HMAP Dataset 22
Catch and Fishing Effort in the Limfjord Fisheries

Supporting Documentation

THE UNIVERSITY OF HULL

Summary

Dataset Title:	Catch and Effort in the Limfjord Fisheries
Large Marine Ecosystem:	22: North Sea
Subject:	catch & fishing effort in the Limfjord (Denmark), various species, 1690-1816
Data Provider:	Bo Poulsen Dept of Environmental, Social & Spatial Change Roskilde University Denmark Email: bopo@ruc.dk
Data Editor:	John Nicholls, MHSC, University of Hull Email: **j.nicholls@hull.ac.uk**
Extent:	496 records
Keywords:	Historical statistics; HMAP; Limfjord fisheries; catch per unit effort.

Citation:

(a) The dataset: please cite as follows: B. Poulsen, 'Catch and Effort in the Limfjord Fisheries', in J.H. Nicholls (comp.) HMAP *Data Pages* (www.hull.ac.uk/hmap)

(b) Supporting documentation: please cite as follows: B. Poulsen (ed.), 'Catch and Effort in the Limfjord Fisheries, Supporting Documentation', J.H. Nicholls (comp.) *HMAP Data Pages* (www.hull.ac.uk/hmap)

2. Research Context & Objectives

The Limfjord is a stretch of water that runs east-west across the Jutland peninsula in Denmark. Prior to 1825 it was an estuary that only connected to the open sea at its eastern (Kattegat) end. However, during a winter storm in 1825, Agger Tange, an isthmus separating the Limfjord from the North Sea, was breached and salt water intruded into the erstwhile brackish fjord. This altered the salinity, hydrography and nutrient composition of the water and drastically changed the fjord's fisheries.

The research that generated Dataset 22 focuses on the long-term development of the herring fishery, the largest of the Limfjord's fisheries in the early modern era. It seeks to establish whether the collapse of the herring fishery around 1830 was caused by the 'Agger Breach', as most commentators have assumed, by charting the pattern of herring catches and fishing effort from 1667 to 2000. Measuring these variables over a 340-year period not only indicates the degree to which herring stocks fluctuated over time, but also suggests that the Limfjord herring did not, as conventionally believed, collapse because of the ecological impact of the breach of Agger Tange. Rather, this research infers that commercial fishing activity greatly impaired herring reproduction - through damage inflicted by gear on eggs and spawning habitats, the capture of immature herring, and the overexploitation of adults. This is the first documented case in Denmark of the decisive impact that a pre-industrial fishery could have on a large marine resource.

The case of the Limfjord herring fishery provides a series of historic baselines that can be used to assess the health of the herring population in the recent past. It also begs questions regarding the wider implications of overfishing, for the depletion of the herring stock encouraged Limfjorden fishers to focus their effort on eel, oyster and other species. Assessing the impact of this shift is a further objective of this research effort.

Dataset 22 also contains time series on catch and effort of the whitefish fishery in the Limfjord from 1812-1829, when the last whitefish was were caught. The resident species is believed not to have survived theinflux of salty water in the eastern half of the Limfjord, where this fishery took place.

Finally the eel fisheries in the Limfjord, (1794-1853) are documented through effort data concerning the number of pound net licenses issued for use in the summer months, and the catch is reflected in export data from the town of Aalborg.

3. Primary Source Materials

An array of archival and printed sources have been utilised to estimate the scale of the Limfjord herring fishery over the 1667-2000 period. While systematic registration of Denmark's fish catches only began in the late nineteenth century, different kinds of proxy-data can be used to indicate the fluctuations that occurred in the fisheries. The custom records from the Limfjord town of Aalborg are available for most years between 1667 and 1835. From these sources, supplemented and tested by other records, an excellent set of proxy-data for the herring catch can be constructed for the Limfjord herring fishery down to the 1830s, when official enquiries into the collapse of catches generated further evidence of the scale of activity down to the late 1880s when the compilation of catch data in its modern form commenced.

The methods applied to transform these primary source materials into valid historical evidence are detailed in Bo Poulsen, 'On the Impact of Environmental Disasters: The Limfjord Herring Fishery before and After the Storm of 1825', in D.J. Starkey & M. Hahn-Pedersen (eds), *Bridging Troubled Waters: Conflict and Co-operation in the North Sea Region since 1550* (Esbjerg, 2005), 287-304.

Following further data validation, results on the causes of the changes in the long term Limfjord ecosystem are presented in: Poulsen, B., Holm, P. and MacKenzie, B. R., 2007. 'A long term (1667-1860) perspective on impacts of fishing and environmental variability on fisheries for herring, eel, and whitefish in the Limfjord, Denmark*.' Fisheries Research*, *Special Issue,* vol 87 (2-3).

4. Metadata: Explanation of Data Fields

The entries below are outlined as per the field headings of HMAP Dataset 22. An explanation is offered for each field in general terms, and also in dataset specific terms.

ID ID is the unique, consecutive serial numbers for the complete HMAP database.
InstitutionCode InstitutionCode is the name given to the overall project of which this Dataset forms a part
CollectionCode CollectionCode is the specific HMAP project Dataset reference code (used for OBIS referencing purposes).
DateLastModified This is the date when the data were last modified.
CASE_STUDY CASE_STUDY is the location identifying description of the Dataset. In this instance: ***Limfjord Fisheries, North Sea / inland sea.***
DATASET DATASET is the HMAP project unique Dataset reference.
PERIOD The Historical Period covered
ID_NUMBERS This field contains the range of record numbers shown in the ID field.
REFERENCE REFERENCE refers to the source of records employed in the research.
publication_date This is the date when the Dataset was published.
GENERAL DESCRIPTION This is a brief description of the Dataset.
Citation Citation is the field where the formal attribution is shown for users of the HMAP Datasets to cite; it credits the researchers and editors of a Dataset together with its database compilers. This citation must be quoted whenever records are referenced or employed for any purpose. Please quote the relevant citation when using extracts or details from this Dataset: • B. Poulsen, 'Catch and Effort in the Limfjord Fisheries', in J.H. Nicholls (comp.) *HMAP Data Pages* (www.hull.ac.uk/hmap)

BasisOfRecord
BasisOfRecord is the abbreviation applied that indicates whether the record is based on observations (O), living organisms (L), specimens (S), germplasm/seeds (G), photos (P), or from literature with original basis unknown (D); the HMAP value is generally 'O'.

OCEAN_REGION
This field indicates the specific Ocean Region where the Dataset research has been carried out. If this field shows 'None', then the research reflects activities carried out in non-seaward locations (e.g. in rivers, weir fishing, etc.). In this Dataset, the ***North East Atlantic*** region was researched.

LME
This field indicates the name of the Ecosystem where the record event occurred. To find out more about LMEs (which are confined to continental shelf regions) browse the Large Marine Ecosystem site (http://www.edc.uri.edu/lme/) where LME GIS data may be downloaded. In this Dataset, the ***North Sea*** region was researched.

LME_NUMBER
This field indicates the number of the LME that is shown in the previous field. In this Dataset, the LME number is 22.

REGION
This field indicates the specific region of the Dataset.

GROUND
The GROUND is the fishing ground(s) of dataset.

LATITUDE
The LATITUDE refers to a mean value of the species distribution from surveys and should be cross referenced with the LONGITUDE field for specific location determination.

LAT_PRECISION
This gives the actual precision of the calculated LATITUDE field. The available options are:

- Approx — Approximate position
- Estimated — Estimated position
- Exact — Exact position
- Ground Centre — Notional centre of the relevant fishing ground
- Unknown — Position not known

LONGITUDE
The LONGITUDE refers to a mean value of the species distribution from surveys and should be cross referenced with the LATITUDE field for specific location determination.

LON_PRECISION
This gives the actual precision of the calculated LONGITUDE field. The available options are:

- Approx — Approximate position
- Estimated — Estimated position
- Exact — Exact position
- Ground Centre — Notional centre of the relevant fishing ground
- Unknown — Position not known

ST_YEAR
This field refers to the ***start year*** of the beginning of the sampling.

EN_YEAR
This field refers to the ***end year*** of the end of the sampling. Unless the sampling spanned an extensive period, this value is usually the same as the ST_YEAR field entry.

ST_DATE
This field refers to the date observation commenced.

EN_DATE
This field refers to the date observation concluded.

DAYS_FISHING
This is the actual number of fishing days involved.

ScientificName
This field indicates the scientific name of the species under investigation which is linked to the HMAP database containing detailed information about the species that were sampled.

…SPECIES FIELDS…
The following fields are included to add detail to the Species data:

- Subspecies
- GENUS
- SPECIES
- FAMILY
- ORDER
- CLASS
- PHYLUM
- KINGDOM
- AUTHOR

HOME_PORT
This is the home port of the fleet employed in the sampling.

TYPE_PORT
This field marks the type of area where the fishers came from.

NATION
The Nationality of the Fishing operation is indicated here.

OPERATOR
The name of the operator is indicated.

EFFORT
This field shows the EFORT taken by the fishery and is measured according to the number of trips undertaken. The EFFORT is calculated effort based on the specific Effort_Unit employed.

EFFORT_OWNED_BY_OPERATOR
This field shows the share of EFFORT which is not only operated by the OPERATOR, but also owned by him.

EFFORT_UNIT
This is the Unit of Effort employed.

POWER
Where known, the type of effort employed is indicated.

METHOD
The METHOD is an indicator of the primary gear used in the fishery; it indicates the means by which samples were extracted. This is typically the actual method of fishing, such as "Bottom Trawl".

CATCH_MT
This field shows the retained catch weight in metric tonnes.

ObservedWeight
This field indicates the observed mass of the sample in Kilograms. Where this data is not available, a value of "unknown" is entered.

CONVERSION_FROM
This field describes the ***Formula*** used in conversion from original units to Metric tonnes, litres, and/or kilograms.

UNIT_ORIGIN
This field indicates the Conversion Units used.

FORMULA
This field contains the actual Conversion formula that is used to calculate the Catch in Metric Tonnes (CATCH_MT).

CATCH_N
This is the number of specimens sampled for a particular record is indicated. Where this data is not available, a value of "unknown" is entered.

GENDER
This field indicates the Gender of the species in the sample. The values available are shown as follows:

'M'	male
'F'	female
'U'	unknown
'B'	both male and female
'H'	hermaphrodite

PRICE The sale price of the catch is indicated (in Skilling).

PRICE_UNIT_CATCH_N This field shows the calculated Price to Catch number.

PROCESS This is a description of the process applied to the original unit.

CPUE The CPUE field (*C*atch *P*er *U*nit *E*ffort) is expressed as: YIELD_KILOGRAM / EFFORT (number of fishing units employed).

NOTES The NOTES field gives detailed information specific to a particular record. The details are provided to clarify specific entries and where further explanation is required than is generally provided in this METADATA file. For complete and academically verifiable explanations, refer to the published research materials that are indicated in the REFERENCE field.

Enquiries regarding the information contained in this document and the accompanying dataset should be directed to David J Starkey (d.j.starkey@hull.ac.uk) or John H Nicholls (j.nicholls@hull.ac.uk).