

# GIS in History of Marine Animal Populations Project (HMAP)

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# History of Marine Animal Populations (HMAP)

HMAP is an international, interdisciplinary research programme funded by **A.P. Sloan Foundation**.

It is based at 3 centres:

- Maritime Historical Studies Centre, Univ. of Hull;
- Roskilde University, Denmark;
- University of New Hampshire, USA .

The programme aims to enhance knowledge and understanding of how and why the diversity, distribution and abundance of marine life in the oceans change over the long term



# Census of Marine Life (CoML), A.P. Sloan Foundation - founding sponsor

A growing global network of researchers engaged in an initiative to assess and explain the **diversity, distribution, and abundance** of marine life in the oceans – *past, present, and future* – and to identify the current limits to knowledge (what is **known, unknown and unknowable**)

The First Census: 2000-2010



# CoML Components

## *Grand Challenge Questions*

**Oceans Past**  
*What did live in the oceans?*

**History of  
Marine Animal  
Populations  
(HMAP)**

**Oceans Present**  
*What does live in the oceans?*

**Ocean Realm  
Field Projects**

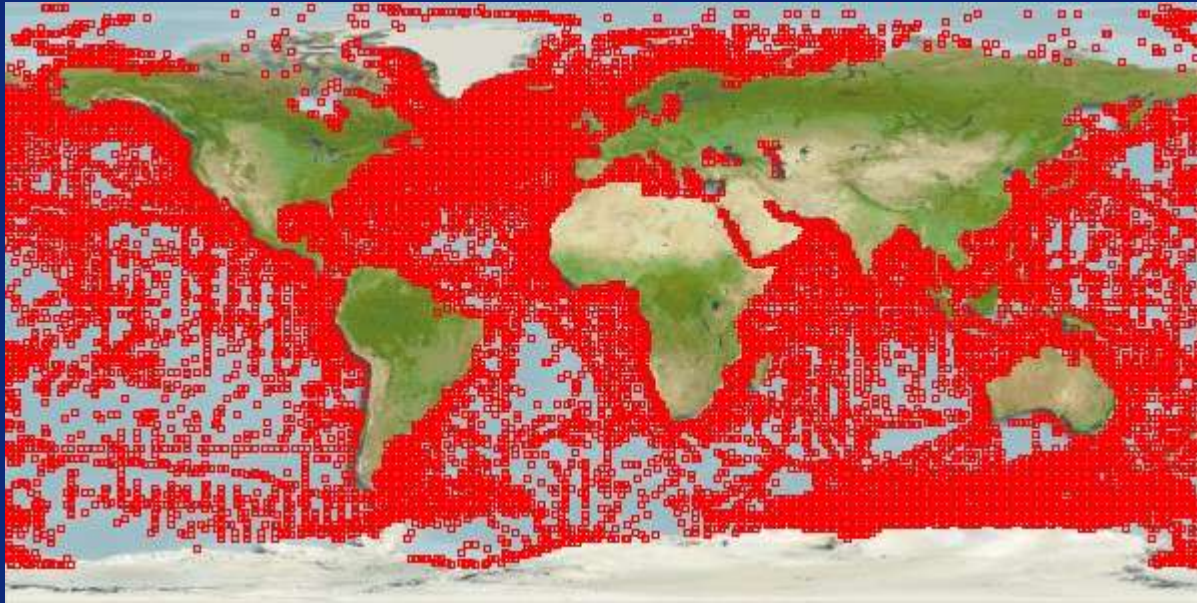
**Oceans Future**  
*What will live in the oceans?*

**Future of Marine  
Animal  
Populations  
(FMAP)**

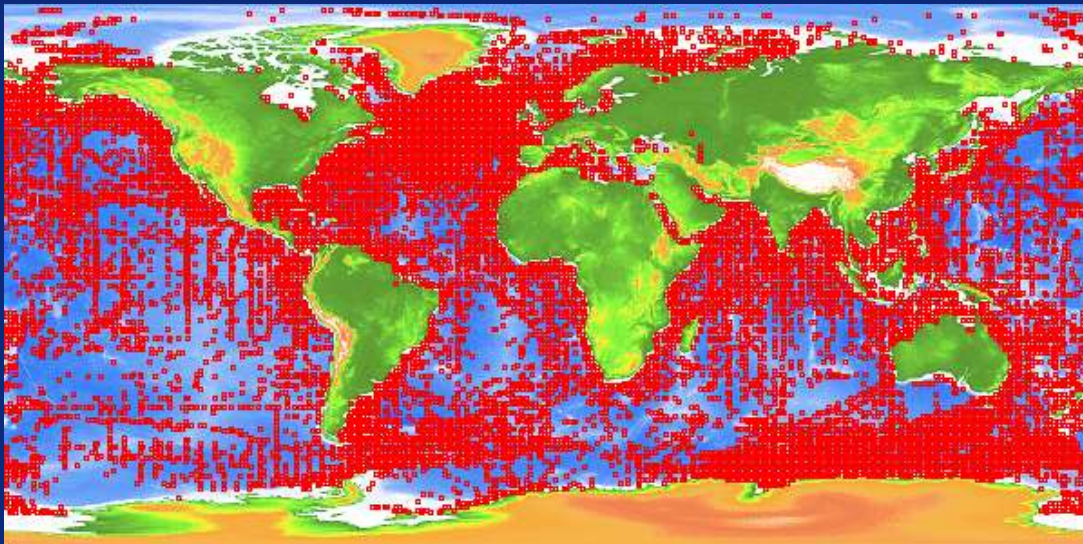


**Ocean Biogeographic Information System (OBIS)**

**Web-based provider of global geo-referenced information on marine species**



**Currently in OBIS  
(Nov 2007):  
13.6 million records  
of 80000 species  
from 231 databases**



**2005: 5 million records  
2006: 10 million records  
Filling in the data gaps –  
Southern Hemisphere,  
deeper waters, taxonomic  
groups**



Public



Scientific



Media

## History of Marine Animal Populations

Home [About HMAP](#) [Who we are](#) [What do we do](#) [Learn more](#) [Contact](#)

[Tip your friends](#)

- [News](#)
- [Site Information](#)



# What lived in the Oceans?

**HMAP is a global research initiative to study the past ocean life and human interaction with the sea.**

We are a group of about 100 researchers who have joined forces to develop an interdisciplinary research program using historical and environmental archives.

HMAP analyzes marine population data before and after human impacts on the ocean became significant. HMAP aims to enhance knowledge and understanding of how the diversity, distribution and abundance of marine life in the world's oceans changes over the long term.



# Global Scope of Project



HMAP has grown in the past 18 months to encompass the globe. We are about 100 historians, archaeologists, and marine scientists, working on 16 case studies

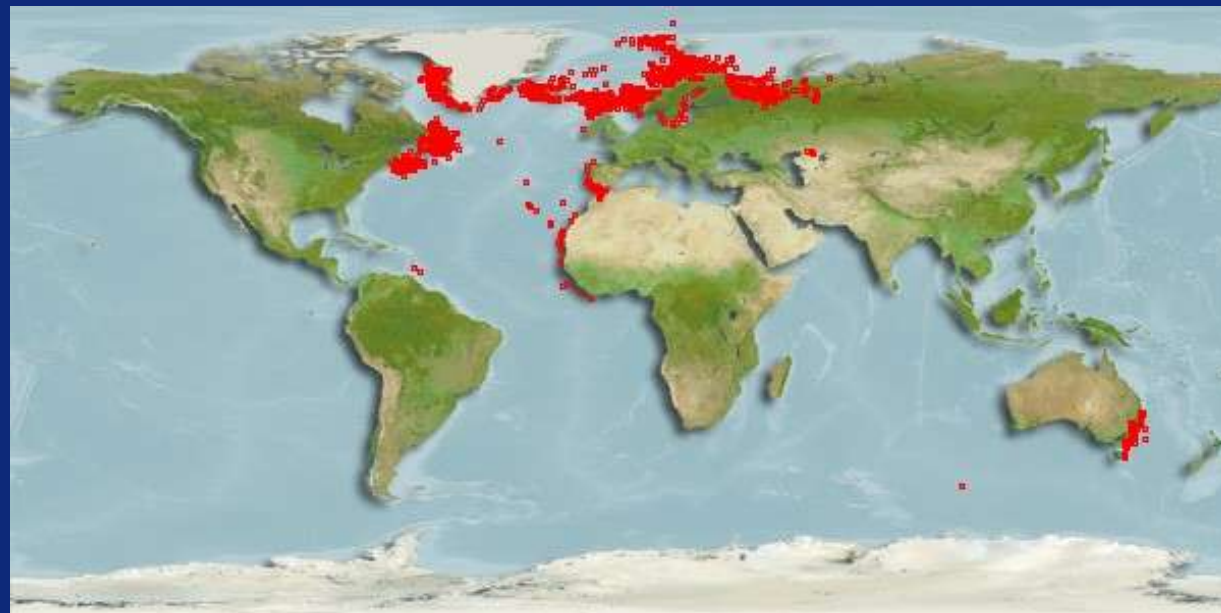
- *We now know* that the distribution and abundance of marine animal populations experience dramatic changes over time
  - Changes are attributed to *climatic and human forces*
    - and while few marine species have gone extinct, conservationists worry that entire marine ecosystems have been depleted beyond recovery
  - An understanding of historical patterns of resource exploitation is key to identifying what has actually been lost in the habitat
    - and is an essential part of developing and implementing recovery plans for depleted marine ecosystems and ecosystem attributes.
  - The HMAP approach offers a means to obtain a broader theoretical and analytical perspective on marine ecosystems
    - to inform present and future environmental management policies.



- Marine environmental history is now recognized as a *necessary complement to ecosystem analysis* and as a *major new contribution to the field of environmental history*
  - *V. Winiwarter et al., Env. & History 10, 501-530 (2004)*
  - *J. R. McNeill, Env. History 10 (2005)*
  - *J. W. Bolster, Env. History 11, 567-597 (2006)*
  - *M. Schrope, Nature 443, 622-624 (2006)*

# Project Data Available in the Ocean Biogeographical Information System (OBIS)

Published in OBIS	Number	Date published (month, year)
a) Datasets	8	to 09/07
b) Species with location data	73	
c) Unique locations	10462	
d) Total species by location records	73	



To be published in OBIS	Number	Anticipate d date (month, year)
a) Datasets	20	2: 11/07 2: 12/07 10: 07/08 6: 01/09
b) Species with location data	c. 85	
c) Unique locations	c.30000	
d) Total species by location records	c. 85	

# HMAP Data Pages

<http://www.hull.ac.uk/hmap/>

## HMAP Data Pages



- Homepage
- MHSC
- Search the Database
- Visualise Data
- Dataset Downloads
- Data Library
- HMAP Partner Centres
  - Roskilde University
  - MHSC University of Hull
  - University of New Hampshire

- Related Links
- OBIS
  - CoML
  - MySQL
  - PHP



### Search the HMAP Database

On these pages you can search the HMAP Database based on criteria that you have selected. You will be offered various search options that will enable you to determine exactly what information the datasets contain, and how this information can be useful to you. [Click here](#) to search now.

### Download HMAP Datasets

The HMAP Datasets are the basis of the HMAP database. You may download these datasets together with accompanying explanatory documentation and Metadata files. [Click here](#) to find out what is available.

### Check the Data Library

The Data Library contains many extra downloads, including more Datasets, Databases, Data Files, Images, Documents and other useful materials. [Click here](#) to find out what is available.

### Visualise HMAP Data

The HMAP Data team are developing means of turning HMAP Data into visually accessible, accurate and useable maps and charts. [Click here](#) for examples of these developments.

### About the HMAP Data Pages

This website is dedicated to the provision of relevant HMAP project data and information for academic and related research purposes. [Downloadable DATASETS](#) and [other materials](#) are available which, in totality, comprise the HMAP database. If you have any queries about the use of this resource, please contact [John Nicholls](#) (Database Administrator) or [Michaela Barnard](#) (HMAP Research Fellow) for assistance.



## HMAP Data Visualisation

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### Visualising the seas of the past



This page is dedicated to the visualisation of HMAP data. Here you will learn, and see for yourself, how data may be visually presented to make the seas of the past come to life. Developments in visualisation are ongoing and include GIS Mapping of the HMAP datasets ([Aquamaps](#)) and a special [HIVE](#) (Hull Immersive Visual Environment) project is being undertaken to bring full 3D interactive involvement to the experience of understanding the HMAP researched data.

### A Practical Example

#### Salmon Catches in the Swedish Baltic Sea 1900 to 2000

The image on the left graphically depicts fishing grounds off the Swedish coast where Salmon have been typically caught (red dots). Based on the size of the red dots, the volume of salmon caught between 1900 and 1925 is indicated; The volume of fish caught, on average per year during this period ranges from up to 20,000 tonnes (small red dot) to over 200,000 tonnes per year (largest red dot). What we see here is a rough depiction of actual HMAP data that has been gathered into a dataset ([Dataset 8: Swedish Baltic Catches](#)).

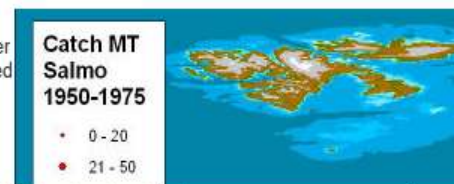
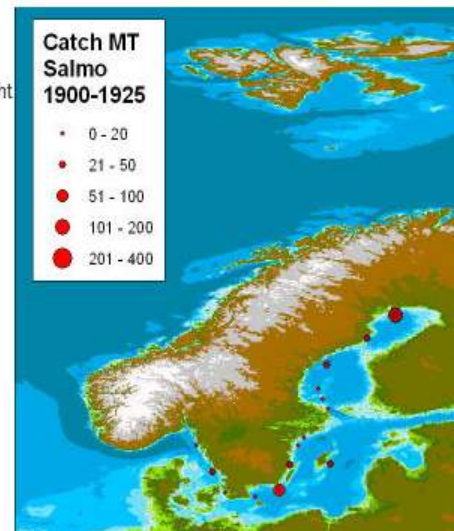
NOW... HOVER OVER THE IMAGE WITH YOUR MOUSE

Notice how the map changes to show the period 1925 to 1950. This is the same region (Swedish Baltic) but we can clearly make out that many of the red dots are noticeably larger than before. Here we have a clear indication that between 1925 and 1950, catches of Salmon increased in average compared with the previous 25 years.

But this is not where the story ends. Look at what follows...

Here we have the same region again but depicted from 1950 to 1975. There has clearly been a radical reduction in the volume of salmon caught. Notice that only a few red dots remain, showing us that the grounds of the past were no longer fished during this period. Why is this? What happened to the fish? What happened to the fishermen? HMAP is dedicated to addressing these sorts of questions, which is why this data is being collected and collated for serious scientific and historical research.

NOW... HOVER OVER THE IMAGE WITH YOUR MOUSE



# AQUAMAPS <http://www.aquamaps.org/>



[www.aquamaps.org](http://www.aquamaps.org)

Creating Standardized Range Maps

for eventually

All Species in the Oceans

## About AquaMaps | [Search AquaMaps](#)

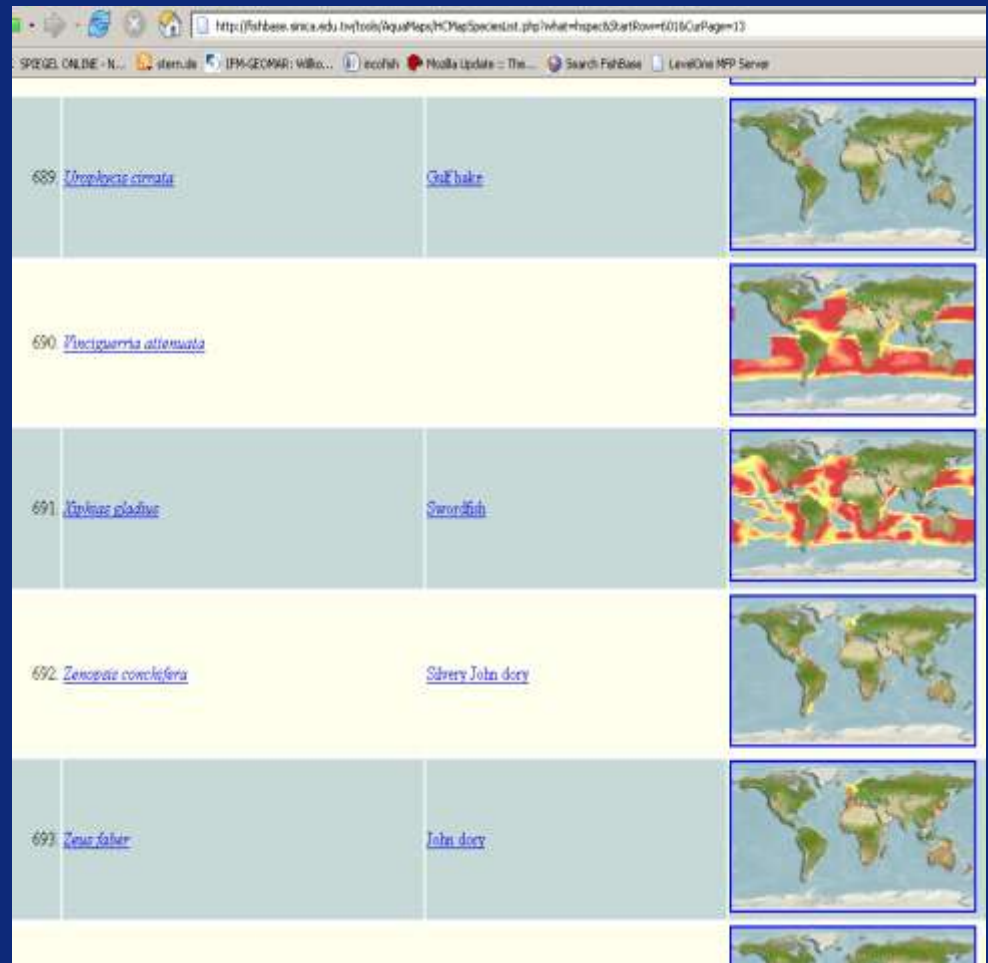
AquaMaps are computer-generated predictions of natural occurrence of marine species, based on the environmental tolerance of a given species with respect to depth, salinity, temperature, primary productivity, and its association with sea ice or coastal areas. These 'environmental envelopes' are matched against an authority file which contains respective information for the Oceans of the World. Independent knowledge such as distribution by FAO areas or bounding boxes are used to avoid mapping species in areas that contain suitable habitat, but are not occupied by the species. Maps show the color-coded likelihood of a species to occur in a half-degree cell, with about 50 km side length near the equator. Experts are able to review, modify and approve maps.

Environmental envelopes are created in part (FAO areas, bounding boxes, depth ranges) from respective information in species databases such as [FishBase](#) and in part from occurrence records available from [OBIS](#) or [GBIF](#).

The creation of AquaMaps is supported by the following projects: MARA, [Pew Fellows Program](#) in Marine Conservation, [INCOFISH](#), [Sea Around Us](#), and Biogeoinformatics of Hexacorals.

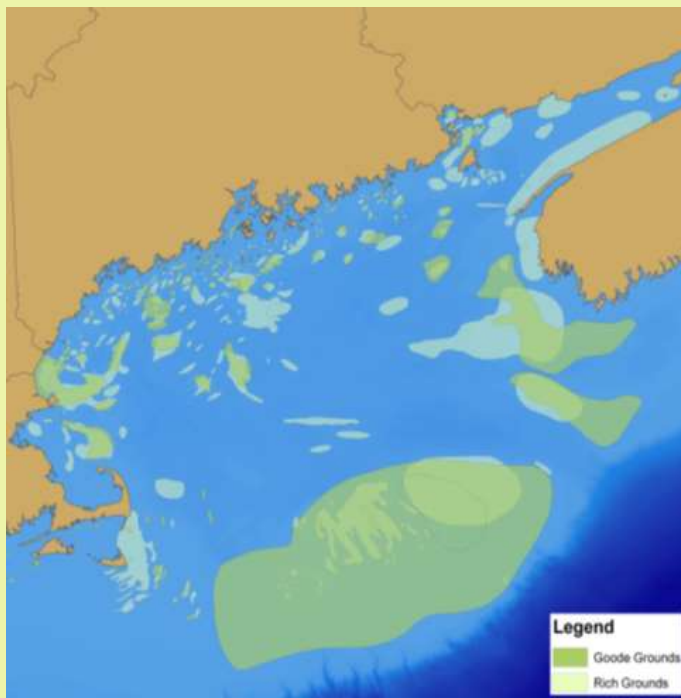
**Contacts** Rainer Froese, IFM-GEOMAR, Coordinator [rfroese@ifm.geomar.de](mailto:rfroese@ifm.geomar.de)  
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Sven Kullander, NRM, extension to freshwater [ve-sven@nrm.se](mailto:ve-sven@nrm.se)  
Jonathan Ready, NRM, implementation [jonathan.ready@nrm.se](mailto:jonathan.ready@nrm.se)  
Tony Rees, CSIRO, mapping tools [tony.rees@csiro.au](mailto:tony.rees@csiro.au)  
Paul Eastwood, CEFAS, valuation [paul.eastwood@cefass.co.uk](mailto:paul.eastwood@cefass.co.uk)  
Eli Agbayani, WFC, web programming [e.agbayani@cgiar.org](mailto:e.agbayani@cgiar.org)  
Josephine Rius Barile, WFC, database programming [rius@cgiar.org](mailto:rius@cgiar.org)  
Kathleen Reyes, WFC, map checking [k.reyes@cgiar.org](mailto:k.reyes@cgiar.org)

## FISHBASE, INCOFISH (EU project)

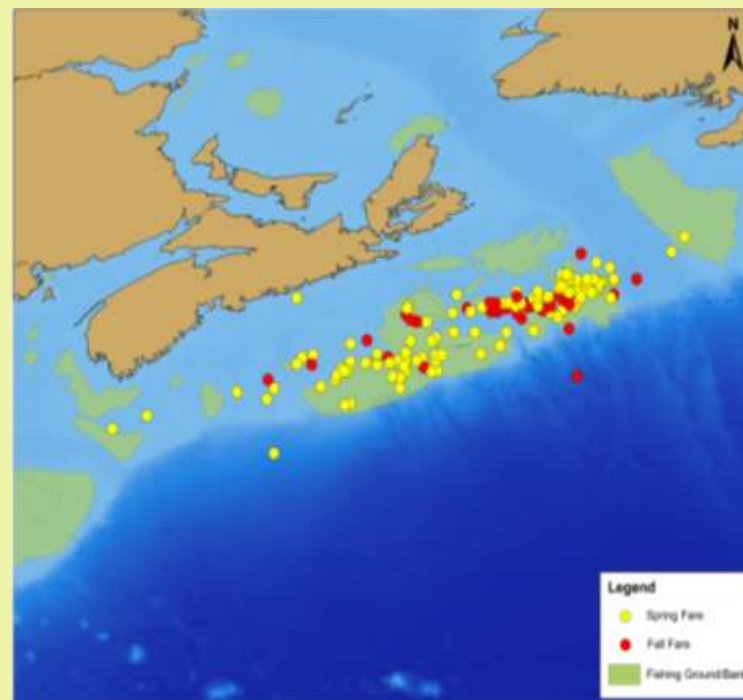


# Mapping Historical Fishing Grounds in the Gulf of Maine and Northwest Atlantic Ocean

*Stefan Claesson, University of New Hampshire.  
Published in Oceans Past. Managements Insights from  
the History of Marine Animal Populations. David J. Starkey,  
Poul Holm & Michaela Barnard (Eds.). Earthscan, 2007.*



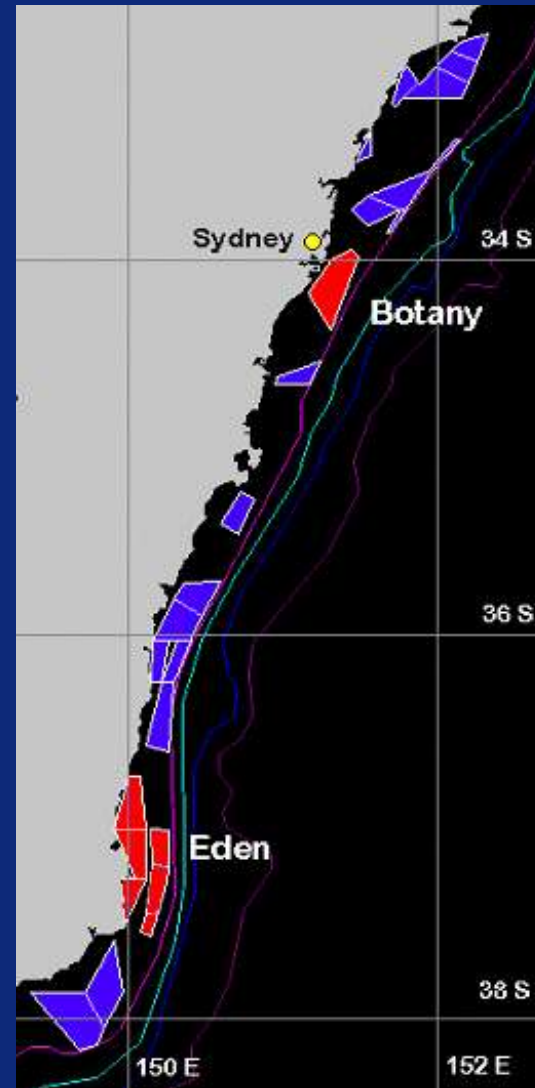
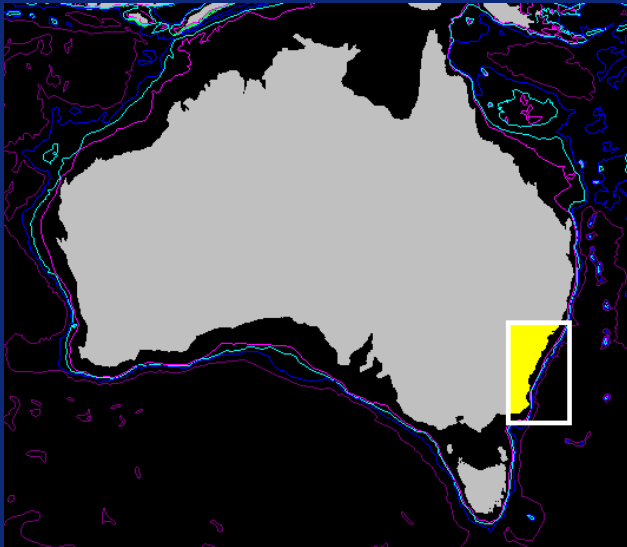
**Fishing chart of known and exploited fishing grounds and banks in the Gulf of Maine in nineteenth and early twentieth centuries**



**Seasonal fishing by American vessels on the Scotian Shelf shows a concentration of the effort on Banquereau and Sable Island Banks**

# Shelf fishing grounds in Australia to 1934

*Niel Klaer, CSIRO*



# GIS in HMAP White and Barents Sea project

*Julia Lajus, Petr Leontiev, Dmitry Lajus*

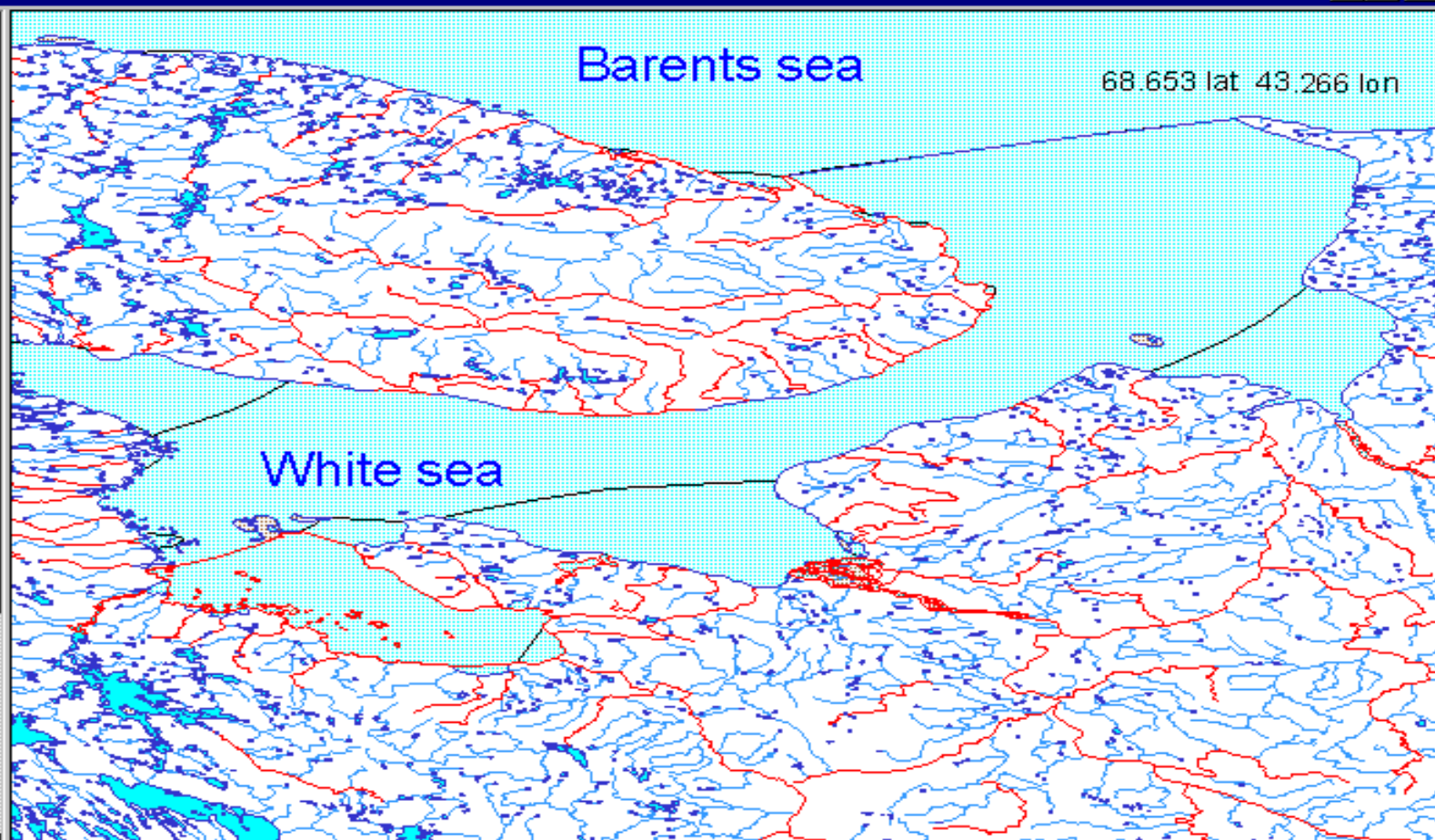
ArcView GIS 3.2

File Edit View Theme Graphics Window Help



Geographic

- Salm on .shp
- Theme12.shp
- Herring1.shp
- Herring.shp
- Towns.shp
- Coasts.shp
- Shore line.shp
- Seas & lakes.shp
  - 40
  - 41
  - 42
  - 43
- Rivers.shp
- Region.shp
- Isobaths.shp





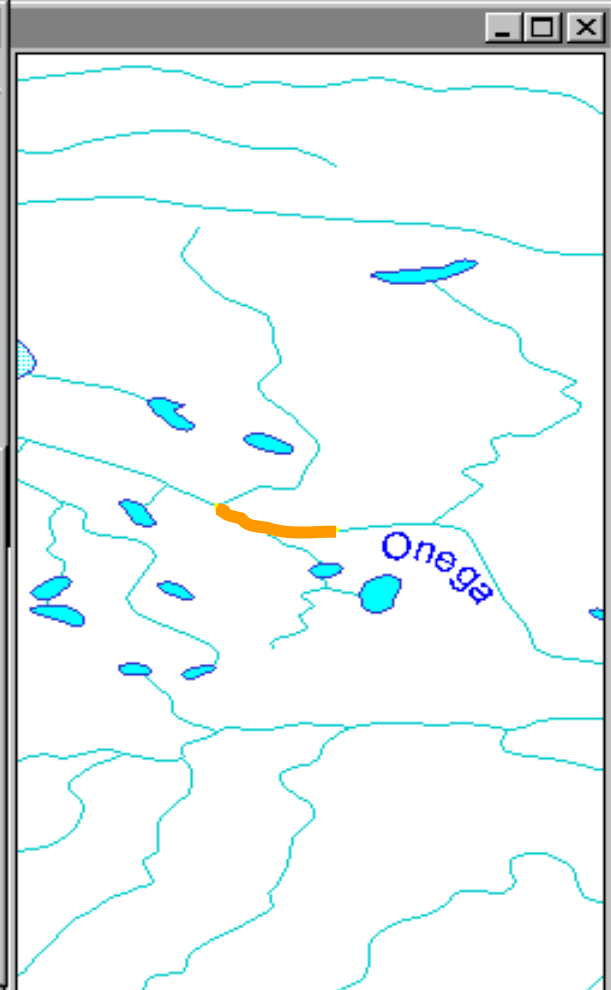
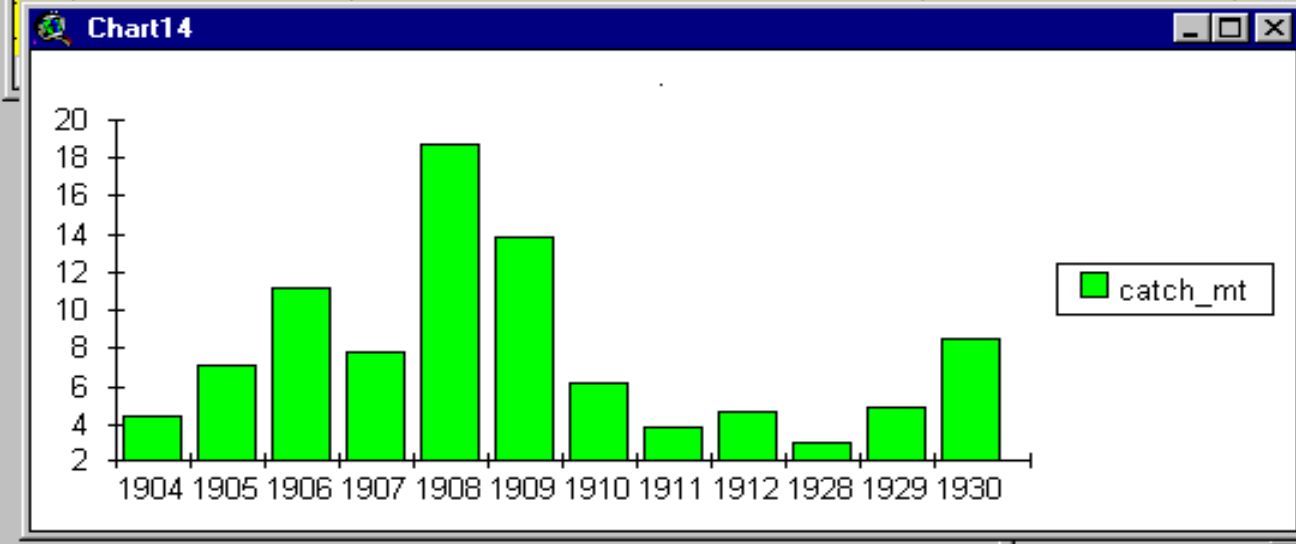
ArcView GIS 3.2

File Edit Gallery Chart Window Help



salmon.dbf

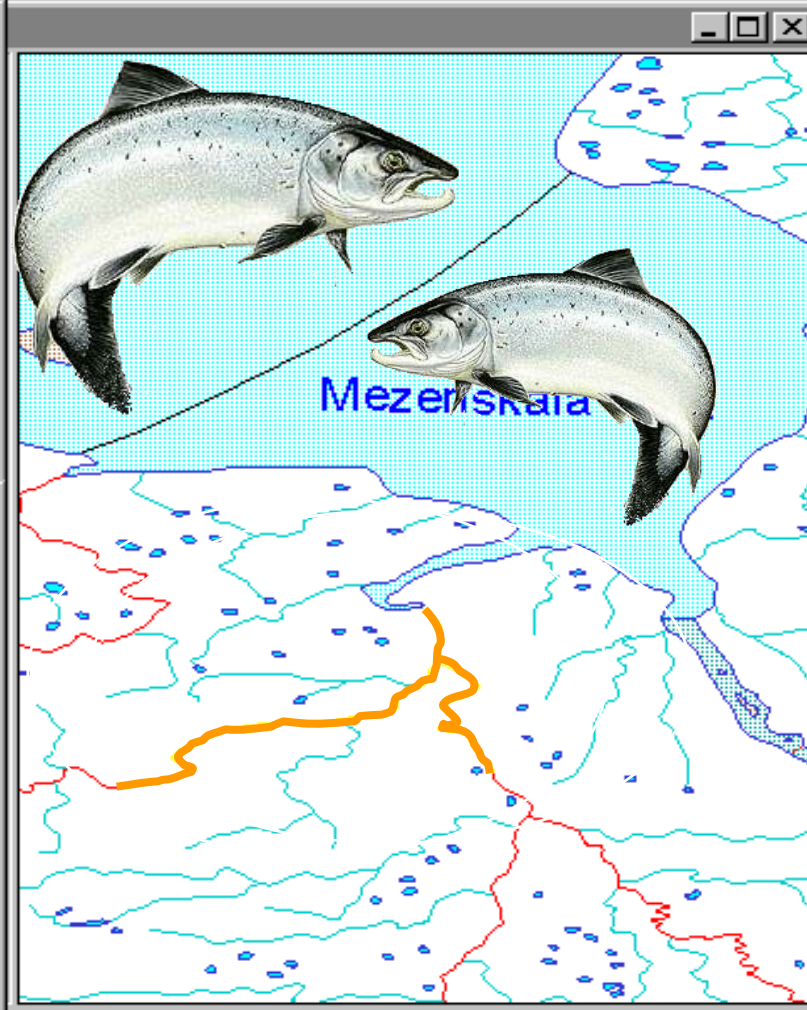
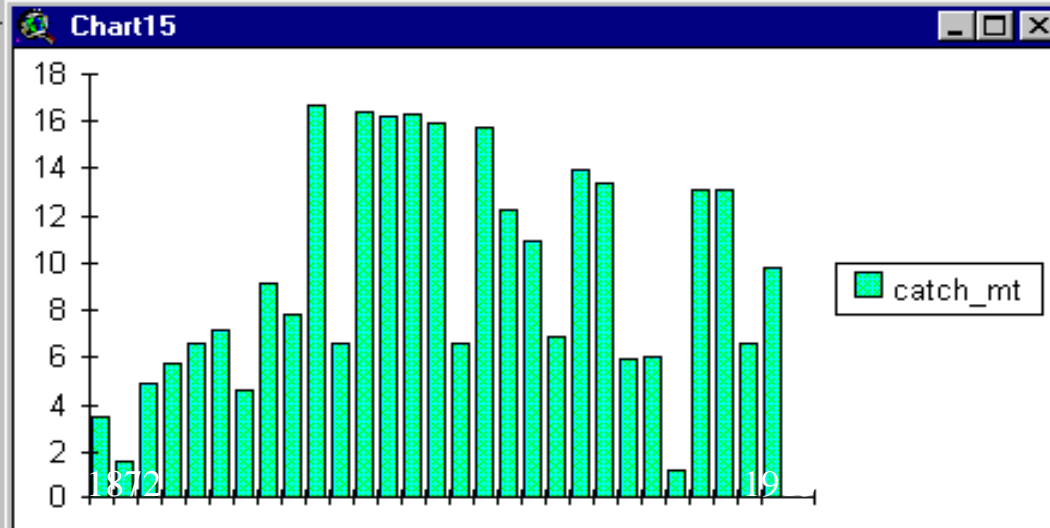
Ground	catch_mt	Lat	Lat_precis
Podporozhskii weir	4.47030	63.81900	Exact
Podporozhskii weir	7.08330	63.81900	Exact
Podporozhskii weir	11.11830	63.81900	Exact
Podporozhskii weir	7.84700	63.81900	Exact
Podporozhskii weir	18.75440	63.81900	Exact
Podporozhskii weir	13.87040	63.81900	Exact
Podporozhskii weir	6.14920	63.81900	Exact
Podporozhskii weir	3.80720	63.81900	Exact
Podporozhskii weir	4.66470	63.81900	Exact
Podporozhskii weir	2.99850	63.81900	Exact





salmon.dbf

Ground	catch_mt	Lat
Dolgoschel'skaia district(volost)	6.55200	66.053
Dolgoschel'skaia district(volost)	15.72480	66.053
Dolgoschel'skaia district(volost)	12.28500	66.053
Dolgoschel'skaia district(volost)	10.97460	66.053
Dolgoschel'skaia district(volost)	6.87960	66.053
Dolgoschel'skaia district(volost)	13.92300	66.053
Dolgoschel'skaia district(volost)	13.34970	66.053
Dolgoschel'skaia district(volost)	5.97870	66.053
Dolgoschel'skaia district(volost)	6.06060	66.053
Dolgoschel'skaia district(volost)	1.22850	66.053



# GIS on the White Sea herring historical catches

ArcView GIS 3.2

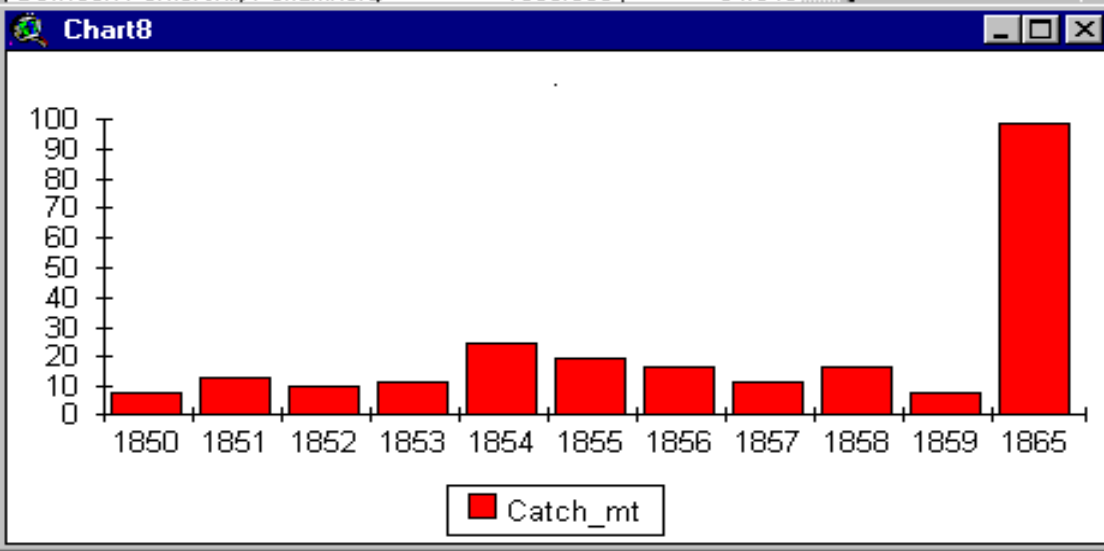
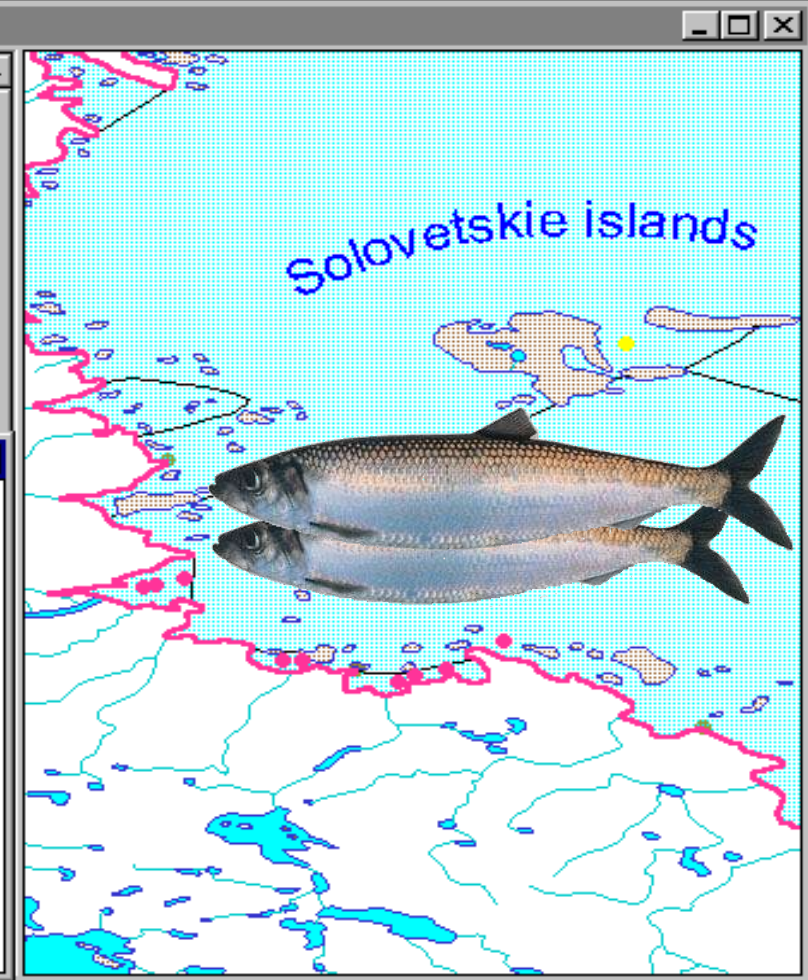
File Edit Gallery Chart Window Help



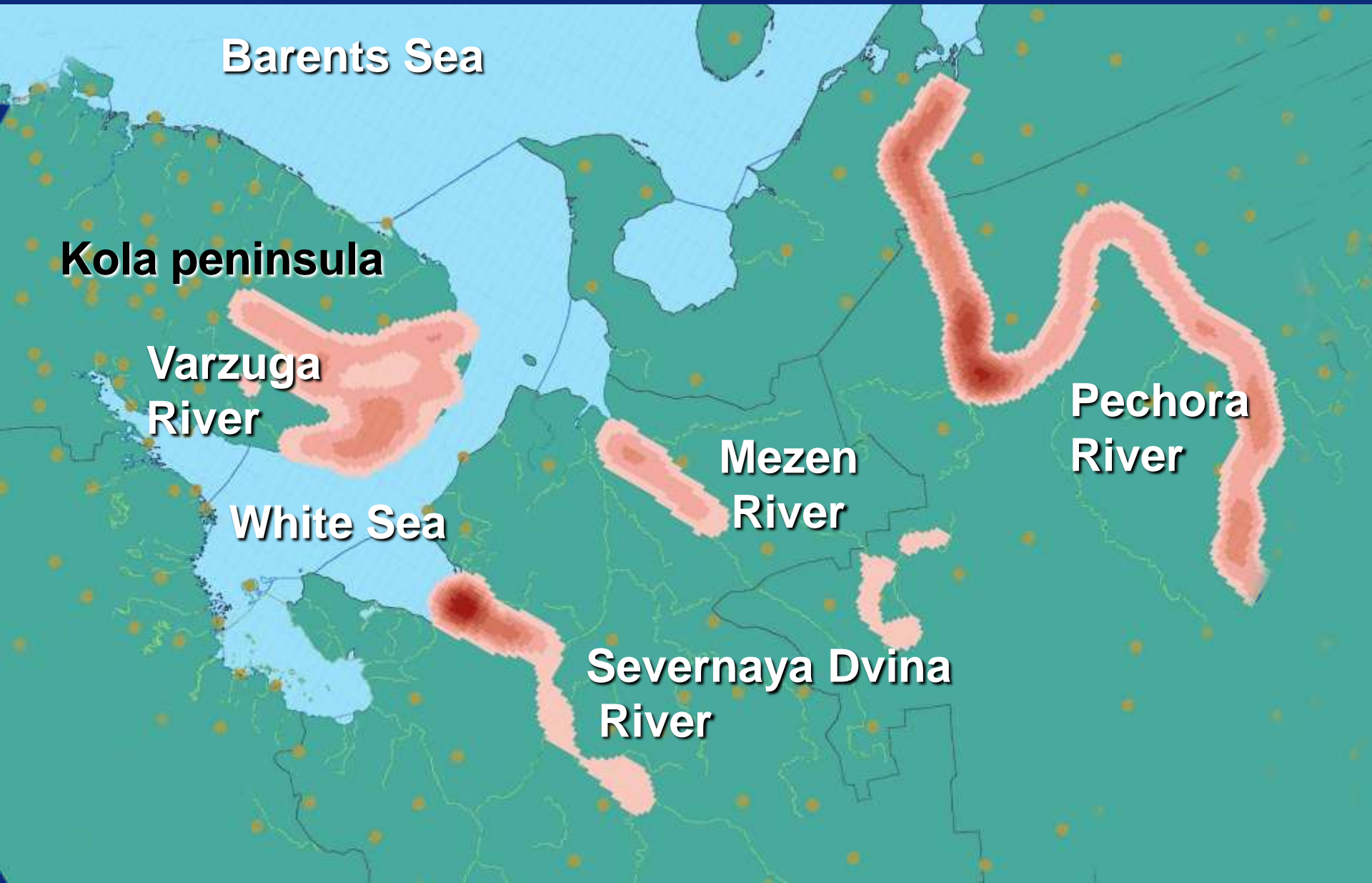
Ground	Catch_mt	Lat
Solovetskie islands	13.104	65.100
Solovetskie islands	11.466	65.100
Solovetskie islands	24.570	65.100
Solovetskie islands	19.656	65.100
Solovetskie islands	16.380	65.100
Solovetskie islands	11.466	65.100
Solovetskie islands	16.380	65.100
Solovetskie islands	8.190	65.100
Solovetskie islands	98.280	65.100
Between Pentel'skii, Poltanskoy	1966.000	64.540

Geographic

- Herring1.shp
- Herring.shp
- Rivers.shp
- Salt on.shp
- Towns.shp



# Integrated data (1875-1915) on catches of Atlantic salmon in Russian North visualized with kernel density technique



# Distribution of fisheries in the eastern part of the Gulf of Finland

15- 16<sup>th</sup> c.



19<sup>th</sup> c.



Fisheries are moving from the rivers down to the river mouths and adjacent coastal zones

# Influence of urban settlements on fisheries (Narova River, Baltic)



1470



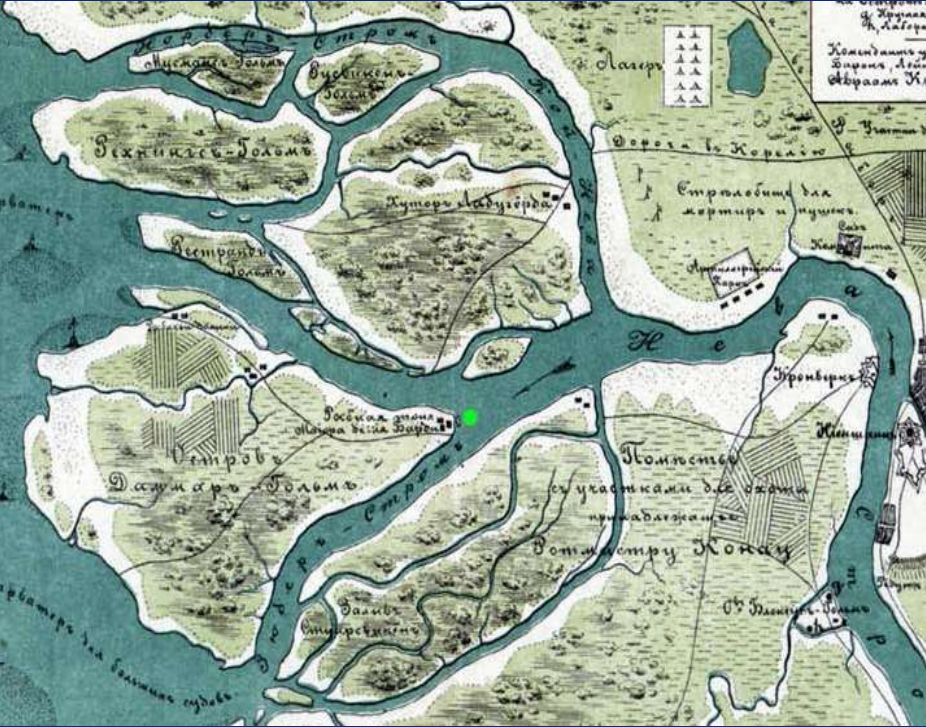
1500



Town of  
Ivangorod,  
founded in 1473

# Fisheries in urban environment, case of St. Petersburg

1698



1834

