



Norfish Dataset 08

Norwegian/Swedish Bohuslän Herring Landings 1520–1809

Supporting Documentation

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*Trankokeri (herring factory buildings) and herring saltery in Bohuslän.
View of the Trankokeriet at Stensholmen and Rörholmens where the herring salting in the
Bohuslän Archipelago decreased during herring fishing in 1794
(Weinberg 1795)*



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Summary

Dataset Title:	Norwegian/Swedish Bohuslän Herring Landings 1520–1808
Norfish Case Study:	Norwegian/Swedish Bohuslän Herring Landings 1520–1808
Large Marine Ecosystem:	59: Iceland Shelf and Sea
Subject:	Catches, domestic consumption, export, Norway, Bohuslen, Herring 1520–1808
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Data Editors:	John Nicholls Norfish Project Centre for Environmental History Trinity College Dublin
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Objectives

Today, Bohuslän is a Swedish region by the Skagerrak coast between the Oslo fjord and modern Gothenburg. In the medieval period to 1658 it was ruled by Norwegian and Danish kings. The region enjoyed a large herring fishery in the second half of the 16th century. In 1658, under the Treaty of Roskilde, Bohuslän was ceded to the Swedish kingdom. Under Swedish control, commercial herring fishing grew again in the latter half of the 18th century with several fishing communities springing up along the coast.

Båhuslen is the Norwegian name; the Swedish name is Bohuslän, and Danish texts refer to the region as Bohuslen. The name in English means “Fief of Bohus”, after the Norwegian medieval castle of Bohus.

Bohuslän was a largely forested area in earlier centuries, but deforestation during the 17th-19th centuries changed the landscape to reflect the current rocky and barren looking vista. Wood was required for the growing fishing industry as construction material for housing and boats, as well as fuel for herring boilers known as “trankokerier” (Larsson 2018).

Sources and Chronology

Data was extracted from several sources covering different periods of Bohuslän history. Sources vary in terms of availability, levels of conversion, and reliability. During periods where there is no available data, gaps have been filled by extrapolating between given points. Bohuslän had long periods where it is known that very little, if any, herring fishing took place at all; these periods are recorded accordingly to reflect the unique boom and bust nature of the industry.

1520 to 1579

From 1520 to 1556 there is no indication that any herring fishing took place of any note. It is known that from 1557 fishing began from meagre beginnings and expanded into a flourishing industry by 1579, heralding the start of a boom period. From the 1557 to the 1579 start-up to established industry, simple extrapolation has been used to determine likely growth across the period (Holm 2003).

1580 to 1590

The herring fishery experienced massive growth and became a major exporter. It was rivalled only by the North Sea Dutch and Flemish fisheries; in 1585 it surpassed them, nearly amassing as much

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as both put together. However, by 1590 there was a sudden decrease in activity. Fishing all but ended and by 1591 it ceased altogether. The figures provided, tabulated by Holm (2003) are based on lasts from Bohuslän into the Baltic as recorded in the Sound Toll Tables.

	Exports through the Sound for Baltic ports		Estimated total export	Live volume	Local consumption (35% of exports)	Total estimated landings	Total estimated landings
year	lasts, salted herring	barrels (1 last = 12 barrels)	(Sound exports x 2)	litres	litres	litres	MT
1580	5068	60816	121632	20053468	7018714	27072182	27072
1581	5312	63744	127488	21018947	7356631	28375578	28376
1582	3876	46512	93024	15336867	5367903	20704770	20705
1583	5230	62760	125520	20694482	7243069	27937551	27938
1584	3622	43464	86928	14331819	5016137	19347956	19348
1585	9010	108120	216240	35651489	12478021	48129510	48130
1586	3359	40308	80616	13291160	4651906	17943066	17943
1587	2256	27072	54144	8926721	3124352	12051074	12051
1588	1861	22332	44664	7363754	2577314	9941067	9941
1589	539	6468	12936	2132758	746465	2879224	2879
1590	52	624	1248	205758	72015	277773	278

Figure 1: Bohuslän total estimated landings based on Sound Toll figures 1580-1590 (Ibid.)

The table in Figure 1 (Holm 2002) reveals detailed figures for exports bound for the Baltic from Bohuslän. Domestic consumption (approximately 35% of exported values) is factored in and total landings values are derived. The local consumption values are obtained from Samuel de Forselles' estimate of total production in 1791 (Nilsson 1963). The reasons for the remarkable decline after 1585 to zero by 1591 are not clear. There may have been economic factors involving the sheer scale of the Dutch and Flemish exports from the North Sea, or the availability of herring in the Bohuslän waters may have simply stopped due to natural migration patterns. Most likely, a combination of these factors was the cause.

1591 to 1752

This period is characterised by the complete lack of herring fishing that is punctuated only briefly between 1664 and 1676. Holmberg (1962) provides data that indicate annual trade of about 300 metric tonnes during this interlude: Holmberg provides figures based on the Sound Toll Records for trade into the Baltic and trade to Gothenburg while there is no evidence for potential westwards

exports. No clear explanation for the emergence and sudden disappearance of this effort is available. Again, both ecological and economic factors may have been at play. The periodicity may suggest migration of herring was favourable over these years; this was also a period when the Dutch output declined sharply, especially in the first several years of the period due to war with England and a period of recovery; the Flemish industry had declined markedly by this time and would also have presented little competition. Nevertheless, this burst of activity was comparatively minor and represented less than one percent of the Bohuslän herring fishery at its peak in 1585 when some 48,000 tones were landed. With such a small average annual catch over this atypical period, and zero catches before and after, it is clear that, overall, the fishery had very little impact and was in complete decline for well over a century.

1753-1808

Nilsson (1963) provides detailed assessments of the resurgent Bohuslän fishery under the Swedish state. Total production is typically given in barrels of herring and/or litres of live volume fish. Conversion to live weight in metric tonnes was carried out to provide the annual figures for the dataset.

Data for the *total production of barrels of herring* are only available for 1753 to 1773. For three of these years (1761, 1773 and 1787) independent figures generated by producers indicate values lower than those of the primary series provided by fisheries inspectors. This discrepancy amounts to about 10% and may be attributed to underreporting by producers or imprecise total estimates by fisheries inspectors. Fisheries inspector figures, where available, have been used (Nilsson 1963, p.283).

For the period 1755-1808 the Royal Chancellery maintained annual records of exports of barrels of salted herring (Ibid. pp.294-5). To derive an “export ratio” the overlapping “total production” figures (1753 to 1773 and 1787) and the “export” figures (1755 to 1808) were compared and a factor calculated: $\text{Export figure} / \text{total production figure} * 100$. The median export ratio was 62.02.

A total production value was then plotted. For the years 1753 to 1773 and 1787 the provided total production figures were applied. For the years 1774 to 1786 and 1788 to 1808, the factor of 62.02 was applied to the given export figures to calculate the total production: $\text{Export figure} / 62.02 * 100$. This boosted the given export figures to account for local domestic consumption.

Conversion rates

The various calculations applied in the dataset required a clear set of conversion factors to enable accurate total production figures to be provided in metric tonnes.

Fresh / salted herring

The Swedish Crown enforced strict regulations pertaining to the volume of barrels used in the herring fishery. They distinguished between the *mätaretunna* (size barrel) which was used to measure amounts of fresh herring, the *silltunna* (herring barrel), which was the marketed salted herring barrel, and the *fat* (a vessel of herring oil).

Based on Crown regulations of 1773, the *mätaretunna* was fixed at 63 kannor (164.87 litres) and in 1786 increased to 80 kannor (209.36 litres). The *silltunna* was stable throughout the Bohuslän fishery at 48 kannor (125.62 litres).

The difference between the *mätaretunna* and the *silltunna* was a measure of the loss in the process which incorporated gutting as well as shrinkage due to salting. The *mätaretunna* was introduced in 1763 in response to a demand by workers to ensure fair remuneration by the owners of the plants. The increase in 1786 was at the request of the owners but met with little resistance from workers, possibly to ensure that arbitrary practice by the owners would be ruled out. Real wages did increase in following years. (Nilsson 1962, p.284)

Conversion factor of salted herring barrels to live volume

In order to calculate live volume, it is necessary to calculate waste during production. The *mätaretunna* provides a useful indication. In a carefully regulated fishery, waste may have been less while in cases of superabundance of catches such as experienced in Bohuslän in 1780s and 1790s the waste may have increased.

Two conversion factors are therefore proposed:

Low waste fishery, live volume: 1 salted barrel = 164.87 litres

High waste fishery, live volume: 1 salted barrel = 209.36 litres

Fresh herring / train oil

According to calculations in 1791 and 1795 by the fishery inspector Samuel af Forselles 1 *fat* of oil equalled 16 *mätaretunnor* of fresh herring (Nilsson 1963, p.285).

Conversion factor of train oil to live weight herring

Low waste: 1 *fat* of herring oil = 16×164.87 litres = 2.637.92 litres

High waste: 1 *fat* of herring oil = 16×209.36 litres = 3.349,76 litres

(Ibid.)

Measures

1 *kanna* (pitcher) = 2 stop (quart) = 2.6 litres

1 *fat* (barrel) = 60 "kannor" = 157 litres

1 *tunna* = 4 *fjårding* = 48 *kannor* (pitchers) = 125.6 litres

Other Processes

The marine species information that informs the dataset is obtained from the World Register of Marine Species (WoRMS 2020) which validates common species names, scientific names and sources.

The Metadata system underpinning the dataset is based on Darwin Core (OBIS 2017; 2020) which provides static formulations of all data fields as outlined in the Data Fields section of this document.

Data Fields

Darwin Core Field Name	Description
occurrenceID	A globally unique “per record” identifier based upon the concatenated <code>institutionCode</code> , <code>collectionCode</code> , <code>catlogNumber</code> and ID fields. (TCD_Norfish_BohHolNicHer_1)
type	Description of data series type. (Dataset)
modified	Most recent date the data was modified; ISO 8601 metric date/time standards apply. (2021-01-19)
license	Data licensing conditions that apply. (http://creativecommons.org/licenses/by/4.0/legalcode)
bibliographicCitation	Author citation for the dataset: (Holm, P and Nicholls, J. 2021. Norfish: Norwegian/Swedish Bohuslän Herring Landings 1520 - 1808. Dublin: TCD)
references	Denotes the link where more detailed information about the dataset is held. (http://www.vliz.be/imis?module=project&proid=5064)
institutionCode	Identifies the institution which owns the data - Trinity College Dublin. (TCD)
collectionCode	Code of the project or research group. (Norfish)
datasetName	Name of the dataset (Norwegian/Swedish Bohuslän Herring Landings 1520-1808)
basisOfRecord	Specifies the nature of the observed or researched specimens or data. Human Observation applies to researched archive data. (HumanObservation)
dataGeneralizations	Source data that informs the provenance of the data.

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	(Source: Holmberg, Åke. 1962. Perioden 1550-1880. In: Bohusläns historia. Erik Lönnroth. (Ed.). Göteborg: Almqvist & Wiksell pp 224-234.)
catalogNumber	Identifier of the data within the institution and project – “Boh” refers to Bohuslen, “Hol” refers to Holm, “Nic” refers to Nicholls and “Her” refers to Herring. (BohHolNicHer)
occurrenceRemarks	Comments about the occurrence record. (NA)
recordedBy	Researchers who recorded the data. (Poul Holm John Nicholls)
organismQuantity	Quantity of fish represented in the record shown in Kg live weight. (8285162)
organismQuantityType	organismQuantity unit of measurement. (biomass in kilograms (kg))
occurrenceStatus	Stipulates the physical presence or absence of animals relating to the record. (present)
eventDate	Actual date and time at which an occurrence was recorded. ISO 8601 metric date/time standards apply. (1520)
year	Year taken from the eventDate field. (1520)
locationID	Location identifier. (http://marineregions.org/mrgid/14721)
locality	Local name for the overall location or region. (Bohuslen/ Bohuslän, Norway/Sweden)
locationAccordingTo	MRGID location identifier based on the marineregions.org/mrgid system. (MRGID)
locationRemarks	Regional information. (Coast off Bohuslän and region)
decimalLatitude	Latitude shown in decimal notation based on the WGS 84 (EPSG:4326) geodetic datum standard.

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decimalLongitude	Latitude shown in decimal notation based on the WGS 84 (EPSG:4326) geodetic datum standard.
coordinateUncertaintyInMeters	The smallest circle (radius) in metres from the ground zero point depicted by the decimalLatitude and decimalLongitude fields. In this instance, “60000” depicts a radius of c. 60 Km.
georeferenceRemarks	Location information – NOAA LME system used (23: Baltic Sea)
scientificName	Scientific name of the animal based upon the commonName. (Clupea harengus)
scientificNameID	The WoRMS LSID associated with the scientificName, based on the Marine Species database: (urn:lsid:marinespecies.org:taxname:126417)
kingdom	Together with taxonRank assists in determining broader animal characteristics for darwinCore search engines. (Animalia)
taxonRank	Together with “kingdom” assists in determining broader animal characteristics for darwinCore search engines. (species)
scientificNameAuthorship	Based on the scientificNameID field and discoverable through the WoRMS database. (Linnaeus, 1758)
vernacularName	Literal common name applied to the animal involved. The Norwegian/Danish and Swedish common names for dry Cod. (sild, sill)
identificationRemarks	Comments about the identity of the species. (Danish name is sild; Norwegian and Swedish name is sill)
conversion	Conversions required to calculate and provide values in metric tonnes. (Based on Crown regulations of 1773, the mätaretunna was fixed at 63 kannor (164.87 litres) and in 1786

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	<p>increased to 80 kannor (209.36 litres). The silltunna was stable throughout the Bohuslän fishery at 48 kannor (125.62 litres).</p> <p>Low waste fishery, live volume: 1 salted barrel = 164.87 litres</p> <p>High waste fishery, live volume: 1 salted barrel = 209.36 litres</p> <p>1 fat of oil = 16 mätaretunnor of fresh herring</p> <p>Low waste: 1 fat of herring oil = 16×164.87 litres = 2.637.92 litres</p> <p>High waste: 1 fat of herring oil = 16×209.36 litres = 3.349,76 litres</p> <p>1 kanna (pitcher) = 2 stop (quart) = 2.6 litres</p> <p>1 fat (barrel) = 60 "kannor" = 157 litres</p> <p>1 tunna = 4 fjärding = 48 kannor (pitchers) = 125.6 litres</p> <p>1 litre herring = 1 Kg = 0.001 metric tonnes)</p>
catchMT	<p>Derived metric tonnes value based on the calculated fields as shown in the conversion field.</p> <p>(27972)</p>
exportsThroughSoundForBalticPortsLastsSalted	<p>Export values (in lasts of salted herring) that passed through the Danish Sound bound for Baltic ports (according to Sound Toll records).</p> <p>(5068)</p>
exportsThroughSoundForBalticPortsBarrels	<p>Export values (in barrels of herring) that passed through the Danish Sound bound for Baltic ports (according to Sound Toll records).</p> <p><i>exportsThroughSoundForBalticPortsLastsSalted</i> * 12.</p> <p>(60816)</p>
totalExport	<p>Calculated total exports in barrels. <i>exportsThroughSoundForBalticPortsBarrels</i> * 2.</p> <p>(121632)</p>
liveVolumeLitres	<p>Liveweight (fresh caught) of herring in liters. Converted from <i>totalExport</i>.</p> <p>(20053468)</p>

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localConsumptionLitres	Local consumption of herring factored as 35% of the <i>totalExport</i> value. (7018714)
totalProductionBarrelsSalted	Total production (herring landed) including exports and domestic consumption in barrels of salted herring. (1483830)
exportsLiveweight	Liveweight (fresh) herring exported derived from the percentage of fresh herring exports indicated in Appendix 1. (88)
domesticLiveweight	Liveweight (fresh) herring locally consumed derived from the percentage of fresh domestic herring indicated in Appendix 1. (88)
localConsumptionHerring	Local consumption in liters of herring derived from the percentage of local consumption of herring indicated in Appendix 1.
exportsTrainOil	Herring oil (train) exported derived from the percentage of train oil exports indicated in Appendix 1. (3363348)
domesticTrainOil	Herring oil (train) locally consumed derived from the percentage of domestic train oil indicated in Appendix 1. (162084)
localConsumptionTrainOil	Local consumption in liters of herring oil (train) derived from the percentage of local consumption of train oil indicated in Appendix 1. (90465)
totalExtractionLitres	Total extraction in liters of herring factoring in total production and train oil production. (1484428)
totalExtractionsMT	Total extraction (catch) in metric tonnes derived from <i>totalExtractionLitres</i> ; 1 liter = 1 Kg = 0.001 metric tonnes

trafficLight Traffic Light coding system denotes level of certainty, and/or level of accuracy that can be described for each record; see Appendix 2 for details.

codes Explanation codes that highlight the process for each record; see Appendix 3 for details.

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Appendix 1

Domestic Consumption 1791 - Samuel de Forselles' estimate (Nilsson 1963)

salted/fresh herring	barrels	live volume in litres	% of exports
exports, salted herring	276582	57905208	
exports, fresh herring	3431	3431	0.0059252
domestic, salted	97509	20414484	35.2550057
domestic, fresh	9897	9897	0.01709173
local consumption	10000	10000	0.0172696
Total	397419	78343020	

train oil	<i>fat</i>		
exports	44614	149446193	
domestic	2150	7201984	4.81911508
local consumption	1200	4019712	2.68973865
	47964	160667889	
Total		239010908	

Appendix 2

Traffic Light System

Traffic Light	Explanation
green	Values are extracted from archival and source materials; population figures may be calculated in some instances
amber	Export values, domestic consumption values and estimated landed tonnes ungutted (in tonnes) are calculated; population figures are extracted from archival and source materials
red	Export values, domestic consumption values, estimated landed tonnes ungutted (in tonnes) and population figures are calculated

Appendix 3

Codes

Codes	Explanation
a	Demographic values calculated based on given values for specific years
b	Export values, domestic consumption values and estimated landed tonnes ungutted (in tonnes) are calculated and based on recalculated source values from Jonsson 1994; domestic consumption is inelastic and should be calculated as a per capita addition to exports (PH)
c	Export values, domestic consumption values, estimated landed tonnes ungutted (in tonnes) and population figures are extracted from archival and source materials
d	Export values calculated based on trend of noOfVessels field (as supplied by Ehrenberg 1899)
e	Domestic Consumption values calculated based on population trend
f	Trended values based on assumed 1520 value of 20000 metric tonnes