about 65 herrings per capita can be realised. A conversion of 8 herring per kg gives a herring consumption of 8 kg p/c for Berlin. (Hitzbleck p.303)

Based on contemporary information, we make a conservative estimate that two-thirds of Norwegian, Icelandic and Shetland cod catches from 1520 to 1790 were shipped to Germany as dried cod (Wubs-Mrozewicz 2009, pp.187-208; Nedkvitne 2014; Rössner 2008). Our figures indicate that 8,000 t of LW cod went to Germany in 1520, 30,000 t LW in 1610, 20,000 t LW in 1680, 40,000 t LW in 1750, and 50,000 t LW in 1790 (Holm and Nicholls 2021a; 2021b; 2021c). We also know that in 1680, 17,000 t

LW of herring were exported from the Netherlands to Germany (Israel 1995, p.305). While German fisheries also operated in the North Sea, the Dutch herring fisheries were by far the largest in the eighteenth century and represent a large portion of total available herring supplies to Germany (Poulsen 2008). This means that herring imports were 85% of cod imports in 1680. We assume this percentage was the same in 1520, 1610, 1750 and 1790. The total cod and herring figures for each year are shown in Table 3, while the values are also added to Table 2.Using data from the Maddison Project (2020) we estimate the German population for these years (see Table 3) and then divide the total cod and herring supplies by this figure. This equates to a per capita consumption of cod and herring of 1.16 kg LW in 1520, 3.49 kg LW in 1610, 2.43 kg LW in 1680, 3.90 kg LW in 1750 and 4.17 kg LW in 1790.

Wilhelm Abel collected detailed records on the price of different seafood products in fifteenth century Germany (See Table 4 for the full figures). His figures do not allow us to estimate consumption, but they do indicate what species were most affordable to German consumers at that time (Abel 1981). The cheapest fish were herring, followed by 'halpfisch', a type of processed cod. Overall, fresh fish were more expensive than processed products. Abel also established the household expenditure and nutritional intake of a typical German family around the year 1400 (1981, p.30). Abel estimated seafood consumption at 10 kg PW, or 18 kg LW if we use Helland's general CF of 1.82 (Helland 1896). Abel noted values for the consumption of herring at the Lüneburg hospital from c. 1450 to 1500. His figures show a consumption rate of 15 kg p/c per annum PW, while monks in the city received 20 kg PW (Hitzbleck 1971, pp.307-312). We use Helland's CF of 1.67 (Helland 1896) to estimate LW. This gives us a figure of 25 kg LW for the Lüneburg hospital, 33.4 kg LW for the monks. Together, these estimates give us an average intake of 29.26 kg LW of herring. Given the lack of detail provided by Adel, we do not consider his figure as accurate, and therefore do not use it in our summary estimates.

Institutions (see Table 5)

The Heilig-Geist Hospital in Munich provides figures for 1650 and 1700. Herring was rarely given except on Good Fridays when each inmate received 1 herring, and half a herring on Mondays, Wednesdays and Fridays during Lent. In 1650, an average stockfish consumption was 0.455 kg per annum (PW) compared with 30 kg of meat. By 1700, no herrings were given at all, stockfish was given at 0.411 kg p/c (PW), and meat consumption was 89.6 kg (Hitzbleck p.306-7)

The Würzburger Bürgersptial (People's hospital) consumed more fish. Around 1750, stockfish consumption was high with purchases of 600-700 pounds per year from the Cologne market. By the end of the century this had dropped to 200-300 pounds. In addition, about 100 pounds of alternate dried fish was also purchased (i.e. not cod) (Hitzbleck p.307).

For Hannover, average p/c consumption of herring can be calculated from the account books of the Workhouse and Orphanage for the period 1728-1768 and comparative figures for meat and bacon are

given as well. In the period from 1728 to 1755, the annual average consumption per person in the poorhouse and orphanage was between one and a half and four kilograms. In the following years, consumption fluctuated greatly. In 1756, an average of 26.2 herring pieces (3.3 kg PW) were consumed per person per year. (Hitzbleck p.307)

In 1757, no meals were provided at the institutions due to Hannover being under siege. In 1758, each person received an average of 18.4 pieces (2.3 kg PW); in 1759 and 1760, due to high prices, again no herrings were given out. In 1761 the consumption per capita and year was 10.2 pieces (1.3 kg PW), in 1763: 3.9 pieces (0.5 kg PW), in 1764: 22.9 pieces (2.9 kg PW) and in 1765: 55.2 pieces (6.9 kg PW). (Hitzbleck p.308)

There is not enough information to draw any detailed conclusions or comparisons between Hannover and Munich institutions due to lack of data, however, the actual consumption in the institutions may be viewed as the upper limit of what ordinary households consumed (Hitzbleck p.308).

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Netherlands

Summary Data for the Netherlands 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	19.69	19.69	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	12.85	12.85	1	20 national
Average of national estimates (FAOSTAT 2021)	1960-1979	12.22	12.22	1	19 national
Interpolated value	1946-1959	13.26	13.26	5	0
Interpolated value	1920-1938	14.31	14.31	5	0
Interpolated value	1900-1913	15.35	15.35	5	0
Interpolated value	1850-1899	16.40	16.40	5	0
National estimate (Segers, 2003)	1800-1849	17.44	17.44	2	1 national
Low estimate national value from 1800-1849, high estimate average of partial figures (McCants 1992).	1750-1799	17.44-18	17.72	3	1 national 4 partial
Low estimate national value from 1800-1849, high estimate average of partial figures (McCants 1992).	1700-1749	17.44-21.6	19.52	3	1 national 3 partial
Low estimate national value from 1800-1849,	1650-1699	17.44-18	17.72	3	1 national 3 partial

high estimate average of partial figures (McCants 1992).					
Low estimate average of partial figures (McCants 1992), high estimate from 1805-1849.	1600-1649	16.2-17.44	16.82	3	1 national 1 partial
No estimate available.	1550-1599				
No estimate available.	1500-1549				

Table 1. National annual Dutch fish consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis
2019	8.26	FAO 2022	Apparent Consumption	Food supply and population data
2018	8.3	FAO 2022	Apparent Consumption	Food supply and population data
2017	8.34	FAO 2022	Apparent Consumption	Food supply and population data
2016	9.04	FAO 2022	Apparent Consumption	Food supply and population data
2015	8.43	FAO 2022	Apparent Consumption	Food supply and population data
2014	8.39	FAO 2022	Apparent Consumption	Food supply and population data
2013	8.35	FAO 2022	Apparent Consumption	Food supply and population data
2012	9.8	FAO 2022	Apparent Consumption	Food supply and population data
2011	10.34	FAO 2022	Apparent Consumption	Food supply and population data
2010	10	FAO 2022	Apparent Consumption	Food supply and population data
2009	9.94	FAO 2021	Apparent Consumption	Food supply and population data
2008	10.99	FAO 2021	Apparent Consumption	Food supply and population data
2007	11.77	FAO 2021	Apparent Consumption	Food supply and population data

2006	11.41	FAO 2021	Apparent Consumption	Food supply and population data
2005	10.72	FAO 2021	Apparent Consumption	Food supply and population data
2004	10.66	FAO 2021	Apparent Consumption	Food supply and population data
2003	11.21	FAO 2021	Apparent Consumption	Food supply and population data
2002	11.28	FAO 2021	Apparent Consumption	Food supply and population data
2001	12.45	FAO 2021	Apparent Consumption	Food supply and population data
2000	11.29	FAO 2021	Apparent Consumption	Food supply and population data
1999	9.77	FAO 2021	Apparent Consumption	Food supply and population data
1998	12.34	FAO 2021	Apparent Consumption	Food supply and population data
1997	11.15	FAO 2021	Apparent Consumption	Food supply and population data
1996	11.04	FAO 2021	Apparent Consumption	Food supply and population data
1995	11.58	FAO 2021	Apparent Consumption	Food supply and population data
1994	11.76	FAO 2021	Apparent Consumption	Food supply and population data
1993	11.3	FAO 2021	Apparent Consumption	Food supply and population data
1992	11.8	FAO 2021	Apparent Consumption	Food supply and population data
1991	11.55	FAO 2021	Apparent Consumption	Food supply and population data
1990	12.38	FAO 2021	Apparent Consumption	Food supply and population data
1989	10.94	FAO 2021	Apparent Consumption	Food supply and population data
1988	10.03	FAO 2021	Apparent Consumption	Food supply and population data
1987	9.68	FAO 2021	Apparent Consumption	Food supply and population data

1986	10.82	FAO 2021	Apparent Consumption	Food supply and population data
1985	9.79	FAO 2021	Apparent Consumption	Food supply and population data
1984	10.52	FAO 2021	Apparent Consumption	Food supply and population data
1983	10.49	FAO 2021	Apparent Consumption	Food supply and population data
1982	9.99	FAO 2021	Apparent Consumption	Food supply and population data
1981	10.19	FAO 2021	Apparent Consumption	Food supply and population data
1980	10.3	FAO 2021	Apparent Consumption	Food supply and population data
1979	9.6	FAO 2021	Apparent Consumption	Food supply and population data
1978	9.63	FAO 2021	Apparent Consumption	Food supply and population data
1977	9.64	FAO 2021	Apparent Consumption	Food supply and population data
1976	10.87	FAO 2021	Apparent Consumption	Food supply and population data
1975	11.03	FAO 2021	Apparent Consumption	Food supply and population data
1974	11.68	FAO 2021	Apparent Consumption	Food supply and population data
1973	11.54	FAO 2021	Apparent Consumption	Food supply and population data
1972	9.79	FAO 2021	Apparent Consumption	Food supply and population data
1971	10.55	FAO 2021	Apparent Consumption	Food supply and population data
1970	10.98	FAO 2021	Apparent Consumption	Food supply and population data
1969	10.58	FAO 2021	Apparent Consumption	Food supply and population data
1968	10.83	FAO 2021	Apparent Consumption	Food supply and population data
1967	10.29	FAO 2021	Apparent Consumption	Food supply and population data

1966	9.81	FAO 2021	Apparent Consumption	Food supply and population data
1965	10.68	FAO 2021	Apparent Consumption	Food supply and population data
1964	10.16	FAO 2021	Apparent Consumption	Food supply and population data
1963	10.14	FAO 2021	Apparent Consumption	Food supply and population data
1962	9.48	FAO 2021	Apparent Consumption	Food supply and population data
1961	9.26	FAO 2021	Apparent Consumption	Food supply and population data
1805-1849	17.67	Segers 2003	Approximated Consumption	Regional consumption estimates, weighted by population

Table 2. Partial annual Dutch fish consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis	Group Covered
1845-1849	24.57	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1845-1849	32.60	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1845-1849	28.58	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1845-1849	10.03	Segers 2003	Approximated Consumption	City archives	Kortrijk (Rural)
1845-1849	19.56	Segers 2003	Approximated Consumption	City archives	Leuven (Inland Urban)
1845-1849	4.51	Segers 2003	Approximated Consumption	City archives	Lokeren (Rural)
1840-1844	24.57	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1840-1844	43.63	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1840-1844	27.08	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1840-1844	14.04	Segers 2003	Approximated Consumption	City archives	Kortrijk (Rural)
1840-1844	17.05	Segers 2003	Approximated Consumption	City archives	Leuven (Inland Urban)

1840-1844	4.51	Segers 2003	Approximated Consumption	City archives	Lokeren (Rural)
1835-1839	27.08	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1835-1839	48.14	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1835-1839	29.09	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1835-1839	20.06	Segers 2003	Approximated Consumption	City archives	Leuven (Inland Urban)
1830-1834	24.57	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1830-1834	36.11	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1830-1834	23.57	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1830-1834	24.07	Segers 2003	Approximated Consumption	City archives	Leuven (Inland Urban)
1825-1829	30.09	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1825-1829	46.14	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1825-1829	24.07	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1825-1829	23.07	Segers 2003	Approximated Consumption	City archives	Leuven (Inland Urban)
1820-1824	36.11	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1820-1824	33.10	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1820-1824	25.07	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1815-1819	42.63	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)
1815-1819	44.63	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1815-1819	25.58	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1810-1814	42.63	Segers 2003	Approximated Consumption	City archives	Antwerp (Coastal Urban)

1810-1814	39.12	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1810-1814	24.57	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1805-1809	36.61	Segers 2003	Approximated Consumption	City archives	Gent (Coastal Urban)
1805-1809	23.07	Segers 2003	Approximated Consumption	City archives	Brussels (Inland Urban)
1790-1812	12.6	McCants1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1780-1789	16.2	McCants1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1760-1779	18	McCants1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1740-1759	25.19	McCants 1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1720-1739	19.8	McCants 1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1700-1719	19.8	McCants 1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1680-99	23.39	McCants 1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1660-1679	12.6	McCants 1992	Apparent Consumption	Orphanage records	Orphanage staff and children
1639-1659	16.2	McCants 1992	Apparent Consumption	Orphanage records	Orphanage staff and children

Table 3. Annual kg PW consumption of fish, 1805-1859 (Segers 2003, p.300)

Year	Antwerp	Gent	Brussels	Kortrijk	Leuven	Lokeren
1805-1809		7.3	4.6			
1810-1814	8.5	7.8	4.9			
1815-1819	8.5	8.9	5.1			
1820-1824	7.2	6.6	5			

1825-1829	6	9.2	4.8		4.6	
1830-1834	4.9	7.2	4.7		4.8	
1835-1839	5.4	9.6	5.8		4	
1840-1844	4.9	8.7	5.4	2.8	3.4	0.9
1845-1849	4.9	6.5	5.7	2	3.9	0.9
1850-1854	4.6	6.2	5.5	1.8	3.7	0.8
1855-1859	4	6.5	6.6	1.1	3.9	1.2

Table 4. Annual kg LW consumption of fish, 1805-1859 (based on Vandenbroeke (2004) break-down of fish consumption types)

Year	Antwerp	Gent	Brussels	Kortrijk	Leuven	Lokeren
1805-1809		36.61	23.07			
1810-1814	42.63	39.12	24.57			
1815-1819	42.63	44.63	25.58			
1820-1824	36.11	33.10	25.07			
1825-1829	30.09	46.14	24.07		23.07	
1830-1834	24.57	36.11	23.57		24.07	
1835-1839	27.08	48.14	29.09		20.06	
1840-1844	24.57	43.63	27.08	14.04	17.05	4.51
1845-1849	24.57	32.60	28.58	10.03	19.56	4.51
average 1800-1849	**31.53**	**40.43**	**25.95**	**12.04**	**20.76**	**4.51**
1850-1854	21.15	28.50	25.29	8.28	17.01	3.68
1855-1859	18.39	29.88	30.34	5.06	17.93	5.52
average 1850-1859	**19.77**	**29.19**	**27.81**	**6.67**	**17.47**	**4.60**

Table 5. Dutch Population - Urban (Inland and Coastal) and Rural 1400-1850 (Paping 2014, pp. 22, 28-29).

Year	Total Population	Inland Urban Popula-tion	Coastal Urban Popula-tion	Rural Popula-tion	Total Popula-tion %	Inland Urban Popula-tion %	Coastal Urban Popula-tion %	Rural Population %
1400	800,000	130000	120000	550000	100	16.3	15	68.8
1450	905,000	145000	150000	610000	100	16	16.6	67.4
1500	961,000	165000	180000	616000	100	17.2	18.7	64.1
1550	1,151,000	190000	225000	736000	100	16.5	19.5	63.9
1600	1,422,000	190000	375000	857000	100	13.4	26.4	60.3
1650	1,823,000	205000	615000	1003000	100	11.2	33.7	55
1700	1,907,000	205000	680000	1022000	100	10.7	35.7	53.6
1750	1,916,000	220000	615000	1081000	100	11.5	32.1	56.4
1800	2,120,000	250000	600000	1270000	100	11.8	28.3	59.9
1850	3,057,000	390000	750000	1917000	100	12.8	24.5	62.7

Explanatory Notes for the Netherlands 1500-2019

Figures from 1961 to 2019 come from the food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

Segers (2003, p.300) provides estimates for seafood consumption in Antwerp, Brussels, Gent, Kortrijk, Leuven, & Lokeren from 1805 to 1859 based on archival records (Table 3). After 1831 all these locations would fall within the newly created country of Belgium. Before that date, they were in the Netherlands, and we feel they provide a fair representation of consumption across the whole country for the first half of the nineteenth century. For this reason, we use Segers' figures from 1805 to 1849 for the Netherlands and his figures after 1849 for Belgium only (See the Belgium/Luxembourg section). Segers' figures are in PW and to convert to LW we use a ratio of different species estimated by Vandenbroeke (1973).

Based on market values from archival records, Vandenbroeke (1973, p.137), describes a typical breakdown of 50% dried cod, 25% salt cod, 16.66% herring and 8.33% other fish at markets in Flanders for the first half of the eighteenth century (Flanders was part of the Netherlands until 1831). We use this ratio to convert the city level consumption data shown in Table 3 to LW consumption data (Table 4). However, for the period 1850-1859 we used an altered ratio of 25% dried cod,50% salted cod, 16.66% herring and 8.33% other fish. This is based on a drop in dried cod exports to the Netherlands and Belgium from Norway, a primary supplier. Solhaug (1976, p. 603) provides data for the Norwegian export of stockfish: in 1836-1840, 26.5% of dried cod went to the Netherlands and Belgium, in 1876-1880 the share was down to 20.5%. Due to this decline in imports we decreased the share of dried cod from 50% to 25% after 1850. The indicative CFs used are: dried cod 6.67, salted cod 5, herring, 1.67, other fish 1.82 (Helland 1896).

After calculating LW values in select cities and settlements (Table 4), we estimate national consumption by calculating regional consumption in coastal cities, inland cities, and rural areas. Consumption differed between different demographics, with coastal cities having higher on average consumption than inland or rural areas. To reach a national estimate for 1800-1849, we take regional consumption values and multiply by average regional population estimates from Paping (2014) as shown in Table 5. Antwerp and Gent represent typical coastal access cities representing 26.4% of the national population, while Brussels and Leuven represent typical inland cities at 12.3%, and Lokeren and Kortrijk represent typical small town and rural communities at 61.3%.

From these regional differences, we can determine that coastal urban communities, inland urban communities and rural communities consumed a ratio of 9.50:2.87:5.07 respectively, giving an annual total of 17.44 kg LW for 1800-1849.

A 1680 account documents total exports of herring from the Netherlands amounting to 13,095 t PW or 21,869 t LW (Israel 1989, p. 305; Helland 1896, pp.21-6). Total landings in 1680 were 30,433 t LW (Nicholls 2021a, line 170), so domestic consumption was 8,564 t LW. The Dutch cod fishery made landings of 366 t LW in 1680 (Nicholls 2021b, line 162; Holm 2021a, line 162); cod was very much a secondary effort compared to the herring fisheries. In the 15th century, 78% of locally consumed Dutch fish was cod (Winter 1981 p.341), but this ratio may have fallen somewhat by the 17th and 18th centuries with herring being fished on an industrial scale and being more available. Any shortfall in cod was in the form of imports primarily from Norway, England and France. This brings a total of 34,256 t LW. The total Dutch population in 1680 was around 1.8 million (Paping 2014), therefore total fish per capita consumption was 19 kg LW.

Anne McCants (1992, p. 80) compiled detailed figures for the Burgherweeshuis (Civic Orphanage) in Amsterdam from 1639 to 1812. The original figures are provided in daily consumption for both children and the adult staff. McCants writes that fish purchases for the orphanage were dominated by three main types, 'stockfish (cod which had been split and cured by drying in the sun), salt cod, and herring in that order' (Ibid. p. 77). Other seafood consumption was rare. For this reason, we apply the ratio of 50% dried cod, 25% salt cod and 16.66% herring and 8.33% other fish that Vandenbroeke (1973) describes. The results of these conversions are shown in Table 2. Because most of the food provided to the orphanage was for children, our estimates may underestimate adult consumption, but they still represent a reasonable trajectory of fish consumption in the institution.

Bibliography for the Netherlands 1500-2019

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Belgium / Luxembourg

Summary Data for Belgium / Luxembourg 1850-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	19.07	19.07	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	19.44	19.44	1	20 national
Average of national estimates (FAOSTAT 2021).	1960-1979	17.16	17.16	1	19 national
Interpolated value	1946-1959	17.57	17.57	5	0
Interpolated value	1920-1938	17.99	17.99	5	0
National estimate (Lefebvre 2001)	1900-1913	18.4	18.4	4	1 national
National estimate (Lefebvre 2001)	1850-1899	17.2	17.2	4	1 national
Combined with the Netherlands for this period, see Netherlands estimates	1500-1849				

Table 1. National annual Belgian and Luxembourg fish consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis
2019	16.02	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2018	16.11	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2017	16.2	FAO 2022	Apparent Consumption	Belgium. Food supply and population data

2016	16.97	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2015	17.9	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2014	19.15	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2013	19.21	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2012	18.76	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2011	20.3	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2010	19.57	FAO 2022	Apparent Consumption	Belgium. Food supply and population data
2009	19	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2008	20.64	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2007	20.09	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2006	19.34	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2005	20.18	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2004	20.31	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2003	20.75	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2002	18.43	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2001	18.13	FAO 2021	Apparent Consumption	Belgium. Food supply and population data

2000	19.3	FAO 2021	Apparent Consumption	Belgium. Food supply and population data
2019	23.13	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2018	23.58	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2017	24.05	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2016	26.03	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2015	26.82	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2014	27.01	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2013	26.51	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2012	26.67	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2011	25.44	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2010	26.39	FAO 2022	Apparent Consumption	Luxembourg. Food supply and population data
2009	23.42	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2008	23.48	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2007	23.14	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2006	23.39	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2005	21.26	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data

2004	22.1	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2003	24.94	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2002	22.65	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2001	22.06	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
2000	20.62	FAO 2021	Apparent Consumption	Luxembourg. Food supply and population data
1999	20.16	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1998	20.25	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1997	19.39	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1996	18.63	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1995	21.6	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1994	20.75	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1993	19.48	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1992	21.67	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1991	20.47	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1990	21.29	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1989	19.1	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data

1988	17.94	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1987	18.09	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1986	18.43	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1985	18.17	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1984	17.94	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1983	19.12	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1982	18.87	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1981	18.59	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1980	18.83	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1979	18.43	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1978	17.65	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1977	17.68	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1976	17.55	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1975	15.62	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1974	16.8	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1973	16.11	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data

1972	16.54	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1971	17.06	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1970	16.78	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1969	16.34	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1968	16.84	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1967	16.87	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1966	17.77	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1965	17.42	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1964	17.71	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1963	17.26	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1962	17.13	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1961	18.49	FAO 2021	Apparent Consumption	Belgium-Luxembourg. Food supply and population data
1900-1913	18.4	Lefebvre 2001	Approximated consumption	Estimated consumption and fish species ratio data.
1860-1889	17.2	Lefebvre 2001	Approximated consumption	Estimated consumption and fish species ratio data.

Table 2. Partial annual Belgian/Luxembourg fish consumption values per capita in kg

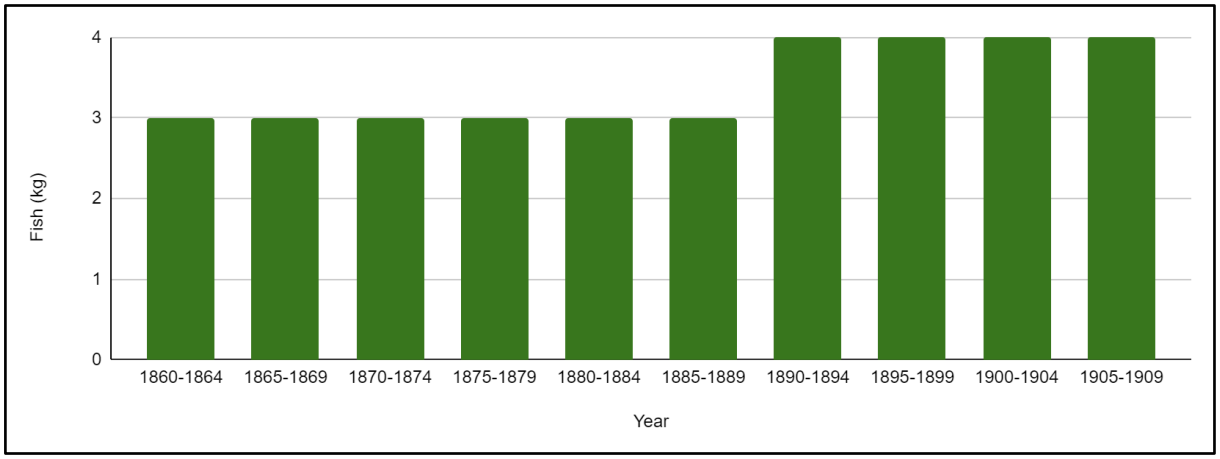
Year	Live Weight (LW)	Source	Type	Group Covered
1855-1859	18.05	Segers 2003	Approximated	Antwerp (Coastal Urban)

			Consumption	
1855-1859	29.33	Segers 2003	Approximated Consumption	Gent (Coastal Urban)
1855-1859	29.78	Segers 2003	Approximated Consumption	Brussels (Inland Urban)
1855-1859	4.96	Segers 2003	Approximated Consumption	Kortrijk (Rural)
1855-1859	17.60	Segers 2003	Approximated Consumption	Leuven (Inland Urban)
1855-1859	5.42	Segers 2003	Approximated Consumption	Lokeren (Rural)
1850-1854	20.76	Segers 2003	Approximated Consumption	Antwerp (Coastal Urban)
1850-1854	27.98	Segers 2003	Approximated Consumption	Gent (Coastal Urban)
1850-1854	24.82	Segers 2003	Approximated Consumption	Brussels (Inland Urban)
1850-1854	8.12	Segers 2003	Approximated Consumption	Kortrijk (Rural)
1850-1854	16.70	Segers 2003	Approximated Consumption	Leuven (Inland Urban)
1850-1854	3.61	Segers 2003	Approximated Consumption	Lokeren (Rural)

Table 3. Conversion from PW to LW of consumed fish in Gent (1805-1850)

Type	Weight (kg)	Conversion factor	Total (kg)	Ratio %
dried cod	3	6.67	16.675	41.67
salted/fresh cod	1.5	1.82	3.64	33.33
herring	1	1.67	1.67	16.67
other fresh fish	0.5	1.82	0.91	8.33
total	**6**		**22.9**	**100**

Figure 1. Annual PW consumption of fish in Belgium 1860-1909 (Lefebvre 2001, Graph 86; after Segers and Dejongh 2000)



Explanatory Notes for Belgium and Luxembourg 1850-2019

Modern Belgium comprises Wallonia (French) and Flanders (Dutch) and Brussels (mixed). It was part of France and the Netherlands/Batavia until 1814. After the defeat of Napoleon Bonaparte, the Congress of Vienna ceded the region to the Netherlands (and the Duchy of Luxembourg). After the 1830 Belgian Revolution, the territories established independence and Belgium was founded as a sovereign country. Data prior to 1831 relates to overall Dutch figures. French influence in the southern territory (Wallonia) was limited to primarily agricultural activities, while the northern Dutch territory (Flanders) had several large cities and relatively well developed infrastructure. Data for the period until 1850 is the same as for the Netherlands.

Figures from 1961 to 2019 come from the food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

From 1961-1999 the FAO reported joint figures for Belgium-Luxembourg. From the year 2000 onwards they reported separate figures for Belgium and Luxembourg. We have recombined these separate figures to generate a single estimate for both countries for 2000-2019. This was achieved by taking the FAO's figure for total seafood supply to both countries and dividing by the combined population of both countries (the FAO also provides these population figures).

Lefebvre (2001, 5.3c graph 86) provides an overall estimate of Belgian fish consumption from 1860-1889 (3 kg PW) and 1890-1909 (4 kg PW) (Figure 1). The original estimates were based on an exhaustive study into overall Belgian human consumption of foodstuffs carried out by Segers and Dejongh (2000); their research included a multitude of sources, primarily city archive papers and reports into agriculture, food and related commerce from Antwerp, Brussels, Gent, Kortrijk, Leuven and Lokeren. Lefebvre (2001, 5.3c) reports that there is little to be said about the stable nature of overall fish consumption in this period, except that an increase is realised with relative per capita increases in population wealth from 1890 onwards, hence a move of 3 kg PW to 4 kg PW. He adds that, at most, fish reached about 14% of the overall meat consumption tally and is seen as a minor aspect of nutrition overall.

For the period 1850-1899, we use a ratio of 25% dried cod (CF 6.67), 16.66% herring (CF 1.67), 50% salted cod (CF 5) and 8.33% other fish (CF 1.82) (Vandenbroeke 1973, p.137) as explained in the Netherlands section above. For this period, a value of 3.75 kg PW is derived based on the values provided by Lefebvre (2001), which leads to an annual consumption value of 17.2 kg LW.

Similarly, for the period 1900-1913, based on Lefebvre's (2001) values in Table 4, and applying Vandenbroeke's (1973, p.137) ratios, we derive a value of 4 kg PW equating to 18.4 kg LW.

Prior to 1831, Belgium was a part of the Netherlands, so see that section for more.

Bibliography for Belgium and Luxembourg 1850-2019

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Portugal

Summary Data for Portugal 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	53.26	53.26	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	52.5	52.5	1	20 national
Average of national estimates (FAOSTAT 2021; Garrido 2010)	1960-1979	52.49	52.49	1	20 national
Average of national estimates (Garrido 2010)	1946-1959	42.65	42.65	2	14 national
Average of national estimates (Garrido 2010; Moutinho 1985)	1920-1938	41.21	41.21	2	16 national
Average of national estimates (Moutinho 1985)	1900-1913	27.69	27.69	2	8 national
Average of national estimates (Moutinho 1985)	1850-1899	25.94	25.94	2	13 national
Average of national estimates (Moutinho 1985)	1800-1849	29.84	29.84	2	11 national
National estimate (Herold 2015)	1750-1799	20	20	2	1 national
No estimate available	1700-1749				
No estimate available	1650-1699				
No estimate available	1600-1649				
No estimate available	1550-1599				
No estimate available	1500-1549				

Table 1. National annual Portuguese seafood consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis
2019	45.52	FAO 2022	Apparent Consumption	Food supply and population data
2019	53.89	FAO 2022	Apparent Consumption	Food supply and population data
2018	53.73	FAO 2022	Apparent Consumption	Food supply and population data
2017	53.57	FAO 2022	Apparent Consumption	Food supply and population data
2016	53.88	FAO 2022	Apparent Consumption	Food supply and population data
2015	48.99	FAO 2022	Apparent Consumption	Food supply and population data
2014	49.11	FAO 2022	Apparent Consumption	Food supply and population data
2013	51.49	FAO 2022	Apparent Consumption	Food supply and population data
2012	49.76	FAO 2022	Apparent Consumption	Food supply and population data
2011	53.91	FAO 2022	Apparent Consumption	Food supply and population data
2010	54.24	FAO 2022	Apparent Consumption	Food supply and population data
2009	55.17	FAO *2021*	Apparent Consumption	Food supply and population data
2008	54.65	FAO *2021*	Apparent Consumption	Food supply and population data
2007	58.59	FAO *2021*	Apparent Consumption	Food supply and population data

2006	55.36	FAO *2021*	Apparent Consumption	Food supply and population data
2005	53.5	FAO *2021*	Apparent Consumption	Food supply and population data
2004	52.92	FAO *2021*	Apparent Consumption	Food supply and population data
2003	51.71	FAO *2021*	Apparent Consumption	Food supply and population data
2002	53.84	FAO *2021*	Apparent Consumption	Food supply and population data
2001	54.26	FAO *2021*	Apparent Consumption	Food supply and population data
2000	52.7	FAO *2021*	Apparent Consumption	Food supply and population data
1999	59.46	FAO *2021*	Apparent Consumption	Food supply and population data
1998	60.5	FAO *2021*	Apparent Consumption	Food supply and population data
1997	56.4	FAO *2021*	Apparent Consumption	Food supply and population data
1996	61.73	FAO *2021*	Apparent Consumption	Food supply and population data
1995	57.29	FAO *2021*	Apparent Consumption	Food supply and population data
1994	57.52	FAO *2021*	Apparent Consumption	Food supply and population data
1993	58.81	FAO *2021*	Apparent Consumption	Food supply and population data
1992	57.63	FAO *2021*	Apparent Consumption	Food supply and population data
1991	61.81	FAO *2021*	Apparent Consumption	Food supply and population data

1990	59.53	FAO *2021*	Apparent Consumption	Food supply and population data
1989	59.46	FAO *2021*	Apparent Consumption	Food supply and population data
1988	59.23	FAO *2021*	Apparent Consumption	Food supply and population data
1987	57.28	FAO *2021*	Apparent Consumption	Food supply and population data
1986	55.44	FAO *2021*	Apparent Consumption	Food supply and population data
1985	55.26	FAO *2021*	Apparent Consumption	Food supply and population data
1984	44.59	FAO *2021*	Apparent Consumption	Food supply and population data
1983	39.69	FAO *2021*	Apparent Consumption	Food supply and population data
1982	29.92	FAO *2021*	Apparent Consumption	Food supply and population data
1981	29.72	FAO *2021*	Apparent Consumption	Food supply and population data
1980	28.73	FAO *2021*	Apparent Consumption	Food supply and population data
1979	25.41	FAO *2021*	Apparent Consumption	Food supply and population data
1978	27.39	FAO *2021*	Apparent Consumption	Food supply and population data
1977	37.54	FAO *2021*	Apparent Consumption	Food supply and population data
1976	41.77	FAO *2021*	Apparent Consumption	Food supply and population data
1975	43.62	FAO *2021*	Apparent Consumption	Food supply and population data

1974	51.86	FAO *2021*	Apparent Consumption	Food supply and population data
1973	52.42	FAO *2021*	Apparent Consumption	Food supply and population data
1972	64.5	FAO *2021*	Apparent Consumption	Food supply and population data
1971	65.13	FAO *2021*	Apparent Consumption	Food supply and population data
1970	66.35	FAO *2021*	Apparent Consumption	Food supply and population data
1969	65.23	FAO *2021*	Apparent Consumption	Food supply and population data
1968	58.11	FAO *2021*	Apparent Consumption	Food supply and population data
1967	71.53	FAO *2021*	Apparent Consumption	Food supply and population data
1967	55.17	Garrido 2010, p. 307	Approximated Consumption	
1966	55.41	FAO *2021*	Apparent Consumption	Food supply and population data
1966	42.74	Garrido 2010, p. 307	Approximated Consumption	
1965	56.43	FAO *2021*	Apparent Consumption	Food supply and population data
1965	43.05	Garrido 2010, p. 307	Approximated Consumption	
1964	59.85	FAO *2021*	Apparent Consumption	Food supply and population data
1964	47.29	Garrido 2010, p. 307	Approximated Consumption	
1963	55.99	FAO *2021*	Apparent Consumption	Food supply and population data

1963	47.90	Garrido 2010, p. 307	Approximated Consumption	
1962	55.06	FAO *2021*	Apparent Consumption	Food supply and population data
1962	47.59	Garrido 2010, p. 307	Approximated Consumption	
1961	55.79	FAO *2021*	Apparent Consumption	Food supply and population data
1961	48.50	Garrido 2010, p. 307	Approximated Consumption	
1960	40.44	Garrido 2010, p. 307	Approximated Consumption	
1959	37.59	Garrido 2010, p. 307	Approximated Consumption	
1958	47.90	Garrido 2010, p. 307	Approximated Consumption	
1957	49.11	Garrido 2010, p. 307	Approximated Consumption	
1956	50.32	Garrido 2010, p. 307	Approximated Consumption	
1955	50.93	Garrido 2010, p. 307	Approximated Consumption	
1954	40.02	Garrido 2010, p. 307	Approximated Consumption	
1953	46.08	Garrido 2010, p. 307	Approximated Consumption	
1952	33.95	Garrido 2010, p. 307	Approximated Consumption	
1951	42.74	Garrido 2010, p. 307	Approximated Consumption	
1950	47.90	Garrido 2010, p. 307	Approximated Consumption	

1949	40.38	Garrido 2010, p. 307	Approximated Consumption	
1948	36.38	Garrido 2010, p. 307	Approximated Consumption	
1947	42.20	Garrido 2010, p. 307	Approximated Consumption	
1946	31.53	Garrido 2010, p. 307	Approximated Consumption	
1945	23.65	Garrido 2010, p. 307	Approximated Consumption	
1944	24.25	Garrido 2010, p. 307	Approximated Consumption	
1943	23.04	Garrido 2010, p. 307	Approximated Consumption	
1942	27.89	Garrido 2010, p. 307	Approximated Consumption	
1941	27.89	Garrido 2010, p. 307	Approximated Consumption	
1940	29.71	Garrido 2010, p. 307	Approximated Consumption	
1939	40.32	Garrido 2010, p. 307	Approximated Consumption	
1938	43.05	Garrido 2010, p. 307	Approximated Consumption	
1937	41.23	Garrido 2010, p. 307	Approximated Consumption	
1936	39.41	Garrido 2010, p. 307	Approximated Consumption	
1935	47.29	Garrido 2010, p. 307	Approximated Consumption	
1934	42.44	Garrido 2010, p. 307	Approximated Consumption	

1930	40.5	Moutinho 1985, p. 44	Approximated Consumption	
1929	43.3	Moutinho 1985, p. 44	Approximated Consumption	
1928	45.13	Moutinho 1985, p. 44	Approximated Consumption	
1927	43.77	Moutinho 1985, p. 44	Approximated Consumption	
1926	45.65	Moutinho 1985, p. 44	Approximated Consumption	
1925	37.58	Moutinho 1985, p. 44	Approximated Consumption	
1924	42.31	Moutinho 1985, p. 44	Approximated Consumption	
1923	36.83	Moutinho 1985, p. 44	Approximated Consumption	
1922	34.21	Moutinho 1985, p. 44	Approximated Consumption	
1921	41.75	Moutinho 1985, p. 44	Approximated Consumption	
1920	34.9	Moutinho 1985, p. 44	Approximated Consumption	
1919	35	Moutinho 1985, p. 44	Approximated Consumption	
1918	23.62	Moutinho 1985, p. 44	Approximated Consumption	
1917	20.06	Moutinho 1985, p. 44	Approximated Consumption	
1916	19.08	Moutinho 1985, p. 44	Approximated Consumption	
1915	20.9	Moutinho 1985, p. 44	Approximated Consumption	

1914	28.14	Moutinho 1985, p. 44	Approximated Consumption	
1913	34.56	Moutinho 1985, p. 44	Approximated Consumption	
1912	34.98	Moutinho 1985, p. 44	Approximated Consumption	
1911	34.02	Moutinho 1985, p. 44	Approximated Consumption	
1905	26.55	Moutinho 1985, p. 32	Approximated Consumption	
1904	29.06	Moutinho 1985, p. 32	Approximated Consumption	
1902	22	Moutinho 1985, p. 32	Approximated Consumption	
1901	22.35	Moutinho 1985, p. 32	Approximated Consumption	
1900	18.03	Moutinho 1985, p. 32	Approximated Consumption	
1899	21.79	Moutinho 1985, p. 32	Approximated Consumption	
1898	26.87	Moutinho 1985, p. 32	Approximated Consumption	
1897	28.66	Moutinho 1985, p. 32	Approximated Consumption	
1896	26.18	Moutinho 1985, p. 32	Approximated Consumption	
1895	26.14	Moutinho 1985, p. 32	Approximated Consumption	
1894	24.74	Moutinho 1985, p. 32	Approximated Consumption	
1893	23.07	Moutinho 1985, p. 32	Approximated Consumption	

1892	23.24	Moutinho 1985, p. 32	Approximated Consumption	
1891	25.25	Moutinho 1985, p. 32	Approximated Consumption	
1890	29.82	Moutinho 1985, p. 32	Approximated Consumption	
1889	25.66	Moutinho 1985, p. 32	Approximated Consumption	
1888	26.34	Moutinho 1985, p. 32	Approximated Consumption	
1887	29.41	Moutinho 1985, p. 32	Approximated Consumption	
1829	28.51	Moutinho 1985, p. 24	Approximated Consumption	
1828	30.26	Moutinho 1985, p. 24	Approximated Consumption	
1827	30.08	Moutinho 1985, p. 24	Approximated Consumption	
1826	35.18	Moutinho 1985, p. 24	Approximated Consumption	
1825	25.72	Moutinho 1985, p. 24	Approximated Consumption	
1824	33.77	Moutinho 1985, p. 24	Approximated Consumption	
1823	27.3	Moutinho 1985, p. 24	Approximated Consumption	
1822	29.84	Moutinho 1985, p. 24	Approximated Consumption	
1821	35.33	Moutinho 1985, p. 24	Approximated Consumption	
1820	26.84	Moutinho 1985, p. 24	Approximated Consumption	

1819	25.39	Moutinho 1985, p. 24	Approximated Consumption	
1770	20	Herold 2015	Approximated Consumption	

Explanatory Notes for Portugal 1500-2019

Figures from 1961 to 2019 come from the Food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

Álvaro Garrido provides figures for cod consumption in Portugal from 1934 to 1967 (Garrido 2010, p. 307). To convert to LW we use a CF of 4.7 (Nicholls et al 2021). The FAO figures for Portugal tell us that 71% of the country's seafood consumption was made up of demersal species in 1961 and of this we know cod was the most important (FAO 2021). This figure remained consistent for the remainder of the 1960s and 70s. Given that demersal species made up 71% of consumption we add another 29% to Garrido's cod figures to estimate total Portuguese fish consumption. We do not use Garrido's figures past 1960 in our summary estimates as we have the more accurate figures from the FAO, but in those years that do overlap we can see that our approximated total consumption based on Garrido's data underestimate real consumption. This is acceptable as we rather underestimate consumption in earlier periods that overestimate.

Moutinho also provides figures for cod consumption and importation in Portugal. His data comes in three parts; the first series from 1819 to 1928 relates only to imports and is in quintals PW (Moutinho 1985, p. 24). The Portuguese quintal is equal to 58.75 kg (Zupko 1977, p.189). To convert to LW, we again use the CF of 4.7 (Nicholls et al 2021). The second series is from 1887 to 1902 and relates only to imports (Moutinho 1985, p. 32). This series is in kg PW, and we used the CF of 4.7. The final Moutinho series covers the years from 1901 to 1930 and relates only to tons of PW imports. However, Moutinho also provides figures for domestic production (Moutinho 1985, p. 44). When combined and converted using the CF of 4.7, these figures provide a picture of total cod supplies. To estimate p/c consumption, we divided yearly totals by population data from the Maddison Project (Maddison Project Database 2020). Where we have overlapping figures for the same year, we choose the estimate that includes imports and domestic production. To estimate total fish consumption we again add 29% on top of our

cod consumption figures using the same logic as outlined above. The full results of these calculations are shown in Table 1.

Marc Herold (2015, p. 10) writes that in the 1770s, Portugal imported about 15 million pounds or 6.8 million kg of cod per year. We assume this is dried fish, so the PW converts to 31,960t LW of fish using a conversion factor of 4.7. Portugal had a population of about 3 million people in the late eighteenth century; therefore, we can estimate a capita consumption of 10.6 kg LW of cod at that time. This would put the Portuguese cod consumption at the same level as that of Spain. Likely, other fish were part of the Portuguese diet at that time, but unfortunately, we have few records detailing these, as it is far harder to estimate the consumption of locally caught fish. If we assume a similar ratio of fish consumption in Portugal as in Spain, a rough estimate, we may put the overall figure at about 20 kg LW p/c by 1800.

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Spain

Summary Data for Spain 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	39.30	39.30	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	36.04	36.04	1	20 national
Average of national estimates (FAOSTAT 2021)	1960-1979	30.37	30.37	1	19 national
National estimate (Losa, 2005)	1946-1959	20.10	20.10	1	1 national
Average of national estimates from (Losa, 2005)	1920-1938	14.45	14.45	1	2 national
National estimate (Losa, 2005)	1900-1913	21.81	21.81	2	1 national
Average of national estimates (Carmona & Losa, 2009)	1850-1899	15.81	15.82	1	12 national
Low estimate (Carmona & Losa 2009) from 1850-1899, high estimate (Carmona & Losa 2009)	1800-1849	15.81-17.46	16.64	3	1 national 1 partial
Low estimate (Carmona & Losa 2009) from 1850-1899, high estimate (Carmona & Losa 2009)	1750-1799	15.81-18.11	16.96	3	1 national 1 partial
Interpolated value	1700-1749	17.22	17.22	5	0
Interpolated value	1650-1699	17.47	17.47	5	0
Low estimate (Carmona & Losa 2009) from 1850-1899, high estimate (Carmona & Losa 2009)	1600-1649	15.81-19.65	17.73	3	1 national 2 partial

Low estimate (Carmona & Llosa 2009) from 1850-1899, high estimate (Carmona & Llosa 2009)	1550-1599	15.81-22.2	19	3	1 national 1 partial
No estimate available	1500-1549				

Table 1. National annual Spanish fish consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis
2019	39.53	FAO 2022	Apparent Consumption	Food supply and population data
2018	39.56	FAO 2022	Apparent Consumption	Food supply and population data
2017	39.60	FAO 2022	Apparent Consumption	Food supply and population data
2016	38.93	FAO 2022	Apparent Consumption	Food supply and population data
2015	39.77	FAO 2022	Apparent Consumption	Food supply and population data
2014	40.05	FAO 2022	Apparent Consumption	Food supply and population data
2013	38.47	FAO 2022	Apparent Consumption	Food supply and population data
2012	36.44	FAO 2022	Apparent Consumption	Food supply and population data
2011	38.29	FAO 2022	Apparent Consumption	Food supply and population data
2010	38.03	FAO 2022	Apparent Consumption	Food supply and population data
2009	37.04	FAO *2021*	Apparent Consumption	Food supply and population data
2008	37.83	FAO *2021*	Apparent Consumption	Food supply and population data
2007	39.72	FAO *2021*	Apparent Consumption	Food supply and population data
2006	41.68	FAO *2021*	Apparent Consumption	Food supply and population data

2005	38.58	FAO *2021*	Apparent Consumption	Food supply and population data
2004	39.87	FAO *2021*	Apparent Consumption	Food supply and population data
2003	41.56	FAO *2021*	Apparent Consumption	Food supply and population data
2002	40.23	FAO *2021*	Apparent Consumption	Food supply and population data
2001	40.75	FAO *2021*	Apparent Consumption	Food supply and population data
2000	40.43	FAO *2021*	Apparent Consumption	Food supply and population data
1999	42.74	FAO *2021*	Apparent Consumption	Food supply and population data
1998	45.32	FAO *2021*	Apparent Consumption	Food supply and population data
1997	40.08	FAO *2021*	Apparent Consumption	Food supply and population data
1996	40.86	FAO *2021*	Apparent Consumption	Food supply and population data
1995	40.74	FAO *2021*	Apparent Consumption	Food supply and population data
1994	40.76	FAO *2021*	Apparent Consumption	Food supply and population data
1993	38.70	FAO *2021*	Apparent Consumption	Food supply and population data
1992	35.85	FAO *2021*	Apparent Consumption	Food supply and population data
1991	33.65	FAO *2021*	Apparent Consumption	Food supply and population data
1990	34.02	FAO *2021*	Apparent Consumption	Food supply and population data
1989	34.20	FAO *2021*	Apparent Consumption	Food supply and population data
1988	35.02	FAO *2021*	Apparent Consumption	Food supply and population data
1987	34.10	FAO *2021*	Apparent Consumption	Food supply and population data
1986-	34.64	Llosa 2005	Apparent	

2001			Consumption	
1986	33.74	FAO *2021*	Apparent Consumption	Food supply and population data
1985	33.46	FAO *2021*	Apparent Consumption	Food supply and population data
1984	32.10	FAO *2021*	Apparent Consumption	Food supply and population data
1983	32.20	FAO *2021*	Apparent Consumption	Food supply and population data
1982	30.79	FAO *2021*	Apparent Consumption	Food supply and population data
1981	30.98	FAO *2021*	Apparent Consumption	Food supply and population data
1980	31.40	FAO *2021*	Apparent Consumption	Food supply and population data
1979	31.39	FAO *2021*	Apparent Consumption	Food supply and population data
1978	34.04	FAO *2021*	Apparent Consumption	Food supply and population data
1977	33.65	FAO *2021*	Apparent Consumption	Food supply and population data
1976	34.95	FAO *2021*	Apparent Consumption	Food supply and population data
1976-85	31.43	Llosa 2005	Apparent Consumption	
1975	33.86	FAO *2021*	Apparent Consumption	Food supply and population data
1974	34.79	FAO *2021*	Apparent Consumption	Food supply and population data
1973	31.07	FAO *2021*	Apparent Consumption	Food supply and population data
1972	31.80	FAO *2021*	Apparent Consumption	Food supply and population data
1971	30.72	FAO *2021*	Apparent Consumption	Food supply and population data
1970	30.80	FAO *2021*	Apparent Consumption	Food supply and population data
1969	27.60	FAO *2021*	Apparent Consumption	Food supply and population data

1968	31.43	FAO *2021*	Apparent Consumption	Food supply and population data
1967	28.72	FAO *2021*	Apparent Consumption	Food supply and population data
1966	28.72	FAO *2021*	Apparent Consumption	Food supply and population data
1965	28.93	FAO *2021*	Apparent Consumption	Food supply and population data
1964	26.94	FAO *2021*	Apparent Consumption	Food supply and population data
1963	27.12	FAO *2021*	Apparent Consumption	Food supply and population data
1962	25.41	FAO *2021*	Apparent Consumption	Food supply and population data
1960-75	28.96	Losa, 2005	Apparent Consumption	
1961	25.13	FAO *2021*	Apparent Consumption	Food supply and population data
1949-59	20.10	Losa, 2005	Apparent Consumption	
1939-48	17.72	Losa, 2005	Apparent Consumption	
1928-34	13.90	Losa, 2005	Apparent Consumption	
1918-27	15.00	Losa, 2005	Apparent Consumption	
1908-17	17.82	Losa, 2005	Apparent Consumption	
1892	17.49	Carmona & Losa 2009	Apparent Consumption	
1889	17.99	Carmona & Losa 2009	Apparent Consumption	
1883	17.27	Carmona & Losa 2009	Apparent Consumption	
1867	13.25	Carmona & Losa 2009	Apparent Consumption	
1866	14.60	Carmona & Losa 2009	Apparent Consumption	
1865	14.37	Carmona & Losa 2009	Apparent Consumption	

1864	17.62	Carmona & Losa 2009	Apparent Consumption	
1863	13.08	Carmona & Losa 2009	Apparent Consumption	
1862	15.85	Carmona & Losa 2009	Apparent Consumption	
1861	16.11	Carmona & Losa 2009	Apparent Consumption	
1860	15.43	Carmona & Losa 2009	Apparent Consumption	
1858	16.71	Carmona & Losa 2009	Apparent Consumption	

Table 2. Partial annual Spanish fish consumption values per capita in kg

Year	Live Weight (LW)	Source	Type	Basis
1853	17.08	Carmona & Losa 2009	Apparent Consumption	Figures for Madrid only
1844-48	17.46	Carmona & Losa 2009	Apparent Consumption	Figures for Madrid only
1789	18.11	Carmona & Losa 2009	Apparent Consumption	Figures for Madrid only
1629	20.70	Carmona & Losa 2009	Apparent Consumption	Figures for Madrid only
1617	18.60	Carmona & Losa 2009	Apparent Consumption	Figures for Madrid only
1590-95	22.20	Carmona & Losa 2009	Apparent Consumption	Figures for Madrid only

Table 3. Apparent fish consumption, kg per capita in Madrid from Carmona & Losa 2009

Year	Fresh, Salted & Pickled	Salted Cod	Total Processed	Total consumption PW	Total consumption LW
1590-95	-	-		7.4	22.2
1617	-	-		6.2	18.6
1629	-	-		6.9	20.7

1789	3.56	4.85		7.97	18.11
1825-29	2.32	-		-	
1830-33	-	2.36		-	
1844-48	3.31	3.01		6.32	17.46
1853	2.28	2.93		5.21	17.08

Table 4. Apparent fish consumption, kg per capita in Spain from Carmona & Losa 2009

Year	Fresh Fish	Salted & Pickled	Salted Cod	Total Processed	Total consumption PW	Total consumption LW
1858	2.75	2.17	1.72	3.89	6.64	16.71
1860	2.04	1.81	1.85	3.66	5.7	15.43
1861	1.9	2.34	1.86	4.2	6.1	16.11
1862	2.36	1.46	1.94	3.4	5.76	15.85
1863	2.16	1.79	1.31	3.1	5.26	13.08
1864	2.53	1.94	2.08	4.02	6.55	17.62
1865	1.92	1.53	1.77	3.3	5.22	14.37
1866	2.48	1.34	1.67	3.01	5.49	14.6
1867	1.52	1.1	1.84	2.94	4.46	13.25
1883	2.14	1.03	2.48	3.51	5.65	17.27
1889	2.41	1.22	2.46	3.68	6.09	17.99
1892	2.53	1.13	2.34	3.47	6	17.49

Explanatory Notes for Spain 1500-2019

Figures from 1961 to 2019 come from the food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

Spain is the one of only countries in this study for which we have a continuous estimate of apparent fish consumption back to the sixteenth century. This wealth of data is thanks to the work by Ernesto López Llosa. We use three series of figures from Llosa in this study; one series for the whole of Spain from 1858 to 1892 in (Carmona & Losa 2009, p. 277). Another series for all of Spain from 1858 to 2001 (Losa 2005, pp. 4-5). And for Madrid only 1590 to 1868 (Carmona & Losa 2009, p. 277).

Losa found that fish in general was a marginal element in the Spanish diet until the twentieth century when railway transportation and distribution facilities opened the Spanish market. In previous centuries fish was an almost exclusively urban phenomenon. Fresh fish could be had only in the coastal cities or in Madrid at huge expense, while salted cod could be transported across the country as it was light and durable. Nevertheless, cod compared unfavourably with the cheaper bull meat. From the mid-eighteenth century cod declined in importance as fast and abstinence days could be reduced by buying religiously sanctioned bullmeat (Carmona & Losa 2009). In contrast, Regina Grafe argues that salted cod became a staple and ubiquitous food in the Spanish diet after it arrived in the market in the sixteenth century (Grafe 2012, pp. 53-6). Grafe goes into far more detail about the origins and economic dimensions of the trade, but we will focus on the consumption levels here. Apart from cod, other fish formed an important part of the Spanish diet in the mediaeval and early modern periods. In the south and east, the tuna fishery was of major importance, while Spanish vessels from the Atlantic provinces travelled to catch hake in the Bay of Biscay and Celtic Sea (Barkham 2009; History Ireland 2001).

For the period 1908-17 Losa estimated Spanish consumption at 7.78 kg p/c (Losa 2005, pp. 4-5). While it is not stated in this text, we assume this figure is in PW, so we convert it to LW. The figure of 7.78 kg is a general figure with no breakdown for species type, so we take the last available figure for species breakdown from 1892 (Carmona & Llosa 2009) to calculate LW in 1908-17. In 1892, 42% of consumption was fresh fish and we use a CF of 1.82 for this (Helland 1896). Likewise, 19% of consumption was salted or picked and we use a CF of 1.67 (Helland 1896). Finally, 39% of consumption was salted cod and we use a CF of 4.7 (Nicholls et al 2021). When this ratio of species is applied to the figure of 7.78 kg from 1908-17 we reach an estimate of 21.81 kg LW. From 1918 onwards we assume the figures are already in LW so have taken them as shown in Losa (2005, pp. 4-5).

Table 3 shows figures from Madrid only from Carmona & Losa (2009, p. 277). The figures were PW, and we have calculated LW, assuming CF of 1.67 (Helland 1896) for fresh, salted and pickled products (presumably mostly oily pelagics), and 4.7 for salted cod (Nicholls et al 2021). Similarly, Grafe calculated per capita consumption based on import figures of bacalao in 1785; in that year, 32,500 tonnes of PW cod (equalling 152,750 t LW) was imported to feed a population of 10.8 million. These figures equate to a per capita consumption of 3 kg CW or 14 kg LW per person (Barkham 2009, p.68). López Llosa's calculation of 4.85 for 1789 is 60% higher but the difference may be explained by the fact

that English landings in Newfoundland, which were almost completely destined for the Iberian peninsula, doubled between 1785 and 1788 (Carmona et al 2009).

Working back from the figure for 1785, Grafe (2012) estimated that consumption was no higher than 0.7 kg PW (3.29 kg LW, CF 4.7) in 1650. This means that cod consumption in Spain would have increased fivefold between the seventeenth and eighteenth centuries. However, the figures for Madrid provided by López Llosa do not indicate any such change took place in the capital. The disagreement warrants further research but indications are that by the early eighteenth century bacalao demand was substantial. We know that in 1735 the Iberian trade from Newfoundland and New England amounted to 400,000 quintals or 92,000 t LW (Lydon 1981). The population of Spain and Portugal in that year was some 12 million, equalling a cod consumption of 7.7 kg LW. It seems therefore that consumer demand was significantly lower earlier in the century, supporting Grafe's view. However, much of the difference is a function of lower production rather than demand. Production in 1735 was only two-thirds of that in 1785. The real difference in consumer demand was therefore relatively small: the Iberian share of the cod exported from Newfoundland was 55%, and in 1735 the share was 47%.

Grafe (2012) estimates that meat consumption in Spain was between 20-30 kg per person in the early modern period. This amount would cover a male adult for 120 days; meanwhile, the average bacalao intake would add another 33 days (Lydon 1981, p.71). However, the consumption pattern of fish and meat was also highly seasonal. Fish consumption rose at Christmas and Lent, while meat-eating fell at the same time. Grafe suggests this indicates that cod became 'an almost perfect substitute for beef' in Spain. A mixture of Catholic tradition and the trading cycles of merchants drove this strong seasonality (Lydon 1981, p.72).

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France

Summary Data for France 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average of national estimates (FAOSTAT 2021; 2022)	2000-2019	30.13	30.13	1	20 national
Average of national estimates (FAOSTAT 2021)	1980-1999	27.08	27.08	1	20 national
Average of national estimates (FAOSTAT 2021)	1960-1979	20.91	20.91	1	19 national
Interpolated value	1946-1959	19.94	19.94	5	0
Interpolated value	1920-1938	18.97	18.97	5	0
National estimate (Helland 1896; Hérubel 1912)	1900-1913	18	18	2	1 national
Average of national estimates (Helland 1896; Hérubel 1912; Wallem 1880)	1850-1899	13.89	13.89	2	2 national
Interpolated value	1800-1849	11.25	11.25	5	0
Average of national estimates (Israel 1995; Hérubel 1912; Holm et al. 1996)	1750-1799	8.6	8.6	2	2 national
Average of national estimates (Israel 1995; Hérubel 1912; Holm et al. 1996)	1700-1749	10.7	10.7	2	1 national
National estimate (Israel 1995; Hérubel 1912; Holm et al. 1996)	1650-1699	6.7	6.7	2	1 national
Average of national estimates (Israel 1995; Hérubel 1912; Holm et al. 1996)	1600-1649	10.4	10.4	2	1 national

Average of national estimates (Israel 1995; Hérubel 1912; Holm et al. 1996)	1550-1599	6.9	6.9	2	1 national
Average of national estimates (Israel 1995; Hérubel 1912; Holm et al. 1996)	1500-1549	1.05	1.05	2	1 national

Table 1. National annual French fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
2019	30.61	FAO 2022	Apparent Consumption	Food supply and population data
2018	29.8	FAO 2022	Apparent Consumption	Food supply and population data
2017	29.87	FAO 2022	Apparent Consumption	Food supply and population data
2016	29.12	FAO 2022	Apparent Consumption	Food supply and population data
2015	29.03	FAO 2022	Apparent Consumption	Food supply and population data
2014	29.41	FAO 2022	Apparent Consumption	Food supply and population data
2013	30.01	FAO 2022	Apparent Consumption	Food supply and population data
2012	28.92	FAO 2022	Apparent Consumption	Food supply and population data
2011	31.25	FAO 2022	Apparent Consumption	Food supply and population data
2010	30.72	FAO 2022	Apparent Consumption	Food supply and population data
2009	30.65	FAO 2021	Apparent Consumption	Food supply and population data
2008	30.57	FAO 2021	Apparent Consumption	Food supply and population data
2007	29.93	FAO 2021	Apparent Consumption	Food supply and population data

2006	31.06	FAO 2021	Apparent Consumption	Food supply and population data
2005	30.78	FAO 2021	Apparent Consumption	Food supply and population data
2004	29.8	FAO 2021	Apparent Consumption	Food supply and population data
2003	30.62	FAO 2021	Apparent Consumption	Food supply and population data
2002	31.2	FAO 2021	Apparent Consumption	Food supply and population data
2001	30.8	FAO 2021	Apparent Consumption	Food supply and population data
2000	28.35	FAO 2021	Apparent Consumption	Food supply and population data
1999	28.84	FAO 2021	Apparent Consumption	Food supply and population data
1998	29.51	FAO 2021	Apparent Consumption	Food supply and population data
1997	27.86	FAO 2021	Apparent Consumption	Food supply and population data
1996	28.15	FAO 2021	Apparent Consumption	Food supply and population data
1995	28.35	FAO 2021	Apparent Consumption	Food supply and population data
1994	27.84	FAO 2021	Apparent Consumption	Food supply and population data
1993	27.79	FAO 2021	Apparent Consumption	Food supply and population data
1992	28.08	FAO 2021	Apparent Consumption	Food supply and population data
1991	28.28	FAO 2021	Apparent Consumption	Food supply and population data
1990	29.25	FAO 2021	Apparent Consumption	Food supply and population data
1989	27.35	FAO 2021	Apparent Consumption	Food supply and population data

1988	28.52	FAO 2021	Apparent Consumption	Food supply and population data
1987	27.39	FAO 2021	Apparent Consumption	Food supply and population data
1986	26.35	FAO 2021	Apparent Consumption	Food supply and population data
1985	25.33	FAO 2021	Apparent Consumption	Food supply and population data
1984	24.39	FAO 2021	Apparent Consumption	Food supply and population data
1983	25.11	FAO 2021	Apparent Consumption	Food supply and population data
1982	24.24	FAO 2021	Apparent Consumption	Food supply and population data
1981	24.94	FAO 2021	Apparent Consumption	Food supply and population data
1980	24.1	FAO 2021	Apparent Consumption	Food supply and population data
1979	23.41	FAO 2021	Apparent Consumption	Food supply and population data
1978	23.62	FAO 2021	Apparent Consumption	Food supply and population data
1977	23.08	FAO 2021	Apparent Consumption	Food supply and population data
1976	21.55	FAO 2021	Apparent Consumption	Food supply and population data
1975	21.75	FAO 2021	Apparent Consumption	Food supply and population data
1974	21.73	FAO 2021	Apparent Consumption	Food supply and population data
1973	21.14	FAO 2021	Apparent Consumption	Food supply and population data
1972	21.02	FAO 2021	Apparent Consumption	Food supply and population data
1971	20.54	FAO 2021	Apparent Consumption	Food supply and population data

1970	20.3	FAO 2021	Apparent Consumption	Food supply and population data
1969	19.97	FAO 2021	Apparent Consumption	Food supply and population data
1968	22.06	FAO 2021	Apparent Consumption	Food supply and population data
1967	21.05	FAO 2021	Apparent Consumption	Food supply and population data
1966	20.61	FAO 2021	Apparent Consumption	Food supply and population data
1965	20.62	FAO 2021	Apparent Consumption	Food supply and population data
1964	19.43	FAO 2021	Apparent Consumption	Food supply and population data
1963	19.23	FAO 2021	Apparent Consumption	Food supply and population data
1962	18.24	FAO 2021	Apparent Consumption	Food supply and population data
1961	17.97	FAO 2021	Apparent Consumption	Food supply and population data
1893-1900	18	Helland, 1896 & Hérubel, 1912	Approximated Consumption	Merchant and institutional accounts
1877	9.78	Wallem 1880	Apparent Consumption	
1789	7.7	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	
1750	9.5	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	
1700	10.7	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	
1650	6.7	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	
1600	10.4	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	

1550	6.9	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	
1500	1.05	Israel 1995, Hérubel 1912, NAFHA vol 1, Holm et al. 2021, calculated by the authors	Approximated Consumption	

Table 2. Partial annual French fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1726	43.4	Turgeon 1984	Apparent Consumption	L'hôpital Saint-Léon de Bayonne	Hospital patients
1734	27.63	Turgeon 1984	Apparent Consumption	L'hôpital Saint-Léon de Bayonne	Hospital patients
1742	19.2	Turgeon 1984	Apparent Consumption	L'hôpital Saint-Léon de Bayonne	Hospital patients
1752	12.03	Turgeon 1984	Apparent Consumption	L'hôpital Saint-Léon de Bayonne	Hospital patients
1765	8.4	Turgeon 1984	Apparent Consumption	L'hôpital Saint-Léon de Bayonne	Hospital patients
1775	10.48	Turgeon 1984	Apparent Consumption	L'hôpital Saint-Léon de Bayonne	Hospital patients
1784	37.1	Husson 1875	Apparent Consumption	Figures for Paris only	
1851-1855	25.48	Husson 1875	Apparent Consumption	Figures for Paris only	
1873	25.17	Husson 1875	Apparent Consumption	Figures for Paris only	

Table 3 - Seafood consumption, France. Total and per capita, 1877

Seafood Product	Landings + Trade Surplus	Per Capita Consumption
Liver oil	-166	0
Crustaceans	6410	0.17

Mollusks	15503	0.4
marine fish, other	45801	1.19
Pelagic fish	48944	1.27
Demersal fish	260747	6.76
Total	**377238**	**9.78**

Table 4. Live Weight calculations of seafood. Oysters are net weight edible matter (no shells). (Husson 1875, pp.316-335; Helland 1896, pp.21-22)

Year	Fresh seafish	Oysters	Cod, salted	Cod, dried	Herring, blancs	Herring, saurs	Mackerel	Salmon	Marinated fish (sardines, tuna, anchovy, oysters)
1789-1790	4450055								
1790-1795									
1796-1800									
1800-1805	7752987								
1806-1810									
1811-1815		261085							
1816-1820	8162036	390394							
1821-1825		737505							
1826-1830	12460833	678011							
1831-1835		728413							
1836-1840		758602							
1841-1845	16920355	663746							
1846-1850	21184473	915239							
1851-1855	18950167	973051	5390000	13333	146667	250000	305000	1167	
1856-1859	22197602	826043							
1860-1865	25247238	748060							

1866-1869	32649496	385976							
1870-1871	29087722	159822							
1872-1873	42254871	255008	66667	66667	110000	400000	125000	22500	684533

Table 5. French Seafood supplies and per capita consumption, 1500 to 1789

Year	Seafood Supplies	Population	Per Capita Consumption
1500	17,000	16,250,000	1.05
1550	117,000	17,000,000	6.9
1600	193,000	18,500,000	10.4
1650	135000	19,985,500	6.7
1700	230000	21,471,000	10.7
1750	245000	25,735,500	9.5
1789	232000	30,000,000	7.7

Table 6a. Daily provision of cod and eggs, L'hôpital Saint-Léon de Bayonne (1726-1775) in grams per person

Year	Cod PW:CW:LW	Eggs, CW	Meat (beef, veal, mutton), CW	Total animal consumption CW
1726	25.3 : 75.9 : 118.9	-	138.3	78.1
1734	16.1 : 48.3 : 75.7	3.3	121.4	63.1
1742	11.2 : 33.6 : 52.6	5.3	179.4	79.7
1752	7.6 : 22.8 : 35.7	7.1	215.2	89.5
1765	4.9 : 14.7 : 23.0	6.5	136.2	57.5
1775	6.1 : 18.3 : 28.7	12.2	152.9	66.9

Table 6b. Summary of CW, PW and LW of daily provision of cod and eggs, L'hôpital Saint-Léon de Bayonne (1726-1775) in kg p/c

Year(s)	1726	1734	1742	1752	1765	1775
Edible Matter (EM)						
Consumed Weight (CW)	75.9	48.3	33.6	22.8	14.7	18.3

Processed Weight (PW)	25.3	16.1	11.2	7.6	4.9	6.1
Live Weight (LW)	118.9	75.7	52.6	35.7	23	28.7
Kg LW per annum p/c	43.40	27.63	19.20	13.03	8.40	10.48

Summary Data for Fance 1500-2019

Figures from 1961 to 2019 come from the food and Agriculture Organization of the United Nations (FAO) food balance sheets. From 2010 onwards the FAO employed a new and more accurate method to calculate consumption estimates (FAO 2022), while figures before 2010 are less reliable they are still the best national consumption estimates available (FAO 2021). In both the old and new methodology the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

Thanks to extensive quantitative studies of merchant and institutional accounts, France's pattern of historical seafood consumption is better known than in most other countries. However, we have not found an overall estimate of nineteenth-century consumption. An analysis in 1893 of apparent consumption in Paris established a per capita intake of 8.04 kg PW (Helland 1896, p.57). Figures for other major cities around 1900 indicate an average p/c consumption of 10 kg PW (Hérubel 1912, p.332). If we assume that the PW:LW ratio in 1893 was similar to the one computed for 1873 in the following section, we may estimate that urban consumption was around 20 kg LW in the late nineteenth and early twentieth centuries. As rural consumption likely was lower, we estimate a per capita consumption of 18 kg.

The French fishery statistics began in 1866, provided landings by value only, and by volume from 1874 for cod, herring, sardine, tuna, mackerel, while other species are known by volume from 1895. However, Wallem (1880) provides detailed information of national supplies of seafood in 1877, presumably based on trade statistics. Figures for salt cod are converted to LW using a CF of 4.7 (Nicholls 2021), stockfish by 7.7 (Jonsson 1998, p.27), and French Icelandic cod catches by 3 (Allaire et al. 2021). To estimate per capita consumption, we divided the total supply of seafood by French population data from the Maddison project for 1877 (Maddison Project 2020). The results of the analysis are shown in Table 3.

For Paris, A. Husson published an extensive survey of consumption which included detailed information of seafood consumption 1789-1873 (Husson 1875, pp.316-335). He calculated consumption per capita by mixing dried, salted, marinated and fresh fish without conversion. Husson’s data are comprehensive but only complete for one year 1872/73. Using the observed conversion rates by Helland, we revised the figures substantially. One item, marinated products, need special mention. Husson only provided

figures for marinated products in the final year of his series, when 581 tonnes of canned fish were sold in Paris. There is no ready conversion ratio to live weight of marinated products which no doubt varied considerably both in terms of actual fish content and the weight of the containers. As a conservative estimate, we assume that half of the net content of the cans was fish, and that the conversion was similar to herring (1.67). By this conversion, marinated products accounted for 0.36 kg LW p/c in 1873. On this basis, seafood consumption in Paris in 1872/73 was 25.17 kg LW per capita (Ibid.). The LW calculation is based on Helland (1896, pp. 21-22). For the 1873 population we used T. Loua, (1873, p.100). For the years 1851-1855 Husson provided average figures of consumption of the same range of seafood products except for marinated products. Using the same conversion ratios and adjusting for the Paris population size (Husson 1875, p.32) per capita consumption in these years were 25.48 kg LW or perhaps 0.1-0.2 kg LW higher to account for marinated products.

For the 1780s we have a list of provisions for Paris. The list shows that marine fish was three times more important than freshwater fish, as consumption in the city totaled 5,100 tonnes of sea fish and 1,680 tonnes of freshwater fish. The sale of salted fish accounted for three quarters of the seafish while fresh fish made up the rest (Robert 1961). Assuming that the salted fish was dry-salted green cod (CF 4.7) (Nicholls et al 2021) and the fresh fish was gutted (conversion 1:1.6) before transportation to the city, this amounted to 2,318 t fresh seafish, 19,125 t salted fish, and 3,055 t freshwater fish, all live weight equivalent. The population of Paris in 1784 was 660,000 (Wilmms 1997) so per capita consumption was 32.5 kg marine fish and 4.6 kg freshwater fish. The list of provisions seems to be based on average figures and may understate the healthy state of fish provisions in the years just before the Revolution. Husson (1875) gives a higher figure for fresh seafish in 1789/90 when the city received 4,450 t. We know that the Newfoundland fishery was also extremely good in the late 1780s (Nicholls et al. 2021) so the city would have been well served with seafood.

For the period 1789-1873 we have more detailed information for fresh sea fish and oyster provision for Paris (Table 4). The list highlights a clear trend towards more consumption of fresh seafish while salted cod lost importance. Oysters clearly gained in popularity in the first half of the nineteenth century.

France was a net importer of fish around 1900 and demand probably exceeded supplies in previous centuries also (Hérubel, 1912, p. 334). To estimate total apparent consumption, we establish minimum production figures for the domestic fisheries, distant-water fisheries, and imports.

Domestic: In 1650, France had 25,000 working fishers, and in 1800 30,000 fishers. By a very conservative estimate if they each landed at least 1 t of fish in a year (NAFHA vol 1), we can estimate that domestic fisheries produced a minimum catch of 25,000 t in 1650 and 30,000 t in 1800. These are very conservative figures, and Toutain (1971) gives good reasons to believe that the domestic fishery

was in the order of 48,000 t in 1800. For earlier years, we do not have an estimate of the homeland fishing population, but we assume that minimum landings will have been 15,000 t in 1500 and 1550, and 20,000 in 1600. The distant-water fishery around Newfoundland and Iceland contributed 0 t in 1500, 97,000 t in 1550, 163,000 t in 1600, 100,000 t in 1650, 195,000 in 1700, 210,000 t in 1750, and 200,000 t in 1789 (Holm et al. 2021).

Imports: Israel (1995, p. 305) states that in 1680 exports from the Netherlands to Northern France, especially Rouen amounted to 5,000 lasts (10,000 t LW) of herring. We assume the same amounts between 1600 and 1700. We assume 5,000 t in 1550 and 2,000 t in 1500. By 1789 it is likely that there was very little importation due to the demise of the Dutch fishery, and we assume 2,000 t in 1750 and 1789. To estimate consumption, we take our estimates of total seafood supplies and divide them by French population estimates from the Maddison Project Database (2020). The results of these calculations are in Table 5, and the figures have also been added to Table 1.

It should be noted that our figures diverge considerably from the results published by J.C. Toutain (1971) who estimates French seafood consumption from 1781 to 1964. We have decided to discard his results based on the following observations:

- Toutain's figure for 1960-1964 (11.9 kg) is lower than the more accurate FAO figure for 1961 (18.08 kg LW) or the FAO average from 1961-1964 (18.9). This suggests Toutain underestimated the conversion to LW (probably caused by dry and salt fish CF) . To account for the difference, Toutain's figure needs to be multiplied by 1.513. This probably also needs to be done for the earlier figures.
- Toutain assumed that throughout the period 20% of the fish consumed was salted, dried, or smoked. This is probably an underestimation of the earlier part of the period.
- For crustaceans and molluscs, values are known from 1865. Toutain calculated total amounts from a price index and reported weights in EW. Toutain then calculated the fish and shellfish series as "fish equivalents", by adding 25% to the gross fish weight series to account for bivalves and shellfish. The precise mechanics of these calculations are not transparent.
- For 1850, Toutain estimates the quantity of fish caught from the value of the fish caught, deflated by the Singer-Kérel fish price index, based on data from 1875. This seems fine but no details are provided.
- For 1789, Toutain based calculations on Peuchet (1805). Peuchet estimated total national landings of 26,000 t herring, 7,000 t sardine, 2,000 t mackerel, and 13,000 t cod, a total of 48,000 t. Importantly, this total clearly did not include the distant-water landings. Nevertheless, Toutain accepts 48,000 t as the likely landings in 1789 and then interpolates landings linearly between 1789 and 1850. Toutain seems to assume that little or no provisions came from across the Atlantic during the years revolution.
- Between 1815 and 1850, Toutain added fish imports from the Grand Banks fishery ("St Pierre et Miquelon").

- By neglecting the distant-water fishery in 1789, Toutain severely underestimates pre-revolutionary fish provisions.

In the eighteenth century, outside coastal locations, fish was predominantly sold in urban contexts, often up rivers and far inland. Customers of fish merchants included craftsmen, tailors, coopers, surgeons, shopkeepers, clerks, and servants, and the institutional consumers such as monasteries, hospitals, schools, the army, and navy. The aristocratic elite preferred fresh fish but salted cod even occasionally made it to the royal table. Peasants on the other hand were absent from merchants' ledgers. Agricultural labourers sometimes got fish from the landowners at harvest time, but generally speaking, in the countryside fish was rare and often of poor quality (Turgeon 1984; 1987). Inland provisions were almost exclusively of herring in the mediaeval period while cod - presumably from the French fisheries off Newfoundland - became more and more important in the sixteenth and seventeenth centuries. (Delsalle et al 2005).

Based on hospital accounts, consumption of fish seems to have declined through the eighteenth century (Turgeon 1984, p.35) Institutional regulations reduced fish days from three to two per week in the almshouse of Nantes, at a hospital in Bordeaux and a convent in Bayonne. At the hospital of Saint-Léon de Bayonne, a coastal region near major Basque fishing ports, the provision of dried cod (morue sèche) fell steadily through the century from 25.3 g PW per person/day in 1726 to 6.1 g PW in 1775 (Table 6a & 6b). The tables are based on data from Turgeon (1984, p.35) and the authors added the calculated CW and LW values. Converted to annual per capita values the figures indicate that inmates in 1726 received 9.2 kg PW : 27.7 kg CW : 43.4 kg LW cod in a year. By 1775 the figures were down to 2.2 kg PW and 10.5 kg LW. This was no doubt caused by the demise of the distant-water fishery during the Franco-British wars. The protein loss was partly made up by increased servings of eggs and meat but inmates experienced a marked decline of animal foods by 1765. The decline in fish consumption was less marked but still discernible in inland towns where consumption had always been low. In Molsheim, near Strasbourg, fish was 1.5% of the calorie intake by the middle of the century but fell to 1% by the 1780s. In nineteenth century Paris hospitals, fish was a similarly marginal part of the diet when it had been replaced by fatty foods.

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England / UK

Summary Data for England / UK 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
National estimate (FAOSTAT 2021; 2022)	2000-2019	17.1	17.1	1	20 national
National estimate (FAOSTAT 2021)	1980-1999	16.99	16.99	1	20 national
National estimate FAOSTAT 2021; Reid 2003) (UK)	1960-1979	18.57	18.57	1	20 national
Average of national estimates (Reid 2003) (UK)	1946-1959	25.87	25.87	1	12 national
Average of national estimates (Reid 2003) (UK)	1920-1938	25.24	25.24	1	19 national
Average of national estimates (Reid 2003) (UK)	1900-1913	31.98	31.98	1	14 national
National estimate (Barker 1966) (England only)	1850-1899	20	20	1	1 national
No estimate available	1800-1849				
No estimate available	1750-1799				
No estimate available	1700-1749				
No estimate available	1650-1699				
No estimate available	1600-1649				
No estimate available	1550-1599				
No estimate available	1500-1549				

Table 1. National annual English fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
2019	15.2	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data

2018	15.29	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2017	15.39	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2016	16.57	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2015	15.63	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2014	15.76	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2013	17.83	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2012	17.25	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2011	17.31	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2010	16.41	FAO 2022	Apparent Consumption	For the whole UK. Food supply and population data
2009	16.73	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2008	18.05	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2007	18.59	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2006	19.23	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2005	17.94	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2004	18.54	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2003	17.09	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data

2002	17.97	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2001	18.63	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
2000	17.56	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1999	17.38	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1998	17.14	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1997	18.47	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1996	17.72	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1995	17.32	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1994	16.87	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1993	16.7	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1992	16.83	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1991	16.29	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1990	16.96	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1989	17.9	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1988	17.74	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1987	16.85	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data

1986	16.72	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1985	17.52	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1984	16.67	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1983	16.02	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1982	16.75	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1981	16.7	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1980	15.18	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1979	15.7	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1978	15.67	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1977	16.61	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1976	17.18	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1975	16.14	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1974	16.83	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1973	17.87	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1972	17.59	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1971	18.54	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data

1970	20.14	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1969	20.18	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1968	20.44	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1967	19.99	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1966	19.43	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1965	20.53	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1964	20.03	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1963	19	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1962	19.27	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1961	19	FAO *2021*	Apparent Consumption	For the whole UK. Food supply and population data
1961	20.9	Reid 2003, MAFF 1963	Observed Consumption	For the whole UK
1960	21.16	Reid 2003	Observed Consumption	For the whole UK
1959	21.42	Reid 2003	Observed Consumption	For the whole UK
1958	20.59	Reid 2003	Observed Consumption	For the whole UK
1957	21.45	Reid 2003	Observed Consumption	For the whole UK
1956	22.14	Reid 2003	Observed Consumption	For the whole UK

1955	21.3	MAFF 1957	Observed Consumption	For England only
1954	15.39	Reid 2003	Observed Consumption	For the whole UK
1953	22.75	Reid 2003	Observed Consumption	For the whole UK
1952	27.16	Reid 2003	Observed Consumption	For the whole UK
1951	27.65	Reid 2003	Observed Consumption	For the whole UK
1950	23.91	Reid 2003	Observed Consumption	For the whole UK
1949	30.34	MAFF 1956	Observed Consumption	For England only
1948	35.39	Reid 2003	Observed Consumption	For the whole UK
1947	34.67	Reid 2003	Observed Consumption	For the whole UK
1946	37.92	Reid 2003	Observed Consumption	For the whole UK
1945	33.23	Reid 2003	Observed Consumption	For the whole UK
1944	27.81	Reid 2003	Observed Consumption	For the whole UK
1943	23.84	Reid 2003	Observed Consumption	For the whole UK
1942	23.84	Reid 2003	Observed Consumption	For the whole UK
1941	20.95	Reid 2003	Observed Consumption	For the whole UK
1938	23.79	Reid 2003	Observed Consumption	For the whole UK

1937	26.02	Reid 2003	Observed Consumption	For the whole UK
1936	24.42	Reid 2003	Observed Consumption	For the whole UK
1935	24.31	Reid 2003	Observed Consumption	For the whole UK
1934	22.9	Reid 2003	Observed Consumption	For the whole UK
1933	23.02	Reid 2003	Observed Consumption	For the whole UK
1932	23.09	Reid 2003	Observed Consumption	For the whole UK
1931	23.92	Reid 2003	Observed Consumption	For the whole UK
1930	26.18	Reid 2003	Observed Consumption	For the whole UK
1929	25.12	Reid 2003	Observed Consumption	For the whole UK
1928	25.71	Reid 2003	Observed Consumption	For the whole UK
1927	24.38	Reid 2003	Observed Consumption	For the whole UK
1926	24.54	Reid 2003	Observed Consumption	For the whole UK
1925	27.63	Reid 2003	Observed Consumption	For the whole UK
1924	26.3	Reid 2003	Observed Consumption	For the whole UK
1923	24.1	Reid 2003	Observed Consumption	For the whole UK
1922	25.78	Reid 2003	Observed Consumption	For the whole UK

1921	26.63	Reid 2003	Observed Consumption	For the whole UK
1920	31.74	Reid 2003	Observed Consumption	For the whole UK
1919	35.2	Reid 2003	Observed Consumption	For the whole UK
1918	27.06	Reid 2003	Observed Consumption	For the whole UK
1917	25.29	Reid 2003	Observed Consumption	For the whole UK
1916	23.02	Reid 2003	Observed Consumption	For the whole UK
1915	24.37	Reid 2003	Observed Consumption	For the whole UK
1914	38.86	Reid 2003	Observed Consumption	For the whole UK
1913	33.4	Reid 2003	Observed Consumption	For the whole UK
1912	31.83	Reid 2003	Observed Consumption	For the whole UK
1911	33.97	Reid 2003	Observed Consumption	For the whole UK
1910	34.49	Reid 2003	Observed Consumption	For the whole UK
1909	34.07	Reid 2003	Observed Consumption	For the whole UK
1908	32.92	Reid 2003	Observed Consumption	For the whole UK
1907	34.13	Reid 2003	Observed Consumption	For the whole UK
1906	32.6	Reid 2003	Observed Consumption	For the whole UK

1905	29.49	Reid 2003	Observed Consumption	For the whole UK
1904	30.73	Reid 2003	Observed Consumption	For the whole UK
1903	31.46	Reid 2003	Observed Consumption	For the whole UK
1902	31.37	Reid 2003	Observed Consumption	For the whole UK
1901	28.42	Reid 2003	Observed Consumption	For the whole UK
1900	28.84	Reid 2003	Observed Consumption	For the whole UK
1880	20	Barker 1966	Apparent Consumption	For England only

Table 2. Partial annual English fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1850	49	Mayhew 1851	Approximated Consumption	Figure for London only	
1799	4.6	Cutting 1955, p. 207	Apparent Consumption	Figures for London only and only includes North Sea imports	
1664	18.74	Muldrew 2011	Approximated Consumption	Records from King's College, Cambridge	Fellows at King's College
1572	5.38	Muldrew 2011	Approximated Consumption	Records from King's College, Cambridge	Fellows at King's College
1562	34.45	Muldrew 2011	Approximated Consumption	Records from King's College, Cambridge	Fellows at King's College
1500	171.9	Harvey 2002	Observed Consumption	Records from Westminster Abbey	Monks at Westminster Abbey
1481	85.74	Muldrew 2011	Approximated	Records from King's	Fellows at King's

			Consumption	College, Cambridge	College

Figure 1. Number of Fish and Chip Shops in Preston, 1885-1936 (Walton 1989, p.247).

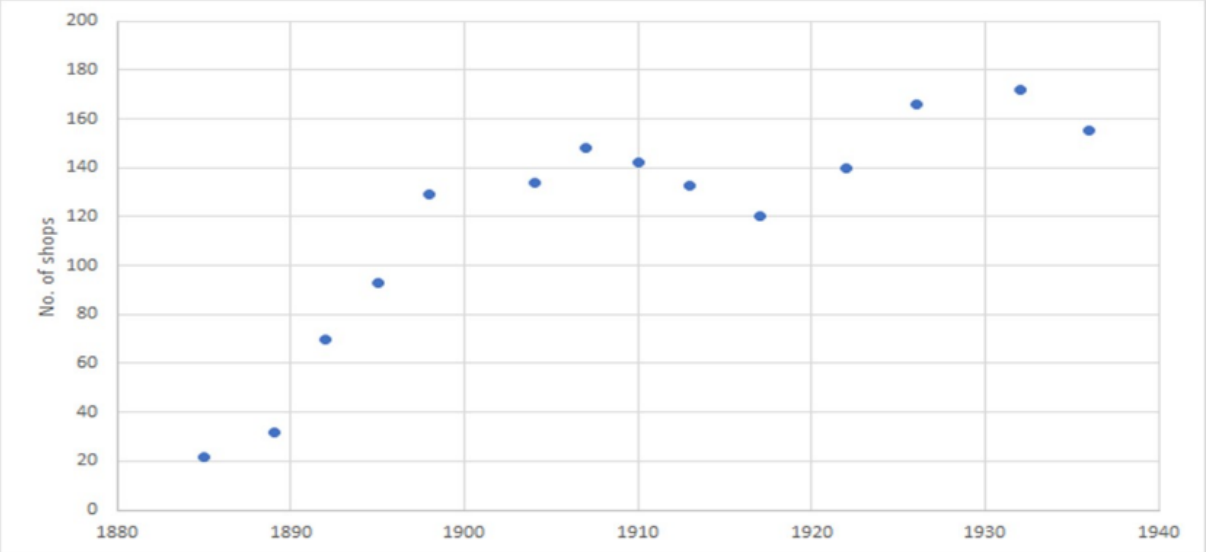

Table 3. Fish Sold in London from Billingsgate Market, 1850 (Mayhew 1851, p.63)

Fish Product	t PW	t LW	LW Per Capita Consumption (kg)
Salmon and Salmon Trout	79	79	0.03
Live Cod	454	454	0.17
Soles	2439	2439	0.92
Whiting	762	762	0.29
Haddock	224	224	0.08
Plaice	13336	13336	5.03
Mackerel	3521	3521	1.33
Fresh Herrings	9525	9525	3.59
Fresh Herrings in Bulk	85729	85729	32.33
Sprats	1361	1361	0.51
Eels from Holland	171	171	0.06
Eels from England and Ireland	14	14	0.01
Flounders	20	20	0.01
Dabs	22	22	0.01

Barrelled Cod	238	281	0.11
Dried Salt Cod	363	479	0.18
Smoked Haddock	495	867	0.33
Bloaters	1202	1493	0.56
Red Herrings	3175	3000	1.13
Oysters	1984	19836	7.48
Lobsters	27	27	0.01
Crabs	14	14	0.01
Shrimps	364	364	0.14
Whelks	501	501	0.19
Mussels	755	755	0.28
Cockles	858	858	0.32
Periwinkles	574	574	0.22
Total	**126221**	**146703**	**55**

Figure 2. Per Capita Consumption of Aquatic Food in London, 1850 in kg.

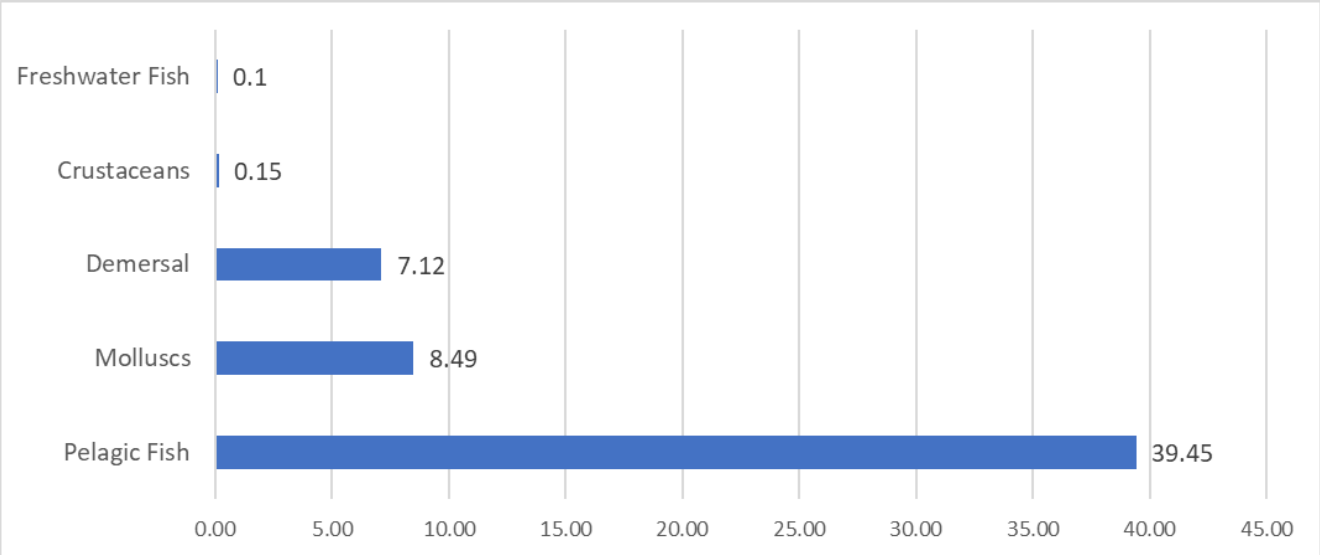

Table 4. Fish Supplies by Train to Manchester, 1852-1881. Fish supply data from Scola (1992, p.139). Population data from University of Portsmouth (2021)

Year	Fish Supplies t PW	Greater Manchester Population	Per Capita Fish Consumption (kg PW)
1852	622	1064656	0.58
1853	3094	1092311	2.83
1854	4852	1119966	4.33
1855	8045	1147621	7.01
1856	9902	1175276	8.43
1857	13173	1202930	10.95
1858	15625	1230585	12.7
1859	19398	1258240	15.42
1860	19739	1285895	15.35
1861	25329	1313550	19.28
1862	29763	1341205	22.19
1863	29156	1368860	21.3
1864	32958	1396516	23.6
1878	116021	1783685	65.05
1879	100908	1811340	55.71
1880	88885	1838994	48.33
1881	96989	1866649	51.96

Table 5 - All 20th century English seafood consumption estimates

Year	LW	Source	LW	Source	LW	Source	LW	Source
1900	28.84	Reid 2003, p. 172						
1901	28.42	Reid 2003, p. 172						
1902	31.37	Reid 2003, p. 172						
1903	31.46	Reid 2003, p. 172						

1904	30.73	Reid 2003, p. 172						
1905	29.49	Reid 2003, p. 172						
1906	32.6	Reid 2003, p. 172						
1907	34.13	Reid 2003, p. 172						
1908	32.92	Reid 2003, p. 172						
1909	34.07	Reid 2003, p. 172						
1910	34.49	Reid 2003, p. 172						
1911	33.97	Reid 2003, p. 172						
1912	31.83	Reid 2003, p. 172						
1913	33.4	Reid 2003, p. 172						
1914	38.86	Reid 2003, p. 172						
1915	24.37	Reid 2003, p. 172						
1916	23.02	Reid 2003, p. 172						
1917	25.29	Reid 2003, p. 172						
1918	27.06	Reid 2003, p. 172						
1919	35.2	Reid 2003, p. 172						

1920	31.74	Reid 2003, p. 172						
1921	26.63	Reid 2003, p. 172						
1922	25.78	Reid 2003, p. 172						
1923	24.1	Reid 2003, p. 172						
1924	26.3	Reid 2003, p. 172						
1925	27.63	Reid 2003, p. 172						
1926	24.54	Reid 2003, p. 172						
1927	24.38	Reid 2003, p. 172						
1928	25.71	Reid 2003, p. 172						
1929	25.12	Reid 2003, p. 172						
1930	26.18	Reid 2003, p. 172						
1931	23.92	Reid 2003, p. 172						
1932	23.09	Reid 2003, p. 172						
1933	23.02	Reid 2003, p. 172						
1934	22.9	Reid 2003, p. 172						
1935	24.31	Reid 2003, p. 172						

1936	24.42	Reid 2003, p. 172						
1937	26.02	Reid 2003, p. 172						
1938	23.79	Reid 2003, p. 172						
1939								
1940								
1941	20.95	Reid 2003, p. 172					17.8	Barker 1966, p. 136
1942	23.84	Reid 2003, p. 172						
1943	23.84	Reid 2003, p. 172						
1944	27.81	Reid 2003, p. 172					22.2	Barker 1966, p. 136
1945	33.23	Reid 2003, p. 172						
1946	37.92	Reid 2003, p. 172						
1947	34.67	Reid 2003, p. 172					35.6	Barker 1966, p. 136
1948	35.39	Reid 2003, p. 172			34.929	Franklin 1997, p. 233		
1949	30.34	Reid 2003, p. 172						
1950	23.91	Reid 2003, p. 172					24.4	Barker 1966, p. 136
1951	27.65	Reid 2003, p. 172						
1952	27.16	Reid 2003, p. 172						

1953	22.75	Reid 2003, p. 172					22.2	Barker 1966, p. 136
1954	15.39	Reid 2003, p. 172						
1955	21.49	Reid 2003, p. 172						
1956	22.14	Reid 2003, p. 172					24.4	Barker 1966, p. 136
1957	21.45	Reid 2003, p. 172						
1958	20.59	Reid 2003, p. 172						
1959	21.42	Reid 2003, p. 172					24.4	Barker 1966, p. 136
1960	21.16	Reid 2003, p. 172			21.524	Franklin 1997, p. 233		
1961	20.55	Reid 2003, p. 172	19	FAOSTAT 2021				

Table 6 - Regional Seafood Consumption in the UK, 1949

Region	LW	Source
London	36.12	MAFF 1956
South and East	32.14	MAFF 1956
South West	27.45	MAFF 1956
Midland	27.81	MAFF 1956
North West	27.09	MAFF 1956
North East	31.42	MAFF 1956
Scotland	26.73	MAFF 1956
Total	**30.34**	MAFF 1956

Table 7 - Regional Seafood Consumption in the UK, 1955

Region	LW	Source
Wales	22.9	MAFF 1957
Scotland	21.63	MAFF 1957
Northern, East and West Ridings	23.62	MAFF 1957
North Western	22.72	MAFF 1957
North Midlands and Eastern	20.01	MAFF 1957
Midlands	17.59	MAFF 1957
South Western	18.53	MAFF 1957
South Eastern and Southern	20.59	MAFF 1957
London	23.87	MAFF 1957
Provincial	23.48	MAFF 1957

Table 8 - Regional Seafood Consumption in the UK, 1961

Region	LW	Source
Wales	18.29	MAFF 1963
Scotland	17.67	MAFF 1963
Northern	25.07	MAFF 1963
East and West Ridings	26.72	MAFF 1963
North Western	20.55	MAFF 1963
North Midland	17.88	MAFF 1963
Eastern	20.55	MAFF 1963
Midland	18.91	MAFF 1963
South Western	15.82	MAFF 1963
South East and Southern	19.52	MAFF 1963
London Conurbation	23.43	MAFF 1963
Provincial	20.55	MAFF 1963

Explanatory Notes for England / UK 1500-2019

The FAO data from 1961 does not relate to England alone, but to the United Kingdom as a whole. This means the figures are not as directly comparable as other examples. Nevertheless, it shows that the

UK consumed 19 kg LW of aquatic food in 1961. Of this, 16 kg was demersal fish, with pelagic fish accounting for another 2 kg. Demersal fish remains the most popular category across the UK today, but its consumption has steadily declined over time, while other categories have seen modest growth. (FAOSTAT 2021)

There is extensive consumption data available for the United Kingdom for the period from 1900 to 1961. Most of this data relates to the UK as a whole, but there is some regional information available too. We will first deal with the UK data before examining the regional data for England. Regional data for Scotland can be found in that country's respective section.

The most complete series of consumption data comes from Chris Reid. Reid employs a range of sources to estimate consumption from 1900 to 1990. The complete details on the methodology and sources employed can be found in his publication (Reid 2003). Reid's data is in grams of PW per week, so we use a CF of 2.45 and multiply by 52 to get a yearly figure to convert to LW. The CF of 2.45 relates to cod fillets and was chosen because cod was the most popular fish in the UK in this period (FAO, 2020). The accuracy of this CF can be verified by comparing Reid's figures to other estimates. For example, based on Reid's figures, we estimate a p/c consumption in 1961 of 20.55 kg LW, which compares to 19 kg LW from the FAO. The difference is partly due to the inclusion of freshwater fish in Reid's figures and its absence from the FAO value, which is 19.83 with freshwater included. The remainder of the difference is small and likely due to the CF used, but without more detailed species information we cannot use a more specific CF. Despite this, the figures match closely and provide a solid estimate of seafood consumption for the UK from 1900 onwards. The full list of Reid's and additional comparative figures can be seen in Table 5.

In another study, Adrian Franklin, uses data from the Ministry of Agriculture, Fisheries and Food, to estimate seafood consumption from the pre-war era to 1990 (Franklin, 1997, p. 223). Franklin's estimates from 1948 and 1960 are relevant to the current study. The original figures are in PW and EM and are broken down into categories, so various CFs are needed to convert the totals back to LW. The most consumed category is Fresh, Frozen and Cured, with 13 kg EM in 1948 and 7.3 kg EM in 1960. We again use the CF of 2.45 for this (FAO, 2020), which results in a value of 31.85 kg LW in 1948 and 17.9 kg LW in 1960. The second most popular category was Canned fish at 0.8 kg EM in 1948 and 1.2 kg EM in 1960. To calculate LW, we use a CF of 1.4, which was reached by averaging the FAO's factors for canned products. This gives us a figure of 1.12 kg LW in 1948 and 1.68 kg LW in 1960. The final category is Shell, mollusc and crustacea, with 0.3 kg EM in 1948 and 1960. To calculate LW, we again average the FAO CFs, this time for shellfish and mollusc products to reach a factor of 6.53 (FAO, 2020). This gives a figure of 1.95 kg LW in 1949 and 1960. These figures mean that total consumption in the

UK was 34.9 kg LW in 1948 and 21.5 kg LW in 1960. These figures again closely match the values from Reid's data (Again see Table 5 for comparison).

Finally, in a 1966 study, T. C. Barker estimates the supply of fish to the UK and calculates apparent consumption for certain years from 1880 to 1962 (Barker 1966, p. 136). Barker's figures are less well matched to Reid's but are still not wildly different. Barker's study is far older than Reid's and uses a less reliable method to calculate consumption, so the differences are not surprising. Barker's values can be seen in Table 5. We feel that Reid's figures are the most reliable in the years they are available, so they have been employed over any competing figures in our final summary data.

We were able to generate regional figures for the UK only for the years 1961, 1955 and 1949. However, these years still provide an idea of how English consumption compares to the UK average. Data for 1961 is based on an annual report from the Ministry of Agriculture, Fisheries and Food titled Domestic Food Consumption and Expenditure survey (MAFF 1963). The report provides figures on the percentage difference in consumption between regions, and we used these figures to adjust Reid's UK average to correspond to England only. The full breakdown can be seen in Table 8, but the average for English was 20.9 kg LW, as compared to 20.6 kg LW for the whole of the UK (from Reid).

The regional data from 1955 is again based on the MAFF report from 1955 (MAFF 1957), but this report provided direct consumption figures. We used a CF of 2.45 (FAO 2020) on these to convert to LW. The full breakdown can be seen in Table 7, and the figure for England was 21.3 kg LW, compared to 21.49 kg LW for the whole UK.

Lastly, figures from 1949 are based on another report from MAFF titled 'Studies in Urban Household Diets 1944-49' (MAFF 1956). This report again provides direct consumption figures, and we use a CF of 2.45 to reach LW (FAO 2020). The breakdown is in Table 6 and the English average was 30.3 kg LW compared to the UK average of 30.3 kg LW. These figures indicate while there were large regional differences within England itself, in most years English consumption was in line with the UK average as a whole. For this reason, the UK average figures are a good indication of how seafood consumption in England changed over the twentieth century.

National consumption estimates are difficult to calculate before 1880, but supply data demonstrates the rapid growth in the popularity of fish in the second half of the nineteenth century. In 1854, only 453 tons of fish were landed in the port of Grimsby, by 1870 this had increased to 30,000 tons and by 1909 it was 175,000. Likewise, the volume of fish carried by the railways in England increased from 285,000 tons in 1890 to 561,000 in 1913 (Cutting 1995, pp. 253-254). Unfortunately, these figures do not represent the total supplies of fish; those figures elude us. Therefore, it is not possible to estimate per

capita consumption for the whole of England before the 1880s. However, we can estimate consumption in a few select cities.

London was the largest urban area in England in the mid-nineteenth century and was supplied with fish by the Billingsgate market. Charles Cutting estimates that 2,540 t of PW fish came into Billingsgate via the North Sea in 1799 (Cutting 1955, p. 207). Using Helland's general CF of 1.82 (Helland, 1896) this equates to 4622.8 kg LW. London's population was just over a million in the census of 1801, so using a rounded figure of 1 million for 1799 this means a per capita consumption of 4.6 kg LW (Census 1801). However, the actual figure would have been higher if supplies from other fishing areas could be included. Despite the lack of complete figures, fish consumption seems to have been low in the city around this time; a Londoner from the period commented that 'the quantity of fish consumed in London is comparatively small, fish being excessively dear' (Cutting 1955, p. 207).

By 1823 the amount of fish coming from the North Sea to Billingsgate increased to 12,000t, or 7.8kg of PW fish per person (Cutting 1955, p. 207). By 1850 the influence of the railway led to a massive increase in the volume of fish entering Billingsgate. A local observer called Henry Mayhew collected detailed data on the fish coming to the market in that year and provides an excellent snapshot of what fish were imported and sold locally by the London costermongers, or street vendors. Of the London diet, Mayhew wrote that the 'fish diet seems becoming almost as common among the ill-paid classes of London, as is a potato diet among the peasants of Ireland' (Mayhew 1851, p.62). Table 3 shows the volume of fish sold locally in London in both PW and LW, while the last column shows the LW per capita consumption of London's population, which was 2.6 million a year later in 1851 (Census of 1851).

Mayhew's data suggests Londoners consumed on average 55 kg of LW seafood in 1850. Although, this figure includes 7.48 LW of oysters, of which 90% is shell (Nielsen 2019). If we only include the EM of oyster the figure is 49 kg per capita. Despite this level of detail, we must treat Mayhew's information with caution. Another London writer called George Dodd wrote in 1856 that the clerk of Billingsgate at that time was 'quite without means of knowing the quantity of fish sold at that market' and questions how Mayhew calculated his figures (Dodd 1856, pp. 355-8). Dodd concludes that while Mayhew's data is based on some guesswork, it is the best estimate available. For our purposes, we must conclude similarly; these estimates are not perfect, but they still indicate the wide range of seafood available in London in this period and illustrate that it held an important part in the city's food consumption.

Keeping these issues in mind, we can break Mayhew's figures down into the same categories used in the FAO food balance sheets (See Figure 2). We can note that pelagic fish were by far the most eaten, with herring accounting for 38 kg LW of the total 39.45 kgs LW of pelagic fish consumption. This level of herring consumption seems abnormally high, but historical catch data supports it, showing that

315,389 t of PW herring were caught per year in the North Sea between 1892 and 1899. English inland railway transport of fish ranged between 200,000 t PW and 500,000 t PW from 1879 to 1902 (Pinnegar 2007). Given this, it is plausible that similar catches were made earlier in 1850, and a large portion of this went to London. In second place in terms of LW were molluscs, but as mentioned above, a large portion of this would be inedible matter from shells. Nevertheless, by Mayhew's reckoning, Londoner's consumed a massive 123 million oysters in 1850, which equates to 46.7 per person and about 0.75 kg of EM. Mayhew's figures, along with a wealth of qualitative evidence, tells us oysters was an extremely popular food in the city. They were even offered free in some taverns to encourage drinking. (Smith 2015, p.52). In third place were demersal fish, with a consumption of 7 kg LW per person. As the nineteenth century progressed, the position of pelagic and demersal fish would reverse. As mentioned above, by the 1870s, catches of demersal fish far outweighed all other categories and pelagic fish consumption would drop markedly. Overall, Mayhew's figures illustrate that fish consumption was diverse and relatively in London before the advent of fish and chip shops later in the nineteenth century.

By the mid-nineteenth century, Manchester was the third-largest city in England and was one of the centres of the industrial revolution (University of Portsmouth, 2021). Table 5 below indicates the supplies of fish brought into Manchester by train from 1852 to 1880 (Scola 1992, p. 139). Not all this fish would have been eaten locally, as Manchester was a major transport hub. However, to give some indication of consumption over time we can assume it was all eaten locally and divide by the population of Manchester based on census records (University of Portsmouth, 2021). Doing this, we find that in 1852, when London was consuming an estimated 55 kg of LW fish per year, Manchester ate only .58 kg LW. However, this would change over the next decades, as the development of the railways contributed to a massive increase in the volume of fish shipped to the city (Scola 1992, pp.126-129). By 1864, the volume of fish coming into Manchester would equal 23.6 kg LW per capita, and by 1878 the shipped fish would account for 65 kg LW, a trend similar to that of London (Muldrew, 2011).

As part of this research, we surveyed the diets of those in workhouses during the eighteenth and nineteenth century. Records of an eighteenth-century workhouse diet from Morton (1797) showed no fish. Research by Miller (2013) for the nineteenth century also indicated no fish consumption in workhouses. In a quantitative series of poorhouse diets from 1589 to 1795 meat and fish are grouped together, making distinguishing consumption of each impossible (Shammas 1984, p. 263). However, in the paper itself fish is not mentioned at all, while meat is discussed several times. This suggests that again, fish was not a feature of the poorhouse diet.

Barbara Harvey estimates that monks in Westminster Abbey ate 570 fish dishes per year, around 1500, with an average serving of 302 g LW per dish, equating to a yearly consumption of 171.9 kg LW. Harvey provides her figures in LW, so no conversion was required. This high consumption is due to the monks'

observance of fish days on several days during the week, on specific religious holidays, and every day during Lent (Harvey 2002, pp. 46-51). The general population of England would not have enjoyed the same level of consumption and variety of species that the monks did.

Fellows at King's College, Cambridge were served 453 g PW fish on fish days in 1481, 182 g PW in 1562, 28.4 g PW in 1572 and 99 g PW in 1664 (Muldrew 2011, p. 122). If we make a conversative estimate that the fellows had an average of 2 fish days per week over this period and use Helland's general CF of 1.82 (Helland 1896) we can estimate that in 1481 the fellows ate 85.74 kg LW of seafood, in 1562 they had 34.45, in 1572 5.38 kg LW and in 1664 18.74 kg LW.

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Scotland

Summary Data for Scotland 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Combined with UK for this period, see England / UK estimates	1900-2019				
Low estimate (MAFF 1956), national figure for 1949, high average of partial figures.	1850-1899	26.7-54	40.35	3	1 national 2 partial
Low estimate (MAFF 1956), national figure for 1949, high (Gourvish 1988)	1800-1849	26.7-60.09	43.4	4	1 national 1 partial
Low estimate average of partial figures, high (MAFF 1956) national figure for 1949	1750-1799	8.13-26.7	17.42	3	1 national 2 partial
Low estimate average of partial figures, high (MAFF 1956) national figure for 1949	1700-1749	15.73-26.7	21.22	3	1 national 4 partial
Interpolated value	1650-1699	25.93	25.93	5	0
Low estimate (MAFF 1956) (national figure for 1949, high (Gibson and Smout 1995)	1600-1649	26.7-34.56	30.63	3	1 national 1 partial
No estimate available	1550-1599				
No estimate available	1500-1549				

Table 1. National annual Scottish fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
1961	17.67	MAFF 1963; Reid 2003	Apparent Consumption	Estimate for Scotland only
1955	21.63	MAFF 1957	Observed Consumption	Estimate for Scotland only

1949	26.7	MAFF 1956	Observed Consumption	Estimate for Scotland only

Table 2. Partial annual Scottish fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1902	29.4	Paton et al 1902	Observed Consumption		Edinburgh only
1869	78.6	Hutchison 1869	Observed Consumption	Food survey	Agricultural labourers in Caithness
1810-30	60.09	Gourvish 1972, pp. 78-80	Approximated Consumption	Variety of contemporary records.	Resident of Glasgow
1790	7.63	Gibson and Smout 1995, p. 260	Observed Consumption		Paupers: Glasgow town hospital
1780	8.62	Gibson and Smout 1995, p. 259	Observed Consumption		Paupers: Glasgow town hospital
1743	5.61	Gibson and Smout 1995, p. 258	Observed Consumption		Lady GrisellBaillie's servants: Mellerstane, Berwickshire
1740	12.56	Gibson and Smout 1995, p. 257	Observed Consumption		Paupers: Glasgow town hospital
1739-40	39.57	Gibson and Smout 1995, p. 256	Observed Consumption		Orphans and servants: Dean Orphanage, Edinburgh
1739	5.17	Gibson and Smout 1995, p. 255	Observed Consumption		Servants: Gordon Castle, Banffshire,
1649	34.56	Gibson and Smout 1995, p. 252	Observed Consumption		Orphans: Hutchesones hospital, Glasgow

Explanatory Notes for Scotland 1500-2019

Data from the Ministry of Agriculture, Fisheries and Food allows for assessment of Scottish consumption in certain years. In 1961 the ministry established figures for the percentage difference in consumption between regions of the UK (MAFF 1963). Reid (2003) established figures for UK consumption in the same year (see English/UK section for more), so we combined these figures to estimate Scottish consumption at 17.67 kg LW in 1961. This figure represents a difference of 14% over the UK average.

Another report from MAFF provides Scottish figures for 1955 (MAFF 1957). In that year the ministry reported consumption directly, and their data shows Scottish consumption was 21.63 kg LW. We converted this figure from PW to LW using a CF of 2.45 (FAO 2020). This CF relates to filleted cod and was chosen because cod was by far the most eaten fish in Scotland around this time (Walton 1989). The Scottish figure differs from the UK average by only 0.65% in that year.

A third report provides another estimate of Scottish consumption in 1949 (MAFF 1956). Again, direct consumption figures are provided and a CF of 2.45 (FAO 2020) was employed. The report shows Scottish consumption was at 26.7 kg LW in that year, which is 11.9% below the UK average. Together, these figures suggest that Scottish seafood consumption was lower than England and the UK average in most years.

Unfortunately, we have no national consumption figures for Scotland before 1949, but we do have regional and institutional estimates. We also know that the explosion of catches that occurred in England also happened in Scotland. Catches in the major port of Aberdeen totalled 9,000 t in 1887 before rising to 18,000 t in 1892, 63,000 t in 2901 and 112,000 t in 1911 (Cutting 1955, p. 253). Like in England, these new catches went alongside the rise of fish and chip shops in Scotland (Walton 1989). Overall, the increase of demersal fish consumption in Scotland during the late nineteenth and early twentieth century was not as dramatic as it was in England, but it was still significant.

A 1902 study from Edinburgh investigated the diets of the city's working class (Paton 1902). The authors surveyed the diets of 16 individuals and found the most commonly eaten foods were bread, potatoes and milk. Fish also featured in the diet, with an average intake of 30 g of fresh fish (PW) and 3.9 g of dried fish (PW) per day. If we apply Helland's CF of 1.82 on the fresh fish and his CF of 6.67 (Helland, 1896) for dried cod on the dried fish, then multiply by 365 we get a yearly intake figure of 29.4 kg LW.

A dietary survey published in 1869 looked at the diets of Scottish agricultural labourers. Fish, particularly salted herring, was a common accompaniment to potatoes, bread and oats at either dinner or breakfast. The passage below describes a typical day of eating for a family in the western coastal county of Argyllshire: 'Breakfast with family, porridge and milk, and tea and bread afterwards. Dinner with family,

bread and milk, or potatoes and milk, or herrings and potatoes, or braxy soup. Wife takes tea and bread. Supper with family, porridge and milk. Health very good' (Hutchison 1869).

Only in the northern county of Caithness are quantitative figures for consumption described in the survey. The authors estimate that a labourer ate 1.3 kg of PW fish per week, while family members would consume 0.45 kg over the same period (Hutchison 1869). Based on these figures, the average intake is 0.9 kg PW per week, or 47 kg of PW fish per year. We know from the accounts that herring was by far the most consumed fish; if we use Helland's conversion factor for herring (Helland 1896) (1.67), that equates to 78.6 kg of LW fish per person in 1869. However, since this figure is based on only one weeks' consumption we cannot account for the seasonality of herring consumption, meaning this estimate may be higher than the true yearly consumption (Devine 2006, p. 221).
Compared to the rest of Scotland, consumption in Caithness was likely higher than average due to its coastal location, but other qualitative evidence supports a large fish consumption across the highlands during the nineteenth century. T. M. Devine writes that, like Ireland, the potato played a vital role in the Scottish diet during the mid-nineteenth century, but the Scottish diet also included 'meal, from both oats and barley, milk, and above all, fish (Devine 2006, p. 221). The New Statistical Account of Scotland, published in 1845, contains many references to the consumption of potatoes and herring for both breakfast and dinner (Devine 2006; The 'New' Statistical Account of Scotland 1845). Devine even suggests that the greater availability of fish in Scotland compared to Ireland allowed the former to avoid famine during the potato blight of the 1840s (Devine 2006, p. 223).

T. R. Gourvish (1972) establishes estimates for the cost of living in early nineteenth century Glasgow (1810-1830), as part of this he estimates the weekly intake of fish by the cities inhabitants. Gourvish estimates a lower end intake of 635 g per person per week, with salted herring and salted ling being the most eaten species (Gourvish 1972, pp. 78-80). Gourvish based his figures on contemporary sources and should be a good approximation of the cities average intake. To convert to LW we use the general CF of 1.82 from Helland (1896) as we cannot be sure how much of each species people ate. This conversion factor gives us an estimated LW intake of 60.09 kg per person per year from 1810-1830. While this does seem high, it matches well with the figures from Caithness.

A.J.S. Gibson and T.C. Smout have established consumption values for several Scottish institutions in the seventeenth and eighteenth centuries (Gibson and Smout 1995). Of the institutions, they surveyed six had some seafood in their weekly rations. The full list of institutions and consumption values are shown in Table 3 below. Consumption values were provided in ounces of daily or weekly PW consumption. We converted to LW by using Helland's CF (Helland 1896) values and multiplying to reach yearly figures.

The earliest value is from an Orphanage called Hutchesones hospital in Glasgow from 1649. Children resident there were provided with one herring every second day, which Gibson and Smout estimate to equal 113.4 g PW fish on those days (Gibson and Smout 1995, p. 252). By using Helland's CF of 1.67 (Helland 1896) and multiplying by 182.5 (half a year), we get a LW value of 34.56 kg LW.

Servants at Gordon Castle in Banffshire were the only people to be fed with cod instead of herring. They had a daily ration of 2.83 g PW in 1738 (Gibson and Smout 1995, p. 256). Using Helland's CF of 5 (Helland 1896) and multiplying by 365 gives us a yearly value of 14.1 kg LW of cod.

Servants in Dean Orphanage, Edinburgh, were provided with two herrings daily in 1738-40 or 64.9 g of fish, according to Gibson and Smout (1995, p. 256). When converted using Helland's CF (Helland 1896) and multiplied by 365, we get a yearly intake of 39.57 kg LW. This was the highest consumption of seafood among these Scottish institutions.

The servants of Lady GrisellBaillie's at Mellerstane had a weekly ration of 64.6 g of herring in 1743, or 5.61 kg LW per year when using Helland's CF and multiplying by 52 (Gibson and Smout 1995, p. 258; Helland 1896).

Paupers at Glasgow town hospital were provided with 144.5 g of herring per week in 1740, which equates to 12.56 kg LW of herring. In 1780 the pauper's herring ration had come down to 8.62 kg LW and by 1790 had decreased further to 7.63 kg LW. All figures were calculated using a CF of 1.67 and multiplying by 52 to get yearly figures (Gibson and Smout 1995, p. 257-260; Helland 1896).

Overall, orphanages had the most general seafood rations, while papers and household servants were provided with relatively modest intake. The provision of seafood also dropped over the period. The average of all figures is 16.25 kg LW, but this is not very indicative of anything as it covers such a long period. However, we can take the figure from 1739-1743 as being a decent representation of consumption in Scotland at that time. The average for that period is 15.73 kg LW.

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Ireland

Summary Data for Ireland 1500-2019

Basis	Period	Consumption Low/High (kg)	Average Consumption (kg)	Evidence Quality Level (1-5)	Related Data Points
Average national estimates (FAOSTAT 2021; 2022)	2000-2019	20	20	1	20 national
Average national estimates (FAOSTAT 2021)	1980-1999	14.18	14.18	1	20 national
Average national estimates (FAOSTAT 2021)	1960-1979	10.19	10.19	1	20 national
Interpolated value	1946-1959	7.70	7.70	5	0
National estimate (Tierney 1932)	1920-1938	5.2	5.2	1	1 national
Interpolated value	1900-1913	4.64	4.64	5	0
Interpolated value	1850-1899	4.08	4.08	5	0
Low estimate average of partial values, high (Tierney 1932) national estimate from 1932	1800-1849	1.83-5.2	3.52	4	1 national 13 partial
Low estimate average of partial values, high (Tierney 1932) national estimate from 1932	1750-1799	2.94-5.2	4.07	4	1 national 8 partial
Low estimate partial figure (Walse et al, 2021; HMSO 1836 & Sexton 2015), high (Tierney 1932) national estimate from 1932	1700-1749	1.12-5.2	3.16	4	1 national 1 partial
No estimate available	1650-1699				
No estimate available	1600-1649				
No estimate available	1550-1599				
No estimate available	1500-1549				

Table 1. National annual Irish fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis
2019	19.27	FAO 2022	Apparent Consumption	Food supply and population data
2018	19.51	FAO 2022	Apparent Consumption	Food supply and population data
2017	19.79	FAO 2022	Apparent Consumption	Food supply and population data
2016	18.15	FAO 2022	Apparent Consumption	Food supply and population data
2015	18.12	FAO 2022	Apparent Consumption	Food supply and population data
2014	19.93	FAO 2022	Apparent Consumption	Food supply and population data
2013	18.87	FAO 2022	Apparent Consumption	Food supply and population data
2012	19.48	FAO 2022	Apparent Consumption	Food supply and population data
2011	19.48	FAO 2022	Apparent Consumption	Food supply and population data
2010	21.79	FAO 2022	Apparent Consumption	Food supply and population data
2009	20.59	FAO 2021	Apparent Consumption	Food supply and population data
2008	19.17	FAO 2021	Apparent Consumption	Food supply and population data
2007	21.17	FAO 2021	Apparent Consumption	Food supply and population data
2006	18.75	FAO 2021	Apparent Consumption	Food supply and population data
2005	19.68	FAO 2021	Apparent Consumption	Food supply and population data

2004	21.13	FAO 2021	Apparent Consumption	Food supply and population data
2003	19.92	FAO 2021	Apparent Consumption	Food supply and population data
2002	18.6	FAO 2021	Apparent Consumption	Food supply and population data
2001	23.18	FAO 2021	Apparent Consumption	Food supply and population data
2000	23.04	FAO 2021	Apparent Consumption	Food supply and population data
1999	20.37	FAO 2021	Apparent Consumption	Food supply and population data
1998	20.92	FAO 2021	Apparent Consumption	Food supply and population data
1997	15.24	FAO 2021	Apparent Consumption	Food supply and population data
1996	14.34	FAO 2021	Apparent Consumption	Food supply and population data
1995	17.44	FAO 2021	Apparent Consumption	Food supply and population data
1994	15.34	FAO 2021	Apparent Consumption	Food supply and population data
1993	15.48	FAO 2021	Apparent Consumption	Food supply and population data
1992	11.7	FAO 2021	Apparent Consumption	Food supply and population data
1991	9.72	FAO 2021	Apparent Consumption	Food supply and population data
1990	12.95	FAO 2021	Apparent Consumption	Food supply and population data
1989	11.57	FAO 2021	Apparent Consumption	Food supply and population data

1988	11.52	FAO 2021	Apparent Consumption	Food supply and population data
1987	14.6	FAO 2021	Apparent Consumption	Food supply and population data
1986	15.93	FAO 2021	Apparent Consumption	Food supply and population data
1985	12.72	FAO 2021	Apparent Consumption	Food supply and population data
1984	10.38	FAO 2021	Apparent Consumption	Food supply and population data
1983	9.96	FAO 2021	Apparent Consumption	Food supply and population data
1982	14.37	FAO 2021	Apparent Consumption	Food supply and population data
1981	13.89	FAO 2021	Apparent Consumption	Food supply and population data
1980	15.19	FAO 2021	Apparent Consumption	Food supply and population data
1979	10.73	FAO 2021	Apparent Consumption	Food supply and population data
1978	14.45	FAO 2021	Apparent Consumption	Food supply and population data
1977	12.51	FAO 2021	Apparent Consumption	Food supply and population data
1976	15.3	FAO 2021	Apparent Consumption	Food supply and population data
1975	13.33	FAO 2021	Apparent Consumption	Food supply and population data
1974	11.63	FAO 2021	Apparent Consumption	Food supply and population data
1973	9.05	FAO 2021	Apparent Consumption	Food supply and population data

1972	10.68	FAO 2021	Apparent Consumption	Food supply and population data
1971	9.82	FAO 2021	Apparent Consumption	Food supply and population data
1970	10.64	FAO 2021	Apparent Consumption	Food supply and population data
1969	9.31	FAO 2021	Apparent Consumption	Food supply and population data
1968	9.21	FAO 2021	Apparent Consumption	Food supply and population data
1967	9.79	FAO 2021	Apparent Consumption	Food supply and population data
1966	8.95	FAO 2021	Apparent Consumption	Food supply and population data
1965	8.9	FAO 2021	Apparent Consumption	Food supply and population data
1964	8.08	FAO 2021	Apparent Consumption	Food supply and population data
1963	7.58	FAO 2021	Apparent Consumption	Food supply and population data
1962	6.75	FAO 2021	Apparent Consumption	Food supply and population data
1961	6.86	FAO 2021	Apparent Consumption	Food supply and population data
1932	5.2	Tierney 1932	Approximated Consumption	

Table 2. Partial annual Irish fish consumption values per capita in kg

Year	Live Weight (kg)	Source	Type	Basis	Group Covered
1839	6.82	Clarkson & Crawford 2001	Approximated Consumption		
1816	1.53	Walse et al 2021;	Approximated	Trade data	Only herring imports

		HMSO 1855	Consumption		
1815	1.66	Walse et al 2021; HMSO 1854	Approximated Consumption	Trade data	Only herring imports
1814	1.53	Walse et al, 2021; HMSO 1853	Approximated Consumption	Trade data	Only herring imports
1813	1.87	Walse et al, 2021; HMSO 1852	Approximated Consumption	Trade data	Only herring imports
1812	2.4	Walse et al, 2021; HMSO 1851	Approximated Consumption	Trade data	Only herring imports
1811	1.82	Walse et al, 2021; HMSO 1850	Approximated Consumption	Trade data	Only herring imports
1810	1.48	Walse et al, 2021; HMSO 1849	Approximated Consumption	Trade data	Only herring imports
1809	1.03	Walse et al 2021; HMSO 1848	Approximated Consumption	Trade data	Only herring imports
1808	0.81	Walse et al 2021; HMSO 1847	Approximated Consumption	Trade data	Only herring imports
1807	0.83	Walse et al 2021; HMSO 1846	Approximated Consumption	Trade data	Only herring imports
1803	0.86	Walse et al 2021; HMSO 1845	Approximated Consumption	Trade data	Only herring imports
1800	1.1	Walse et al 2021; HMSO 1844	Approximated Consumption	Trade data	Only herring imports
1799	3.62	Walse et al 2021; HMSO 1843	Approximated Consumption	Trade data	Only herring imports
1798	3.39	Walse et al, 2021; HMSO 1842	Approximated Consumption	Trade data	Only herring imports
1796	3.08	Walse et al 2021; HMSO 1841	Approximated Consumption	Trade data	Only herring imports
1795	3.09	Walse et al 2021; HMSO 1840	Approximated Consumption	Trade data	Only herring imports

1794	1.74	Walse et al 2021; HMSO 1839	Approximated Consumption	Trade data	Only herring imports
1793	1.83	Walse et al 2021; HMSO 1838	Approximated Consumption	Trade data	Only herring imports
1792	1.7	Walse et al 2021; HMSO 1837	Approximated Consumption	Trade data	Only herring imports
1758	5.1	Sexton 2015	Approximated Consumption	Servants diet	Household servants
1717	1.12	Walse et al 2021; HMSO 1836	Approximated Consumption	Trade data	Only herring imports

Explanatory Notes for Ireland 1500-2019

Figures for 1961, 2000 and 2019 come from the food and Agriculture Organization of the United Nations (FAO) food balance sheets. The 1961 figure uses an older methodology (FAOSTAT 2021) while figures for 2000 and 2019 uses a newer method currently employed by the FAO (FAOSTAT 2022). In both cases the FAO estimates apparent consumption by dividing the total available human food supply by the population. All figures are already in live weight and freshwater fish have been excluded from our figures.

An Irish government handbook from 1932 estimated that seafood consumption was only 2 kg PW. Using the same conversion factor of 2.45 that was employed for the twentieth century English figures, that equates to 4.9 kg LW (Tierney et al 1932, p. 128). Irish domestic fisheries were highly undeveloped in the early twentieth century, so there was little domestic supply. However, like England, fish and chips became popular in larger Irish cities, somewhat boosting consumption (Mac Con Iomaire 2005).

Going back further, the potato dominates the story of the Irish diet from the later seventeenth century until the nineteenth century. L. A. Clarkson and Margaret Crawford write that in 1845, on the eve of the Great Famine, ‘close to 40 per cent of the population of Ireland lived chiefly on potatoes.' (Clarkson and Crawford 2001, p.61). While the potato was the most critical food source during the eighteenth and nineteenth centuries, other foods, including fish, provided some additional nourishment. For example, a survey of labourers’ diets from 1839 shows that potatoes and milk were staple foods, often being served for both breakfast and dinner. However, the survey also indicates that milk was replaced with herring for some meals during the winter months when fish were plentiful and milk was scarce (Clarkson and Crawford 2001, p.71-3).

Unfortunately, this survey of diets does not have details on the amount of herring that was eaten, but we can get a sense of how widely it was consumed from a survey of national food consumption conducted in 1836 as part of the Poor Law Inquiry. This survey found that potatoes were the most ubiquitous food across Ireland, found in 100% of the parishes surveyed and all 32 counties. Next on the list was milk, found in 32 counties and 74.4% of parishes. Milk was followed by oatmeal observed in 28.4% of parishes. Herring was the fourth most common food on the survey, found in all 32 Irish counties and in 25.8% of the parishes. In comparison, beef was found in only 14% of Irish parishes. Other types of fish were recorded in only 6.9% of parishes, which indicates the primacy of herring in the Irish seafood intake at this time. (Clarkson and Crawford 2001, p.76; 'National food consumption patterns 1836 as revealed by the Poor Law Inquiry')

We can use import and export data to estimate seafood consumption in Ireland for some years from 1717 to 1816. These figures are based on data from the CUSTOMS15 dataset (Walsh et al 2018) and a British government inquiry into the state of Irish sea fisheries published in 1836 (His Majesty's Stationery Office [HMSO], 1836, Appendix No. VI., p. 29.). The trade figures reveal that herring was by far the most imported species to Ireland, with tiny amounts of ling and cod being the only other imports. To estimate national consumption, we selected years where herring imports exceeded exports by 95% or greater and divided this figure by the population. This methodology is likely to produce a low estimate as it does not include domestic supplies. However, we know that there were limited local supplies of herring in Ireland during certain years in the eighteenth and nineteenth centuries (Clarkson and Crawford, p. 78.) In these years, the imports represent the minimum demand for herring in the country. In total, 20 years from 1717 to 1816 met our criteria and Table 2 shows the complete figures.

Regina Sexton provides figures for a servant's diet in the household of the Marquis of Kildare in 1758 (Sexton 2015, p. 290). The servant's diet included 'salt fish with potatoes and cheese' for one meal every Sunday. The amount is not specified, but based on portions of other foods we assume a conservative estimate of 100g LW per person, which over a whole year equates to 5.2 kg LW of consumption.

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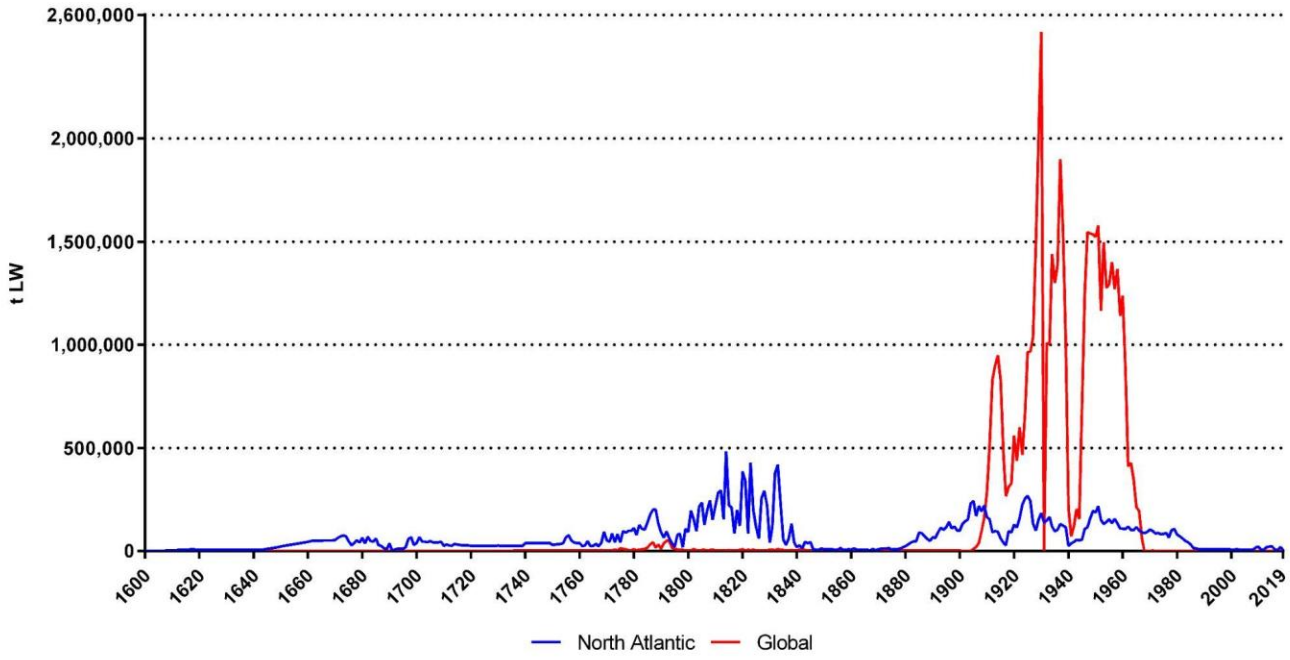
Atlantic European Whaling 1600-2019

Introduction

Atlantic European North Atlantic and Global whaling catches in t LW, 1600-2019



The chart above displays the biomass in t LW of whales caught in the North Atlantic and Globally (outside the North Atlantic) by Atlantic European whaling countries. Until the end of the 19th century, whaling efforts were primarily focused on the North Atlantic, but by the 20th century, whalers increasingly ventured into other oceans and regions. A collapse in global whaling in the 1960s is evident, and by the 1980s whaling was nearly completely abandoned.

In terms of human seafood consumption, whale meat, and that of other marine mammals like dolphins, seals and walruses has not been uncommon. However, such consumption, particularly in the modern period, has been on a minimal scale. Fish and other seafood have been preferred in most cultures and mammal meat (including whale meat) represents a vanishingly small percentage. But the whaling industry provided whale oil used for energy (lighting, heat) and industrial lubricants. Sperm whale oil (Spermaceti) was used for highly prized candles that burned cleanly. Interestingly, whale oil was known as 'trane' oil after the Dutch word for tears – the tears of the whale. Whalebone, or baleen, the pliable yet tough plates the whale uses to sift food like krill, has been utilised in the production of corsets, brushes, and many other goods. Prior to the implementation of plastic on industrial scales, baleen

products abounded. The teeth of certain species (e.g. Sperm whales) were used for piano keys, chess pieces and walking stick handles. (McNamara 2021)

The IWC (International Whaling Commission), the authority on global whaling for the 20th century, compiles data supplied by all whaling countries and has an excellent compilation of data from 1848 to 2019. Extending this data source with mostly pre-1900 data is an ongoing task of the ERC 4Oceans project (2021-2026); the combined effort will develop a long-term global database of whaling catches spanning the period from about 1600. Prior to 1700, there is little evidence of large-scale or industrial whaling with the notable exception of the Dutch and English efforts of Svalbard, Jan Mayan Island and the southern and eastern Greenland coastal region. Quantitative records are rare; in many cases data are either purely qualitative or non-existent. The IWC concedes that their data are subject to change, and that some data points are inaccurate to a certain degree as there is a reliance on member states to supply truthful, concise and correct information. In some rare instances, data are recognised as being inaccurate and explanatory notes are supplied. There is no data available for Sweden. (IWC 2019)

Whales vary radically in physiological make-up, geographic locations and behaviours. A blue whale may have a mass of up to 180 t while a Minke whale may reach a maximum of 9 t. The species covered in the global database include: Blue whales, Pygmy Blue whales, Baird's Beaked whales, Pilot whales, Fin whales, Bottlenose whalesSperm whales, Right whales, Humpback whales, Sei whales, Bryde's whales, Minke whales, Gray whales and Bowhead whales. Other species, like dolphins, include Orca (Killer) whales.

In 1983 all signatory countries to the IWC accord agreed on a moratorium on whale hunting which came into effect in 1985 and commenced in 1986. Specific and very limited quotas of whale catches were agreed for scientific and research purposes only. Indigenous subsistence whaling remains a grey area but has had vanishingly small impacts on whale stocks and behaviours. In some instances, the accord has been violated (e.g. by Japan). (IWC 2019)

In summary, European commercial whaling and sealing effectively only began after 1600 with the deployment of Basque harpooners on Dutch, English, and Danish expeditions to Spitsbergen/Svalbard (Jackson 1978; Senning 1968). Coastal operations had depleted the nearshore whale populations by the 1650s, and seagoing operations proved extremely difficult (Ellis 1999). Large-scale whaling increased rapidly in the 1780s as demand for urban lighting grew. The North Atlantic whale hunt peaked in the 1830s and declined quickly as whale populations were depleted. In 1879, the invention of a substitute for butter, margarine, based on animal fats mixed with milk and water, sustained a rapid increase in demand for whale oil that lasted as long as the industry (Tønnessen and Johnsen 1982). A second wave of European whaling in the early twentieth century expanded to other parts of the globe, especially the Southern Ocean for a rapid but short lived slaughter of cetaceans. After World War II, the

industry rebuilt but faced ecological collapse by the end of the 1960s before the moratorium on commercial whaling was implemented in 1986 (IWC 2022).

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Iceland

Summary Icelandic Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	0	0
1650-1699	0	0
1700-1749	0	0
1750-1799	0	0
1800-1849	0	0
1850-1899	0	0
1900-1949	5,623	0
1950-1999	22,427	0
2000-2019	4,466	0

Explanatory Notes for Icelandic Whaling

The Icelandic whaling trade, while relatively small compared with English, Scottish, Dutch, French and American activities in Icelandic waters and surrounding areas, was very productive on a pro-rata scale. Early Icelandic whaling has been chronicled since at least the 12th century (Einarsson 1987, pp. 35-6). Archaeological evidence points to Basque whaling in Iceland in the 17th century (Edvardsson 2015) but there is no evidence to suggest a large-scale operation of industrial proportions.

No data are available for the period to 1900, however, until 1918, Iceland was a part of the Kingdom of Denmark, and remained in a personal union with Denmark until full independence in 1944. The figures reflect this status.

The IWC data reveals that Icelandic whalers were active every year between 1900 and 1989, and again from 2003 to 2019. Iceland very narrowly failed to oppose the IWC moratorium on whaling since 1986 probably due to pressure from the United States (Darby 2007, pp. 179-80). Catches since 1985 were significantly smaller and pertained (reportedly) to legal catches of small (Minke) whales and scientific interest catches only, with 77% of the whale meat being exported to Japan. Differentials in biomass for 1985 indicate that the 344 whales caught amounted to 17,902 tonnes, whereas the 116 whales caught in 1986 amounted to just 8,800 t. From the 1950s to 1985 Iceland typically caught 400 whales per annum, amounting to around 25,000 t. With only small whales caught during the world war years (higher individual count for smaller biomass), and a spike in 1936-1938 proving the exception, the inter war period saw little activity. The early part of the 20th century saw significant catches with a peak in 1909 of 229 large whales (21,000 tonnes) caught. (IWC 2019)

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Denmark

Summary Danish Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	569.5	0
1650-1699	284	0
1700-1749	250	0
1750-1799	481	0
1800-1849	399	0
1850-1899	849	0
1900-1949	10,485	0
1950-1999	4,766	0
2000-2019	2,277	0

Explanatory Notes for Danish Whaling

Until 1814 Denmark, Norway, Greenland and Iceland were united under the Danish King, and operations ran out of Copenhagen and Bergen. We present all whaling in present-day Norwegian waters in the Norway section and Icelandic catches in the Iceland section. The Danish section relates to Greenlandic operations.

Individual catches between 1866 and 2019 totalled some 22,307 whales, amounting to 997,354 t LW biomass (IWC 2019). Figures from the Royal Greenland Trading Company (Holm and Nicholls forthcoming) reveal a snapshot of earlier Danish activities along the Greenland coast. Between 1721 and 1804, with various gaps in the data, an annual catch can be derived based on values of 'trane' oil. Baleen values are included at various points, and vessel numbers are available for some periods. The figures reveal that about 10 or 11 whales were caught on average each year. These would have been primarily North Atlantic Right whales or Bowhead whales.

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Norway

Summary Norwegian Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649		
1650-1699		
1700-1749		
1750-1799		
1800-1849		
1850-1899	31,164	0
1900-1949	71,122	681,030
1950-1999	22,608	305,472
2000-2019	4,135	0

Explanatory Notes for Norwegian Whaling

IWC reports for Norway provide details from 1864 until 2019. Norway remained active as a whaling nation throughout the 20th century despite severe dips during WWII. A remarkable spike of 27,099 whales (2.59 mil t) taken in 1930 was immediately followed by a crash to just 859 whales in 1931, following which, typical captures resumed at around 10,000 whales. Like Iceland, Norway captured a vast array of whale types, both large and small. Following WWII average catches resumed at about 10,000 whales with a graduated collapse by 1985. Biomass from whaling efforts virtually disappeared from 1986 with incidental scientific catches and a few small whales being taken each year until 2019. In 1991 just 1 whale was captured, but more typically, around 400-500 whales were caught per annum from 1985 onwards. (IWC 2019)

Prior to 1900 we have some details of operations at Spitsbergen operated out of Copenhagen, Denmark (Holm and Nicholls forthcoming). While this trade may appear to be on a small scale, indicating around 12 whales caught per year, it is indicative of the activities of the period and provides a build up to the accelerated Norwegian activities that characterised whaling during the 19th century.

Norway was controlled completely by the Kingdom of Denmark until 1814; Danish figures reflect this control.

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Germany

Summary German Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	233	0
1650-1699	9,892	0
1700-1749	2,336	0
1750-1799	0	0
1800-1849	0	0
1850-1899	0	0
1900-1949	192	22,113
1950-1999	0	0
2000-2019	0	0

Explanatory Notes for German Whaling

IWC records indicate a small-scale industry developing from 1903 which reported around 40 to 85 whales caught per annum. Records are only available for 1903-1905, and the trade almost certainly ceased during WWI (1914-1918). By 1936 the trade had developed again, being championed as part of Germany's largely politically motivated drive for industrial domination in Europe. In 1938 German whalers took some 5,813 whales. WWII (1939-1945) saw the complete collapse of the trade which never recovered after the war. (IWC 2019)

Prior to the 20th century, there is scant information about any whaling activity for Germany, except in the work of Zordrager (1720 pp.263-4) who reports annual whaling figures based on vessels operating out of Hamburg and covering the period 1670 to 1719. A comparatively significant number of whales were taken, reaching peaks of close to 20,000 t in 1673 and 1701.

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Netherlands

Summary Netherlands Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	4,104	0
1650-1699	30,014	0
1700-1749	29,437	0
1750-1799	18,130	0
1800-1849	490	0
1850-1899	57	0
1900-1949	0	8,653
1950-1999	0	37,888
2000-2019	0	0

Explanatory Notes for Netherlands Whaling

The Dutch IWC records highlight activities in the post WWII period only, with indicators as early as 1870 and 1871 providing some level of context. Peaking in 1958 with some 2226 whales caught (193,790 tonnes), the period from 1946 to 1963 was prolific. There appears to have been a collapse after this which never recovered.(IWC 2019)

Zorgdrager (1720 pp.262-3, 269), provides data relating to 1675 and 1719 which have been developed and whale numbers calculated. Typically, 450 whales per annum were caught and processed during this period which may be regarded as the Golden Years of Dutch whaling. The 18th century saw declines in whaling, fishing, trade and the Dutch economy overall.

In 'The First Modern Economy', De Vries (1997, pp261-262) provides detailed data on Dutch whaling efforts between 1622 and 1809. This information is largely reported in a decadal series that includes numbers of vessels,amounts of blubber, and revenue/profit derived from market sales of whale products, as well as whale numbers. The figures derived are very close to those of Zordrager for the period 1675 to 1719 and indicate a greater deal of certainty of the overall accuracy of the data.

Gaps in data have been calculated using simple interpolations and extrapolations based on available data. (Holm and Nicholls, forthcoming)

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Portugal

Summary Portuguese Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	0	0
1650-1699	0	0
1700-1749	200	1,550
1750-1799	403	3,297
1800-1849	800	3,200
1850-1899	1,253	3,200
1900-1949	10,246	1,504
1950-1999	11,364	0
2000-2019	0	0

Explanatory Notes for Portuguese Whaling

Portuguese whaling has been a constant throughout the period of study. The IWC data reports from 1896 to 1987 when whaling ended in Portugal. Like Norway and Iceland, Portuguese whaling was a continuous activity through this period. Prior to 1930, an average of 145 whales (5,500 t) was taken per annum, while the period from 1930 saw an average of 470 whales (17,800 t) per annum. (IWC 2019)

Prior to 1900, Portuguese trade from Brazilian coastal whaling efforts revealed a small but flourishing trade in whale oil and baleen. Between 1764 and 1785 records (in Portuguese) show Fish/whale oil, Sperm oil, Baleen (whale bone) and Spermaceti values. (Vieira, Brito and Nicholls forthcoming)

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Spain

Summary Spanish Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	5,000	0
1650-1699	5,000	0
1700-1749	3,100	0
1750-1799	0	0
1800-1849	0	0
1850-1899	0	0
1900-1949	9,500	0
1950-1999	13,751	0
2000-2019	0	0

Explanatory Notes for Spanish Whaling

Spanish whaling was not a prominent feature during the 20th century as seen from IWC figures. Records from 1924-1926 show 270 whales (25,000 t) p.a. taken, and from 1948 to its end in 1985, 313 whales (18,400 t) taken. The clear indication is that in the latter half of the 20th century, despite more whales being taken each year, the biomass was much reduced – smaller whale species such as Minkes were taken instead of the high yielding large whales. (IWC 2019)

Prior to 1900, there is little evidence of Spanish whaling efforts. However, Basque whaling contrasts radically, and these figures are included here. Between 1530 and 1600 some 13,000 whales (dominantly Bowhead) were taken, amounting to about 650,000 t. The dominant period was between 1560 and 1580, with a decline by 1600. However, Basque whalers established whaling stations along the Canadian east coast and Newfoundland, continuing their efforts into the 1730s. (Loewen 2009, pp.10-11)

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France

Summary French Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	0	0
1650-1699	0	0
1700-1749	450	0
1750-1799	532	0
1800-1849	1195	0
1850-1899	188	0
1900-1949	732	0
1950-1999	3,370	2,720
2000-2019	0	0

Explanatory Notes for French Whaling

The IWC figures for France reveal very little. Activities are limited to a post war period 1949 to 1952 with a high figure of 4793 whales taken in 1951. A single report of just 179 whales in 1959 indicates a collapse in the French industry. (IWC 2019)

Before the 20th century, France was one of the large players in the whaling trade. The French Whaling Database (after du Pasquier 1990) provides listings of 'bone', 'sperm' and 'oil' which can be converted into actual whale numbers and biomass tonnage. Sperm whales were their primary target in equatorial waters of the Atlantic Ocean from the later 18th century onwards, but also in the Indian and Pacific Oceans after 1950. (du Pasquier 1990)

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England and Scotland

Summary English and Scottish Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	755	0
1650-1699	350	0
1700-1749	279	0
1750-1799	52,518	6,789
1800-1849	158,420	1,422
1850-1899	3,230	12
1900-1949	25,465	0
1950-1999	103	0
2000-2019	0	0

Explanatory Notes for English and Scottish Whaling

English Whaling has been significant on the global arena. Since the late 17th century, whaling expeditions have been recorded, primarily in near-shore efforts around the British coast. By the mid-18th century, whaling vessels ventured further into the North Atlantic and the Arctic, and very soon spread to the Indian and Pacific oceans as well.

The British Arctic Whaling industry saw vessels and fleets hunting primarily Bowhead whales along the pack ice edge of the Arctic – their preferred habitat. The trade was characterised by the efficiency and skill of the whaler crews. The period of greatest impact was between c.1750 and c.1850 – coinciding with a raft of remunerative measures (bounties) and sponsorships that made the effort worthwhile financially. The cataclysmic decline of the Bowhead whale population around the middle of the 19th century saw the BAW industry all but collapse (Ayre,Molloy, Stonehouse, Nicholls forthcoming) BAW reports catches from 1613 to 1913, but the primary focus is 1750-1850.

The British North American Whaling (BNAW 2020) industry, despite operating largely from American Atlantic coastal ports, returned whale produce to the UK and vessels were not part of the large American fleets that also operated. From 1779 to 1845, they report the amount of Sperm oil and whale oil taken. The primary species was Sperm whales. Although this was a small-scale operation in comparative terms, it complements the British global whaling operations.

The British Southern Whale Fishery database (Jones, Chatwin and Richards 2020), like the BNAW database, does not provide numbers of whales or LW, but lists Sperm oil, whale oil, bone/baleen, seal skins, seal oil and elephant oil. Some calculations are required to complete the LW tonnage and number of individuals. However, this is not a significant change to the BAW figures and about 20% extra is expected.

Data from the Scottish Arctic Whaling records (Sanger 2020) provides a detailed list of Scottish voyages from 1750 until 1910. A figure of about 121 whales (6,000 t) per annum for Scottish ports was realised. Annual values for whale numbers, whale oil, seals, seal oil and "other" whales are reported.

Gordon Jackson (1978) provides data for the UK (Scotland and England) based on numbers of operating vessels from 1733 to 1809. Totals derived tally very closely with the aggregated counts from the various whaling fisheries highlighted above, further underpinning the degree of confidence in the figures used. Notably, Gordon's figures incorporate both North Atlantic and Global catch figures from the UK whaling effort for the period.

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Ireland

Summary Irish Whaling 1600-2019 (t LW)

Year	North Atlantic	Global
1600-1649	0	0
1650-1699	0	0
1700-1749	2	0
1750-1799	6	0
1800-1849	0	0
1850-1899	0	0
1900-1949	635	0
1950-1999	0	0
2000-2019	0	0

Explanatory Notes for Irish Whaling

We draw on research by Arthur A.E. West (1968) whose study of the Calendar of Justiciary Rolls, Irish records revealed several anecdotal and qualitative data points, but also some verifiable entries. Despite there not being any mention of Irish whaling in the IWC data, failed attempts at establishing an industry are chronicled in 1737, 1739, 1747 and 1759-1763. Despite a special Bill being passed in 1787 to encourage whaling, no whaling industry emerged. In total, these isolated efforts show just 9 whales caught and several failed attempts where whales escaped capture. The entire period from 1763 until the beginning of the 20th century reportedly did not attract a whaling industry. However, in 1908 a shore factory was established at Iniskea Island and whaling began again. Several stuttering starts and failures saw the entire trade end in 1914 with the onset of WWI. No significant whaling trade has emerged until the present day.

Bibliography for Irish Whaling

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Non-food uses: Fishmeal

Fishmeal, primarily used in agriculture, forms the basis of non-food uses of exploited marine life. We provide sourced statistical values where available, and provide calculated values based on trends and extrapolations.

Figures for Norway (from 1907 onwards), for Germany (1934, 1938 and 1950), for Iceland (1950) and for Sweden are taken from Fasting (1954). Danish figures (1938 onwards) are taken from Fiskeri-Beretning 1938-1951 (1952). Figures for all countries from 1953 to 1959 are extracted from US Dept of the Interior statistics (1959). All figures from 1976 onwards are from the FAO Fishery and Aquaculture Statistics (2021).

Table 1. FIshmeal Production in t PW

	1890	1896	1907	1927	1928	1929	1930	1931	1932
Denmark									
France									
Germany									
Iceland									
Ireland									
Netherlands									
Norway			300	39,911	50,067	62,497	56,359	38,140	63,182
Portugal									
Spain									
Sweden									
UK									

	1933	1934	1935	1936	1937	1938	1939	1940	1941
Denmark						550			
France									
Germany									
Iceland								37,000	
Ireland									
Netherlands									
Norway	86,147	44,431	76,517	77,874	51,616	88,322	65,500	98,044	570,363
Portugal									
Spain									
Sweden									
UK									

	1942	1943	1944	1945	1946	1947	1948	1949	1950
Denmark	5,000	3229					11,000	11,000	14,500
France									
Germany									40,000
Iceland									30,000
Ireland									
Netherlands									

Norway	47,284	32,381	23,883	54,016	49,981	55,026	110,997	71,995	129,087
Portugal									
Spain									
Sweden									
UK								60,000	70,000

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Denmark			28,110	35,555	48,201	46,900	54,845	65,606	70,980
France								13,996	
Germany				70,039	69,925	83,902	78,666	75,637	88,975
Iceland						39,199	44,500	43,699	64,991
Ireland									
Netherlands						37,287	56,071	67,800	110,000
Norway	180,055	180,686	160,349	248,639	197,715	263,348	190,773	118,873	127,967
Portugal									4,000
Spain						6,552	8,880	12,408	17,835
Sweden									6,000
UK	75,000		83,746	83,278	90,668	86,669	80,934	79,599	79,547

	1960	1961	1976	1980	2000	2019

Denmark			329,348	351,303	281,075	215,538
France			11,429	9,163	17,453	31,067
Germany			53,031	36,992	14,908	25,086
Iceland			110,531	172,088	253,249	169,237
Ireland			2,033	2,041	22,196	20,500
Netherlands			0	0	0	0
Norway			465,507	298,219	238,881	221,700
Portugal			7,868	12,829	2,858	5,827
Spain			38,348	51,624	120,163	107,769
Sweden			15,205	13,352	17,601	26,856
UK			81,000	68,300	50,000	29,385
Total PW			1,114,300	1,015,911	1,018,384	852,965

Figures from 1976 onwards (FAO 2021) in Table 1 are complete and enable totals to be accurately calculated. By 2019 annual fishmeal production fell by 15% compared with 2000. No estimates or extrapolations are featured in Table 1 where the original sourced figures are given in PW.

Table 2 provides figures converted into LW from data in Table 1 (shown in red). A typical conversion rate was calculated based on the well represented Norwegian data which includes sourced data of landings and fishmeal produced in both PW and LW. A CF of 5.4 has therefore been applied.

Table 2. FIshmeal Production in t LW

	1890	**1896**	**1907**	**1927**	**1928**	**1929**	**1930**	**1931**	**1932**

Denmark									
France									
Germany									
Iceland									
Ireland									
Netherlands									
Norway	100,000		1,620	216,000	295,800	361,200	333,000	211,800	354,900
Portugal									
Spain									
Sweden		85,400	0						
UK									
Total LW									

	1933	**1934**	**1935**	**1936**	**1937**	**1938**	**1939**	**1940**	**1941**
Denmark						2,970			
France									
Germany		15,000				80,000			
Iceland								199,800	
Ireland									

Netherlands									
Norway	445,200	196,900	415,500	414,000	267,000	502,300	378,400	580,700	322,000
Portugal									
Spain									
Sweden									
UK									
Total LW						**585,270**		**780,500**	

	1942	**1943**	**1944**	**1945**	**1946**	**1947**	**1948**	**1949**	**1950**
Denmark	27,000	27,000	27,000				59,400	59,400	78,300
France									
Germany							150,000	175,000	200,000
Iceland							120,000	150,000	162,000
Ireland									
Netherlands									
Norway	265,300	181,800	132,200	329,700	285,700	321,300	662,200	421,400	761,100
Portugal									
Spain									
Sweden									

UK								324,000	378,000
Total LW	**292,300**	**208,800**	**159,200**				**991,600**	**1,129,800**	**1,579,400**

	1951	1952	1953	1954	1955	1956	1957	1958	1959
Denmark			151,794	191,997	260,285	253,260	296,163	354,272	383,292
France								75,578	0
Germany				378,211	377,595	453,071	424,796	408,440	480,465
Iceland						211,675	240,300	235,975	350,951
Ireland									
Netherlands						201,350	302,783	366,120	594,000
Norway	1,041,800	1,057,400	799,800	1,342,651	1,067,661	1,422,079	1,030,174	641,914	691,022
Portugal									21,600
Spain						35,381	47,952	67,003	96,309
Sweden									32,400
UK	405,000		452,228	449,701	489,607	468,013	437,044	429,835	429,554
Total LW	**1,446,800**	**1.057,400**	**1,403,822**	**2,362,559**	**2,195,149**	**3,044,828**	**2,779,213**	**2,579,137**	**3,079,593**

	1960	1961	1976	1980	2000	2019
Denmark			1,482,066	1,580,864	1,264,838	969,921

France			51,431	41,234	78,539	139,802
Germany			238,640	166,464	67,086	112,887
Iceland			497,390	774,396	1,139,621	761,567
Ireland			9,149	9,185	99,882	92,250
Netherlands			0	0	0	0
Norway			2,094,782	1,341,986	1,074,965	997,650
Portugal			35,406	57,731	12,861	26,222
Spain			172,566	232,308	540,734	484,961
Sweden			68,423	60,084	79,205	120,852
UK			364,500	307,350	225,000	132,233
Total LW			**5,014,350**	**4,571,600**	**4,582,728**	**3,838,343**

Table 2 provides calculated totals back to 1939 that are reasonably representative as the major producers have figures available. Notably, figures for the UK are absent until 1949 and this may skew the figures slightly as being rather low. An indicative total value of about 1.5 million t LW for 1950 is a good indicator of the scale of the industry and includes all of the primary producers.

The early figure for Sweden for 1896 is based on the Bohuslän herring phenomenon which ended shortly after and there was no production post-1900. The same temporary phenomenon is behind the Norwegian figure for 1890; the industry basically ended soon after and only restarted again in 1907 (Fasting 1954).

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