Towards precision fishery: standardized modelling of smart services in the fishery domain

Ståle Walderhaug[†]	**Per Gunnar Auran**	**Arne Jørgen Berre**
Department for Software Engineering, Safety and Security SINTEF Digital Tromsø Norway stale.walderhaug@sintef.no	Department for Energy and Transport SINTEF Ocean AS Trondheim Norway per.gunnar.auran@sintef.no	Department for Software and Service Innovation SINTEF Digital Oslo Norway arne.j.berre@sintef.no

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Our research goal

- Investigate in a **large scale** how smart **data-driven services** for fisheries can be **identified** and **modelled** using
  - a model-driven approach with **Archimate** 3.0
  - big data reference model from **BDVA**.

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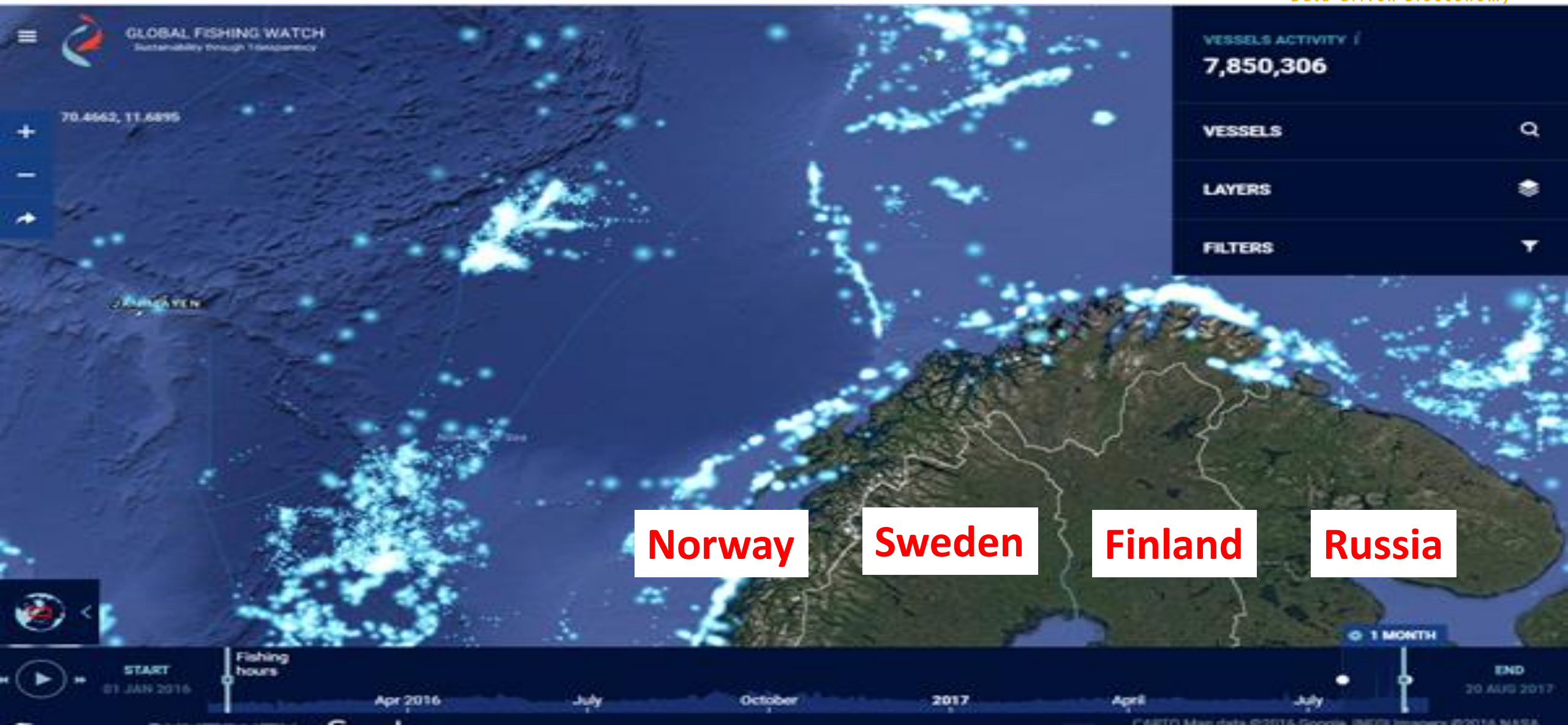
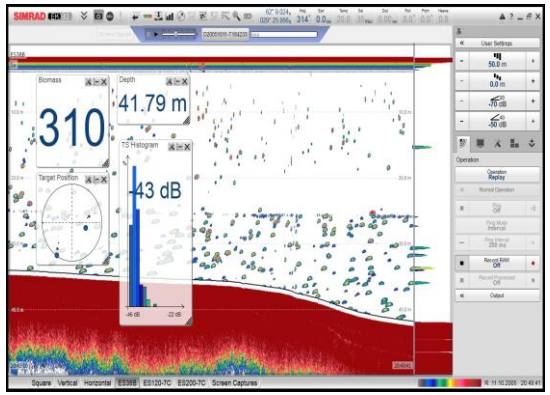
The problem domain



Fishing is data intensive

- The fishing fleet is increasingly sophisticated with **numerous sensors**.
- **Sales data** are routinely accessed to obtain information
- **AIS** (Automatic Identification System) tracking portals are used
- The governing bodies (EC and national EU and EEC member states) requires fishermen and landing sites by law to report **catch data** back to them for monitoring purposes.



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Fishery Datasets – Oceanic Tuna and Small Pelagic Fisheries

Dataset type / Variety	Dataset	Volume (GB)	Velocity (GB/year)	Start date	Comment
Market Data	Catch reports, economic figures	< 1GB	<0,07	20120101	9 data sources, **catch data >50k but important**
Vessel Data	ESAS	67	18,8	20140901	
	Eros	64	20,5	20140903	
	KingsBay	78	19,6	20140826	
	LiegFi	1,5	17,1	20180731	**Recently installed by DataBio**
	Echebastar A1 pilot data	25	5,4	20140101	
	Echebastar UE Fleet data	903,8	602,6	20170101	12bit x 4variables x 1,07e+11/year (minimum)
EO, CMEMS, Met	Ocean physcis(current/temp)	310	115,5	20160101	
	Wave data (open ocean)	283	165,7	20161209	
	Biology	99,8	37,1	20160101	
	Wind	325	121,2	20160101	
	Coastal waves (Met)	1203	802	20160918	
	Oceanic Tuna EO + research data	938,8	625,9	20170101	12bit x 4variables x 1,11e+11/year (minimum)
SINMOD	Oceanographic modeling (4km)	385	1752	20180614	**Operationalized + fishmodel by Databio**
	NOAA atmospheric + SINMOD input	N/A	3500	N/A	Only keept for model output generation
Hydroacoustics	SIMRAD EK80 series-echosounder	3,3	121,2	N/A	**Logging module development in DataBio**
	(SIMRAD SX90 Sonar	N/A	5402	N/A	For information only, main fish sensor)
	Simrad SN90 Sonar +echosounder	317	Per cruise	20180612-18	*Mitigation- Research cruise, manual logging*
Total	**All fishery pilot data assets**	**5004,2**	**5815,4**		

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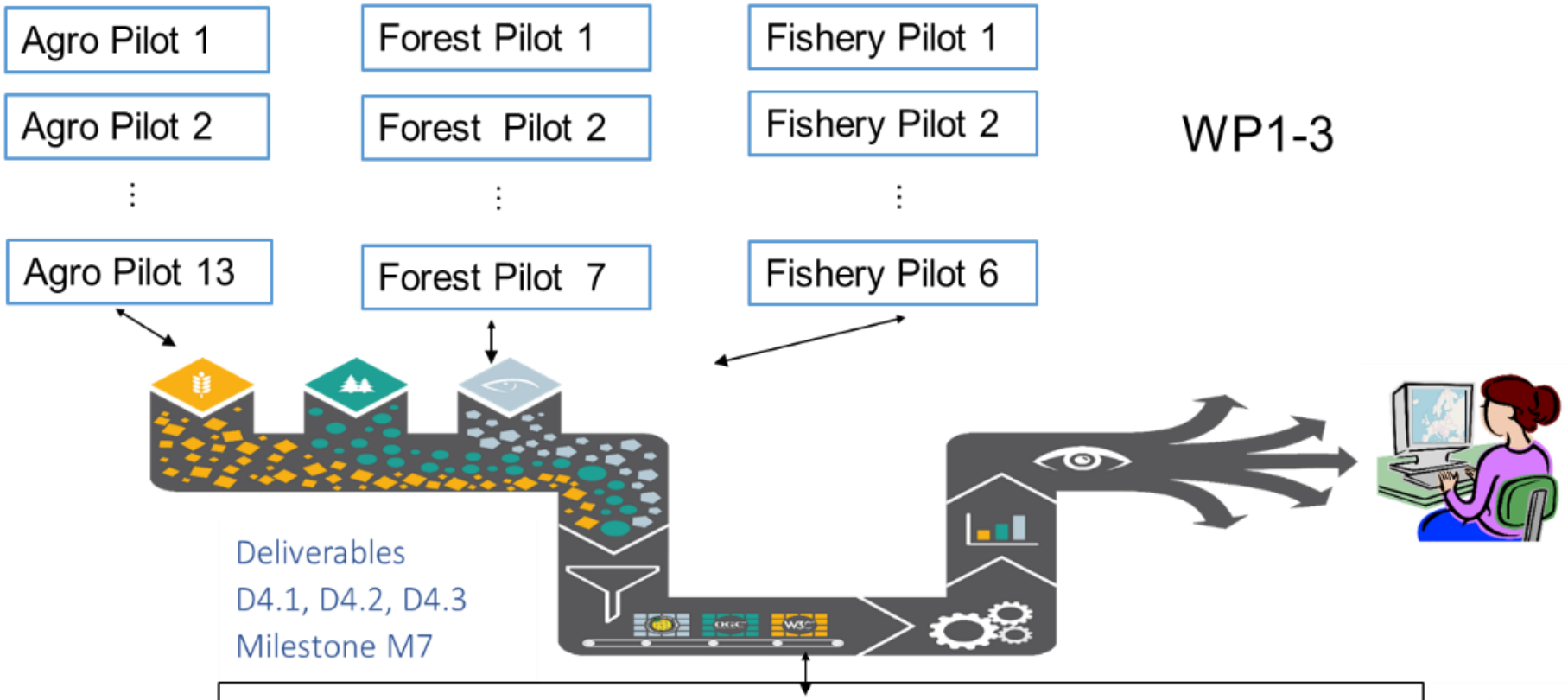
Context: The DataBio project with pilot demonstrations



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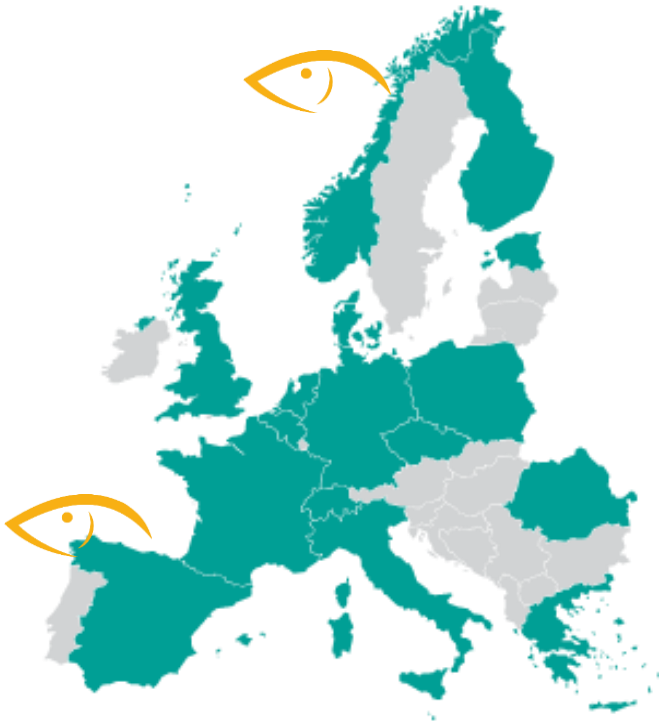
DataBio – Fisheries Pilots Overview

Apply Big Data Technology in two fisheries and three thematic groups: 6 pilots



		Oceanic tuna fisheries	SINTEF (Eros AS, Kings Bay AS) Small pelagic fisheries
OPERATION	T3.2	A1 Oceanic tuna fisheries immediate operational choices	A2 Small pelagic fisheries immediate operational choices
PLANNING	T.3.3	B1 Oceanic tuna fisheries planning	B2 Small pelagic fisheries planning
SUSTAINABILITY	T 3.4		C1 Pelagic fish stock assessments C2 Small pelagic market predictions and traceability

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Methods and materials

- Use the **BDVA reference model** with **Archimate** modelling as a tool for bridging the communication gap actors involved

- Identify **stakeholders**, their operation **goals** and **strategies** for implementing them

- Identify state of the art data sources and software components

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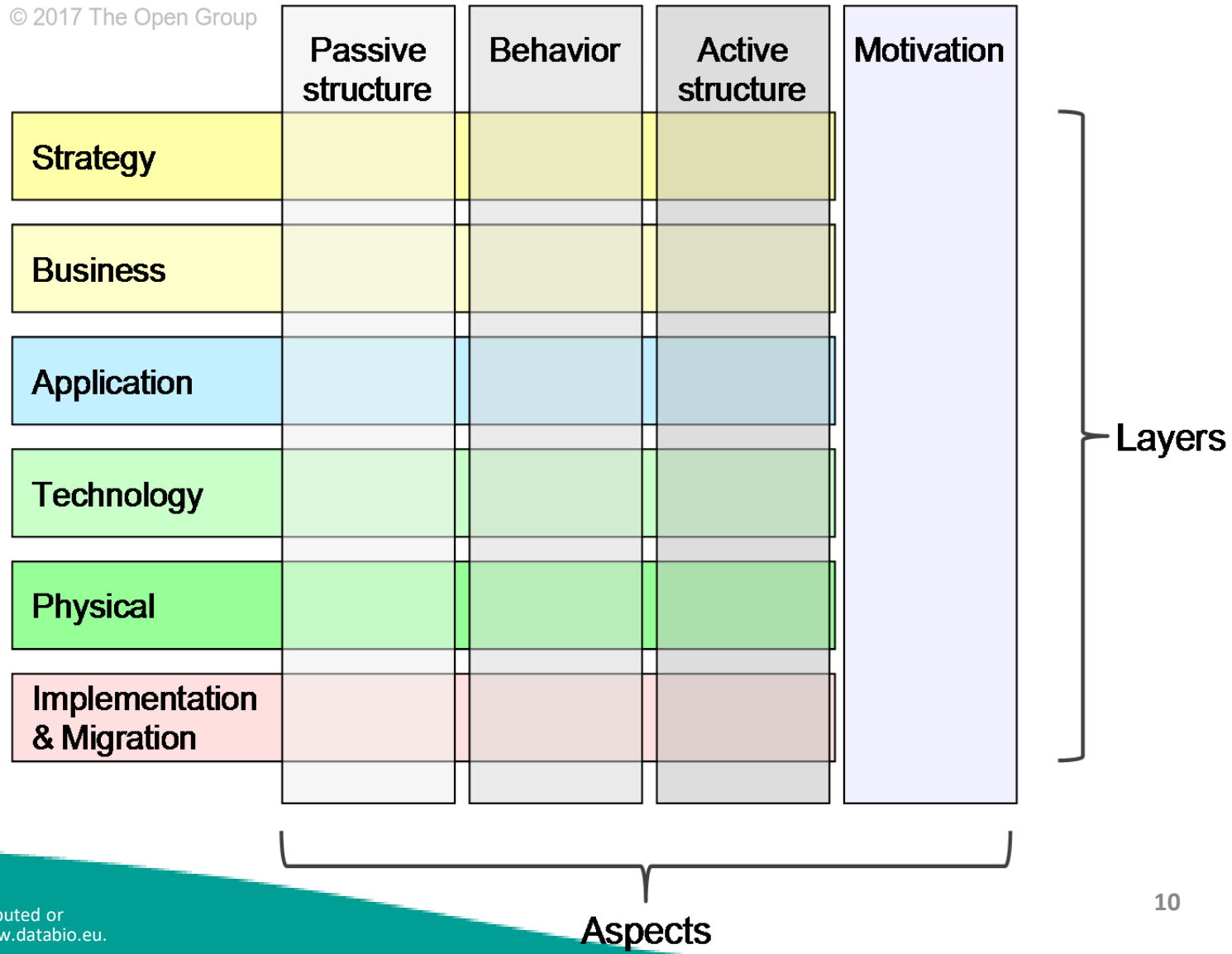
The results

- Archimate
  - Motivation
  - Strategy
  - Business models
  - Application
- Extended diagrams
  - Pipelines
  - Role
  - Lifecycle



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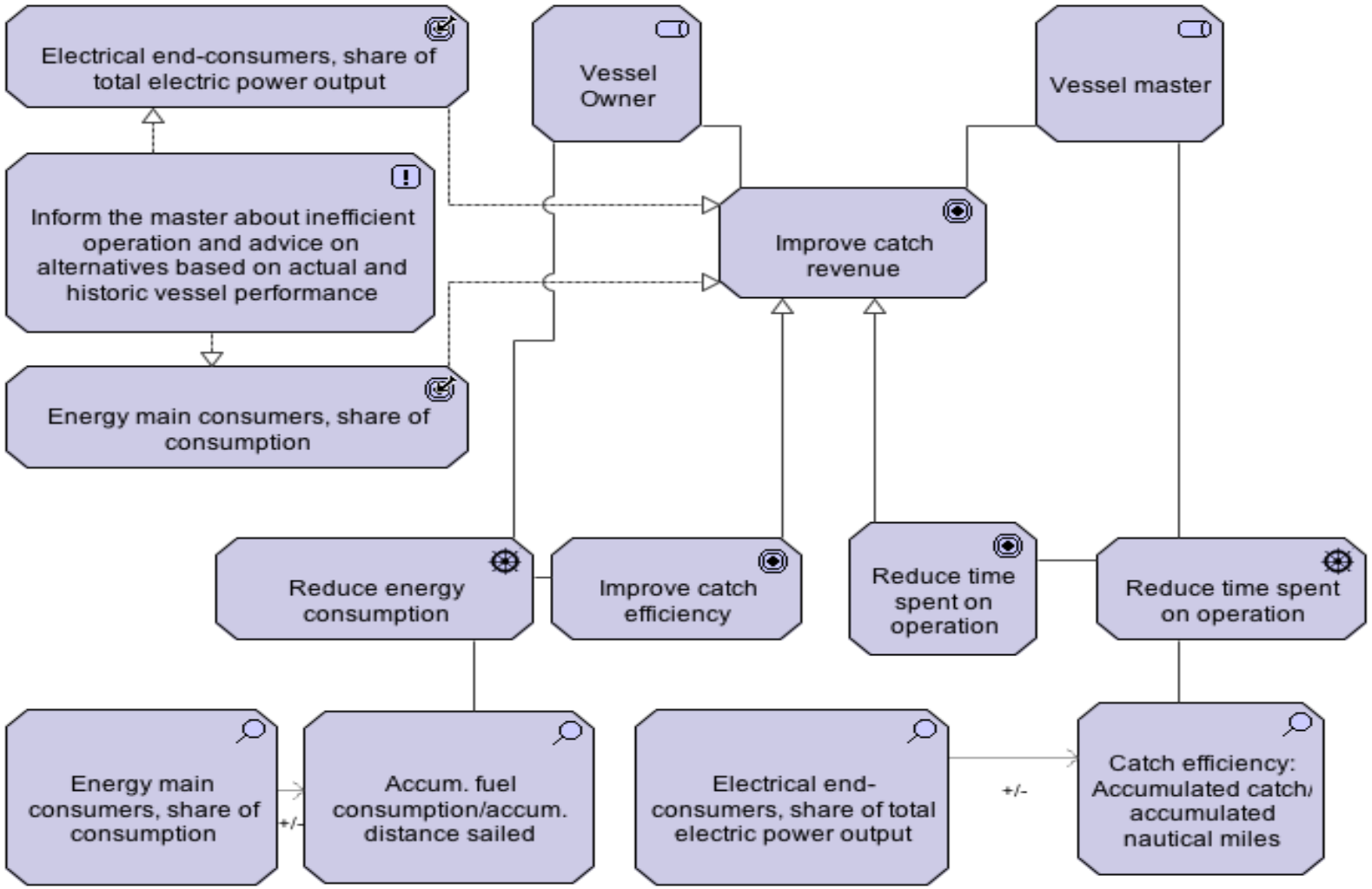
Motivation



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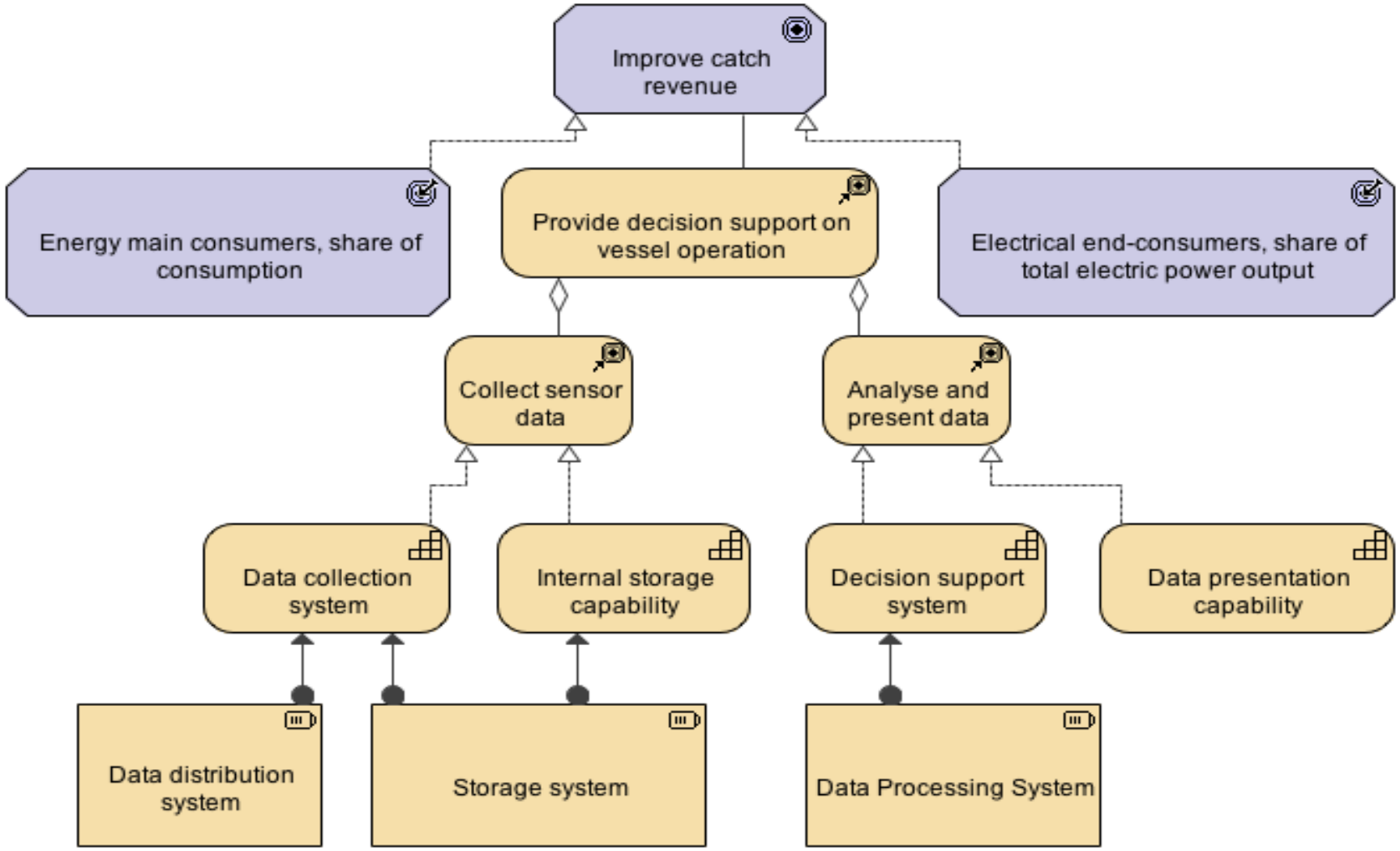
Strategy



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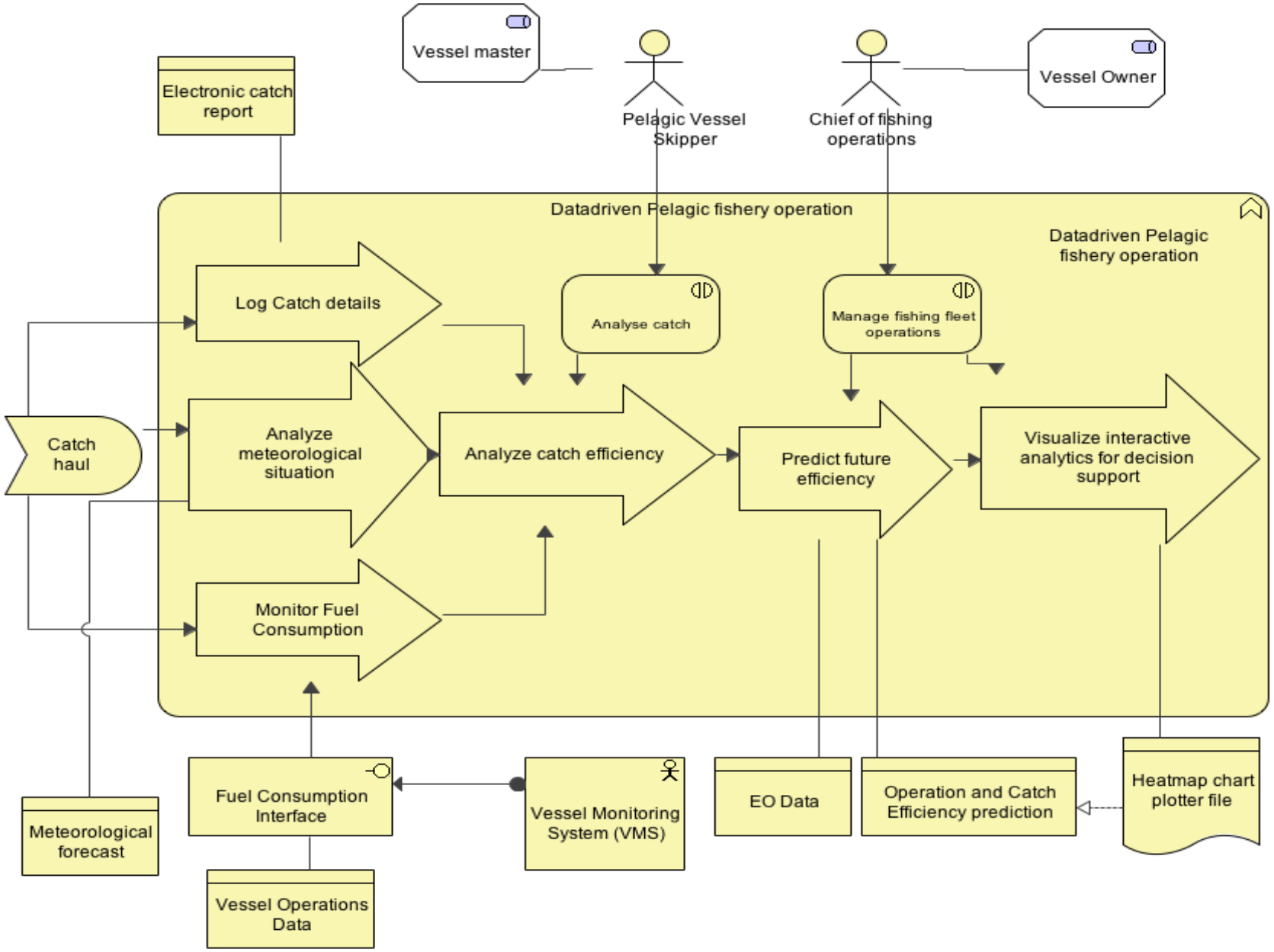
Business



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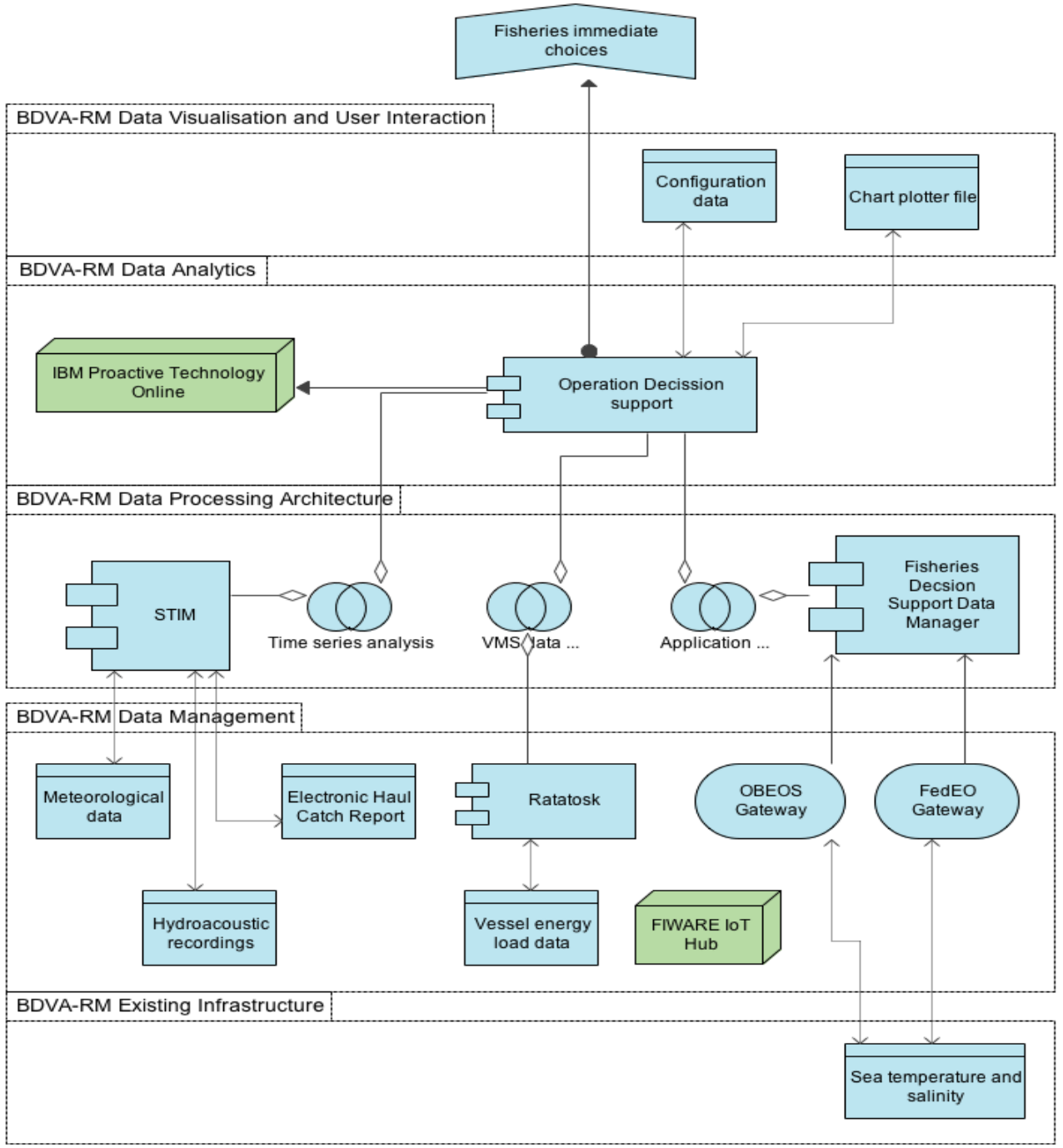
BDVA distribution



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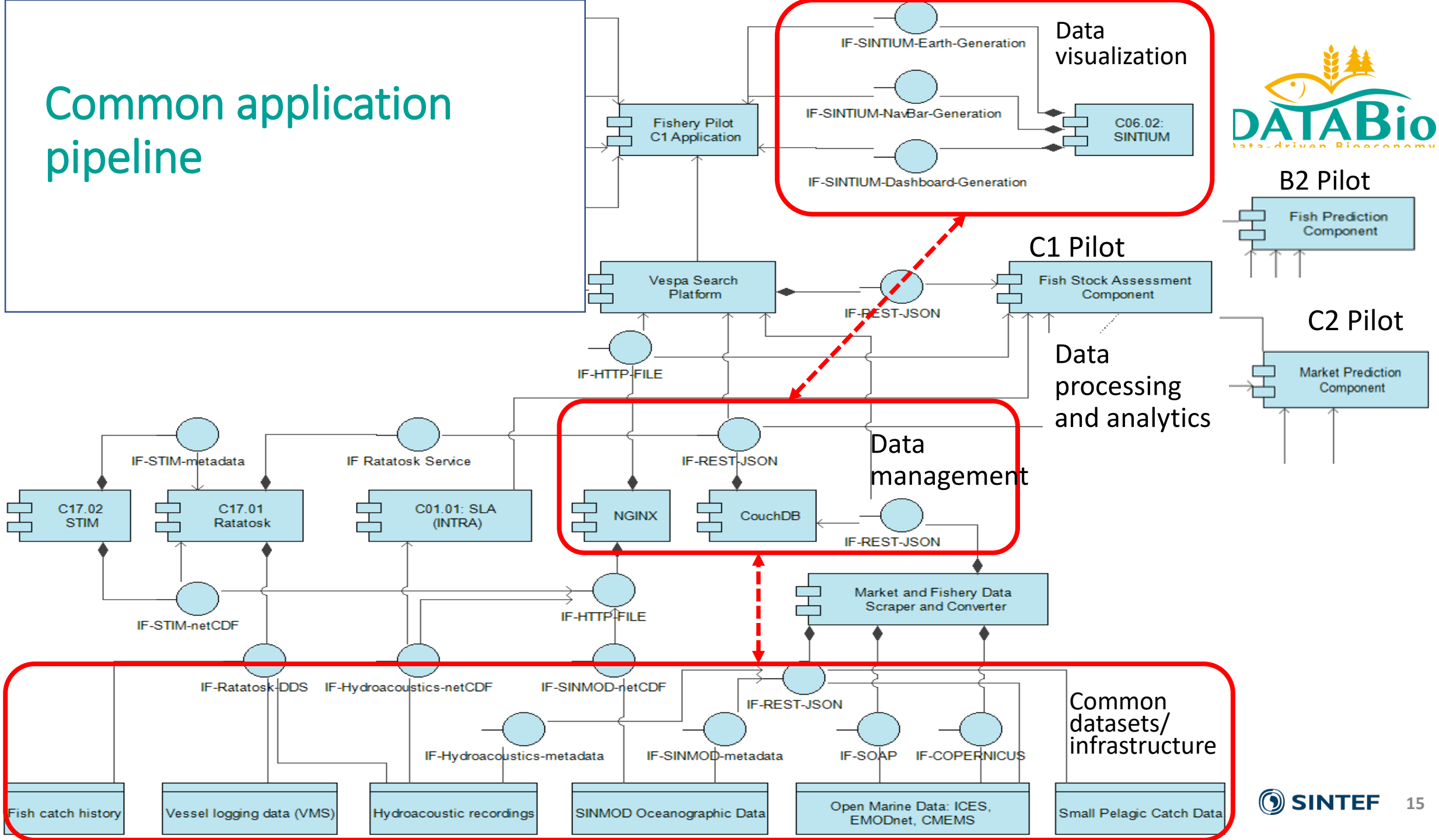
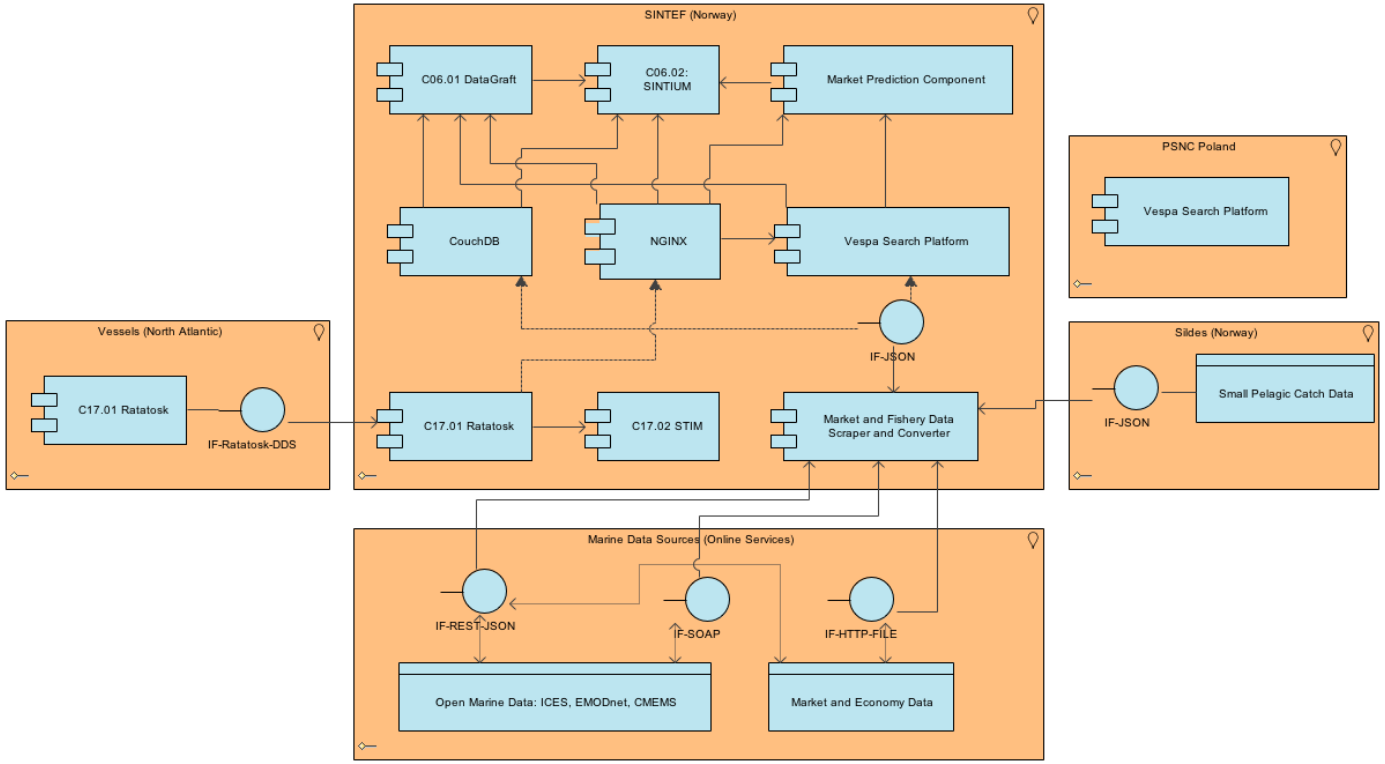
Common application pipeline



Modelling results summary

- 26 pilot systems
  - Extended modelling to include agriculture and forestry
- 450 design diagrams
- 5700 modelling elements



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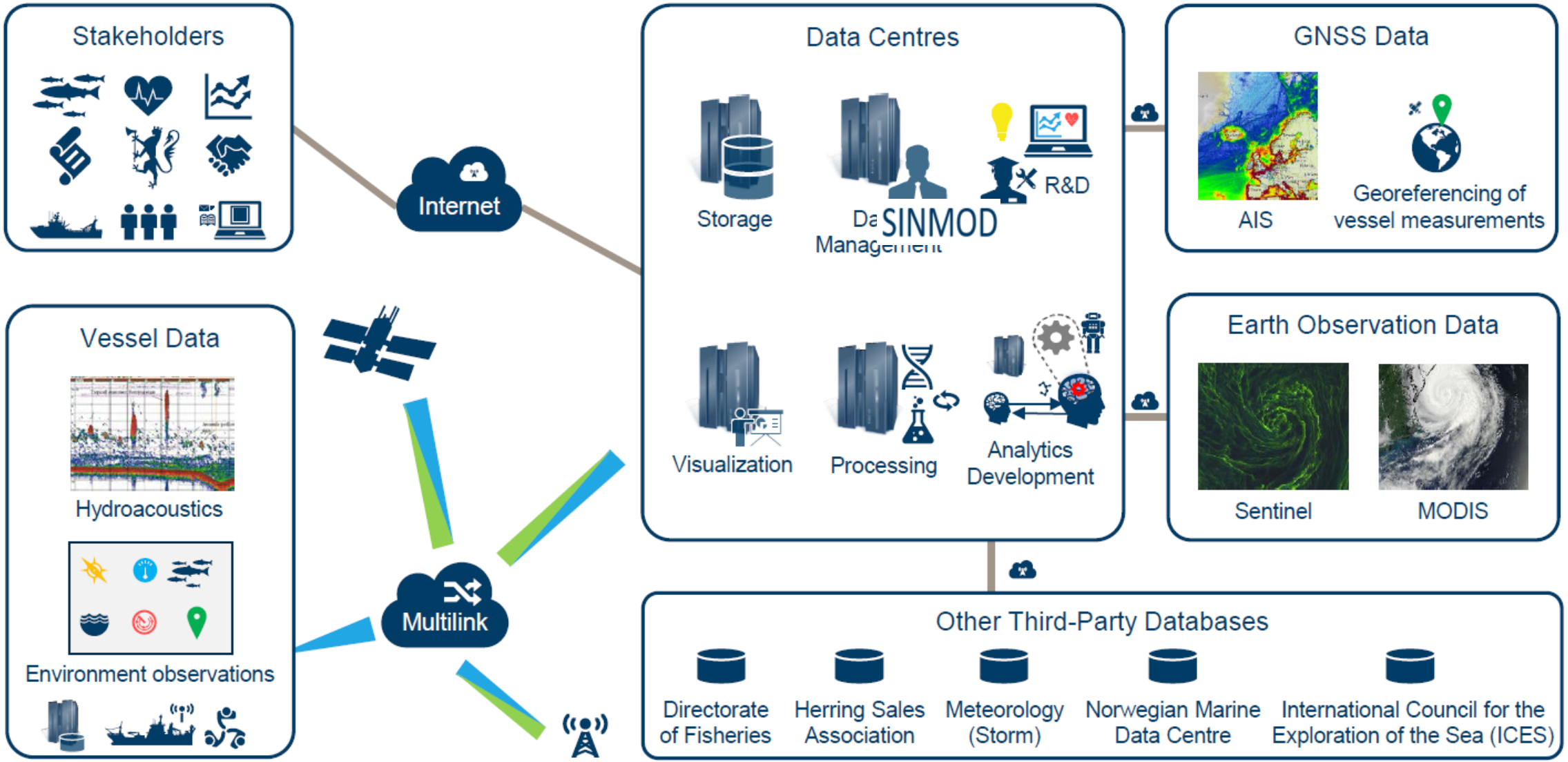
DataBio Fishery services – Small pelagic pilots common picture



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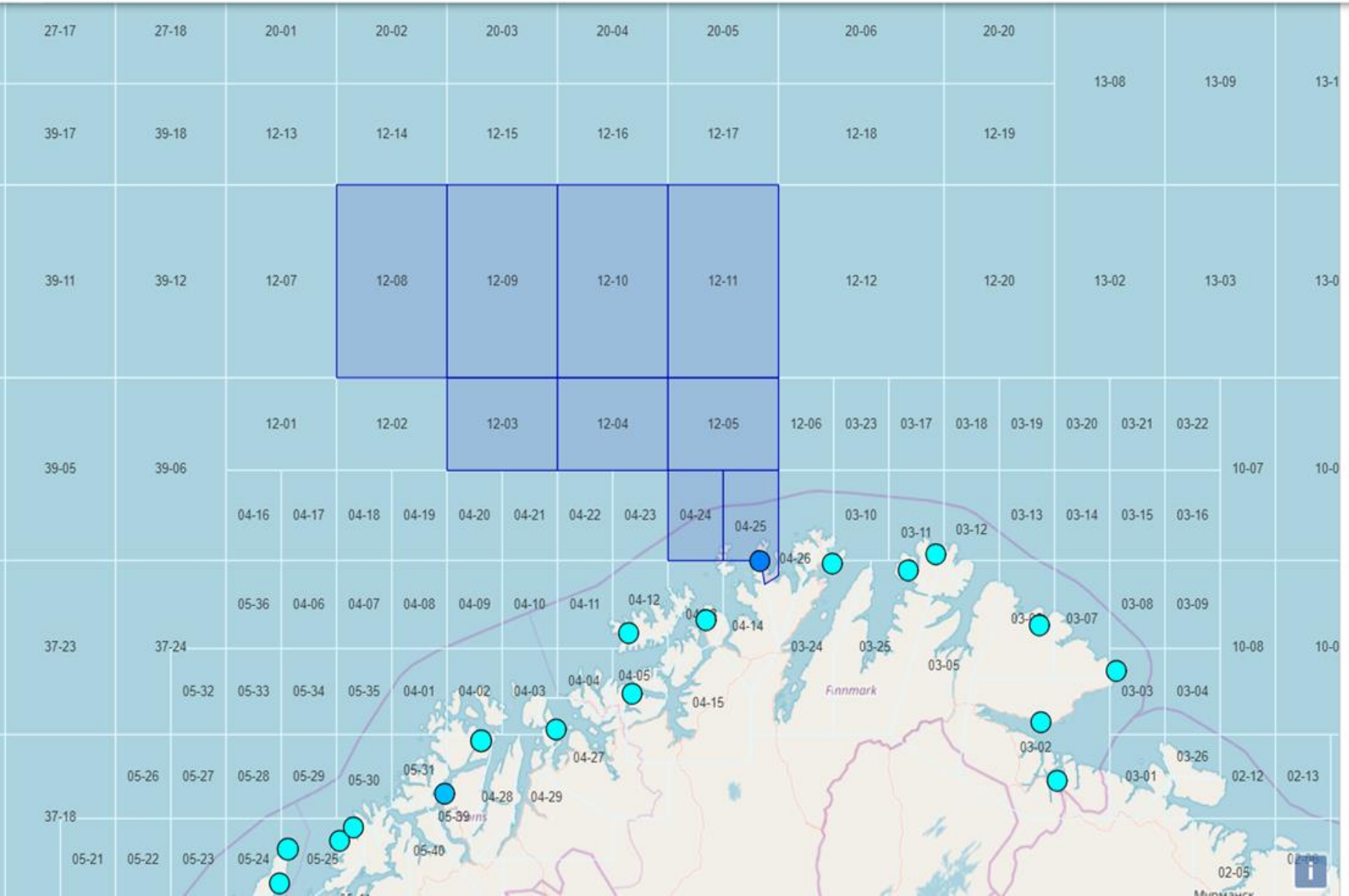
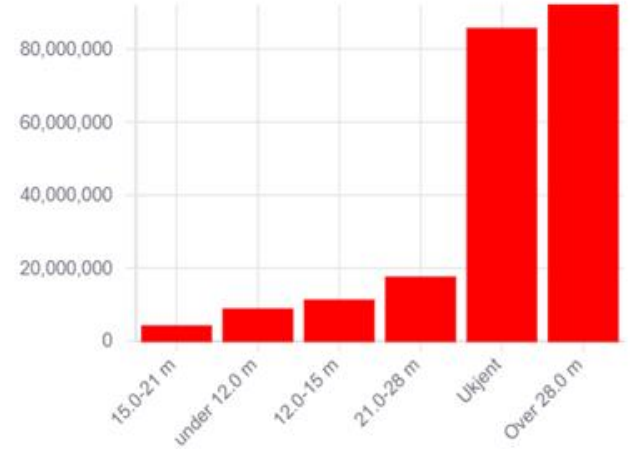
Historic catch data: fishing grounds, landing site catch composition

Noatun

2010, 2011, 2012



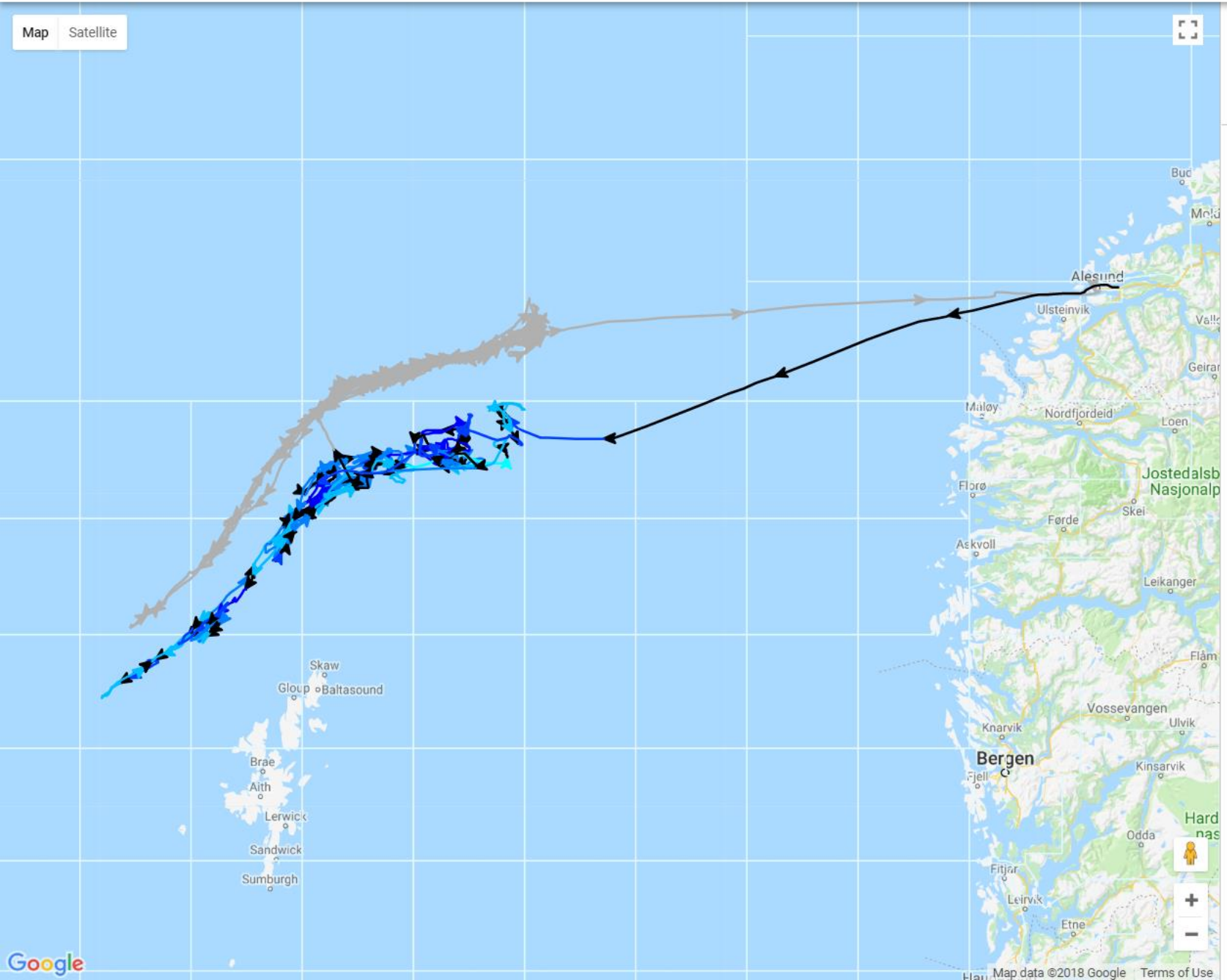
Gross catch per boat type

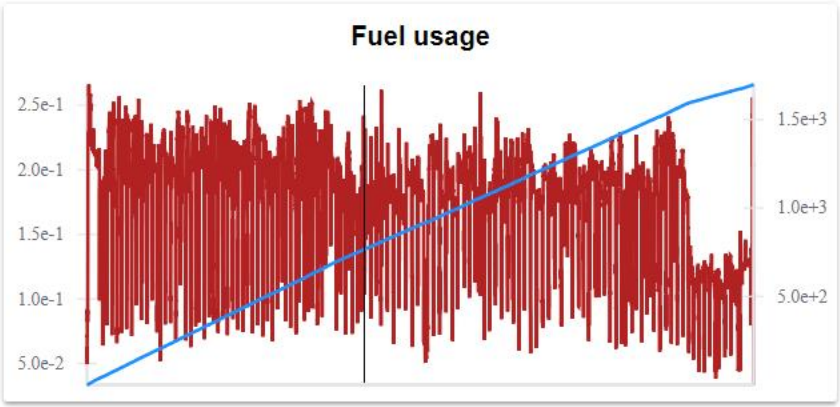


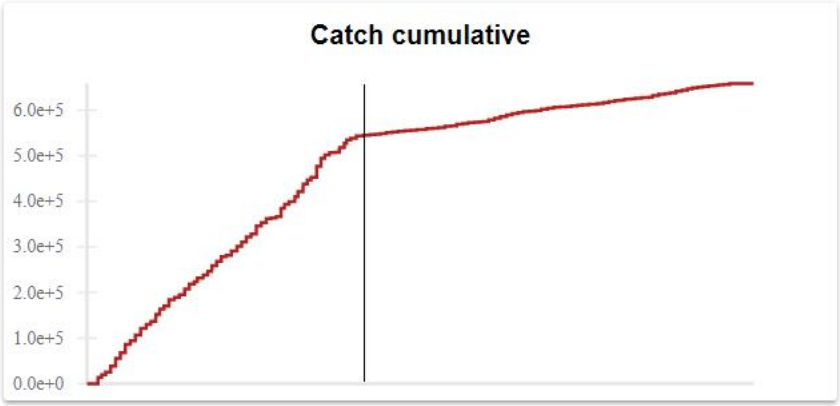
Gross catch per fish type

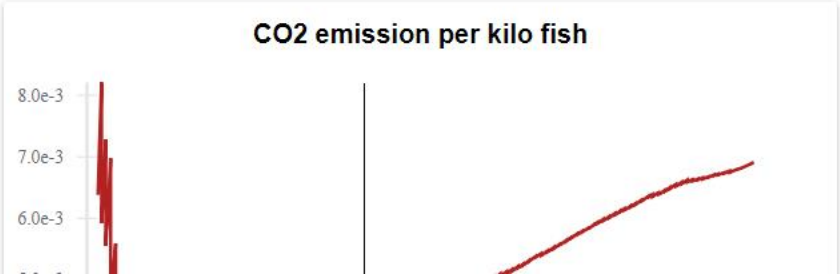
Individual Haul Analytics

Trip 11

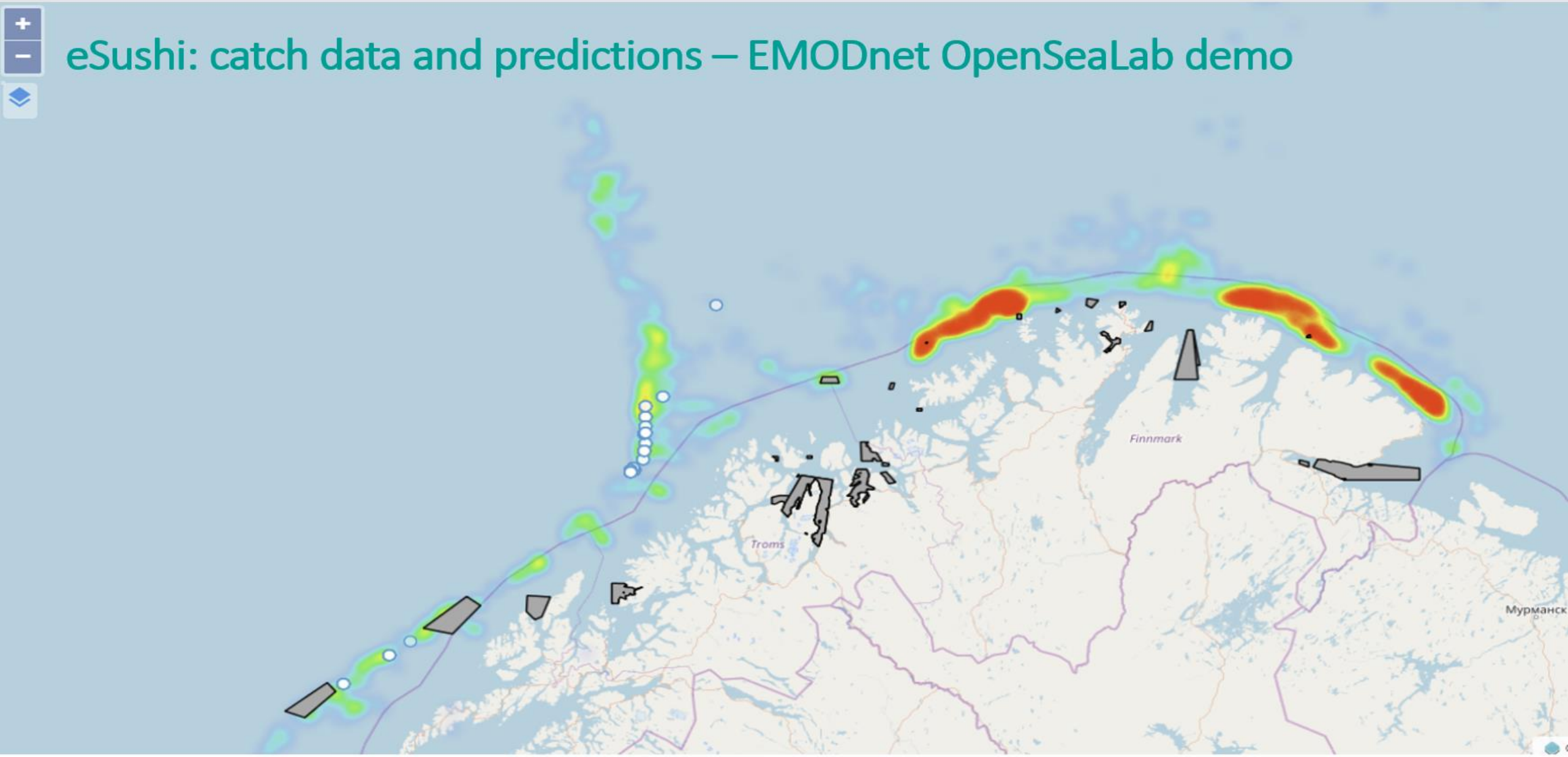








eSushi: catch data and predictions – EMODnet OpenSeaLab demo



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Hent data

Findings from modelling Fishery Big Data Services

- Fishermen from different fisheries and geographical areas **share the majority of goals and drivers**
- The **strategy** for reaching these goals require many **common activities** and will utilize a **common set of resources** (e.g. processing and data sets)
  - Reuse and standardization may be useful
- There is a **large variation in quality and availability** of relevant **data sources** for predictive analytics
  - Data spaces should be in focus

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Concluding remarks

- Archimate and domain experts
  - Motivation and strategy models useful for communication and design
  - Business models in some cases
- Archimate and BDVA
  - Reference model useful component classifications and application design
  - Pipeline and lifecycle modelling more structured

Promosing results, but more evaluations are requiered to conclude

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