





Implementation of a process of traffic and activity of fishing fleet based on Automatic Identification System (AIS) - satellite data

Michał Bis – Statistics Poland

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Automatic Identification System in a nutschell



Dynamic data

- Information on ship movements
- Automatically transmitted
- Every 2 to 10 seconds depends on vessel's speed

- Every 3 to 6 minutes when anchored

Maritime Mobile Service Identity number (MMSI)

- AIS navigational status
- Rate of turn
- Speed over ground
- Position coordinates (longitude/latitude)
- Course over ground
- Heading
- Bearing at own position
- UTC second

Static data

- Information on ship characteristic
- Manually transmitted
- Every 6 minutes

- International Maritime Organisation number (IMO)
 Call sign
- Name
- Type
- Dimensions
- Location of the positioning system's antenna on board the vessel
- Type of positioning system
- Draught
- Destination
- ETA (estimated time of arrival)

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Satellite system for Automatic Identification System



Source : https://blog.orbcomm.com/ais-new-og2-satellites-enable-near-real-time-vessel-monitoring/



The area monitored by a single satellite (SmallSats <180 kg), i.e. FOV (Field Of View), is a circle with a diameter of approx. 3000 km.

To cover the entire Earth's surface, it is necessary to use multiple satellites.



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Information about the project - ESSnet Big Data II – Tracking ship

Project ESSnet Big Data II – 2018 – 2020

Three National Statistical Institutes participated in WPE – Tracking ship: the Netherlands, Greece and Poland;

Four use cases have been developed:

- Inland waterways (the Netherlands);
- Energy used and emissions of shipping vessels for the environmental accounts (the Netherlands);
- Port visits (Greece);
- Traffic and activity of fishing fleet (Poland).

Main objectives:

- Development of a functional prototype to promote and support processes of collecting, processing and analysing of big data based on AIS for statistics production;
- Implementation of experimental statistics in the domain of maritime economy;
- The output of the work available to the ESS, NSIs and international organizations.





Overview of process & technology



Source code of project – Github repository:

https://github.com/AIS-data/WPE_fishing_fleet



Data collection and preparation of a reference of frame for fishing fleet

AIS data

According to EU regulations, the system for fisheries controls requires all fishing vessels in Europe above 15 meters to use the AIS transmitters. https://ec.europa.eu/fisheries/cfp/control/technologies_en

In our case, we used:

AIS data	AIS Polish data	AIS - UN Global Platform
Source	Polish Maritime Authority	ExactEarth API
Coverage obtained	Poland	The whole world
Type of data	Streaming data	Satellite data
Applied for	Poland	Poland, Denmark

Register of fishing fleet

The first step in implementing the process is preparation of a reference of frame for fishing fleet based on public register. Each EU country is obliged to maintain (i.e. collect, update and share) on the national fishing fleet register.

Data from the EU fishing fleet register are used to apply the rules of the Common Fisheries Policy.

The register is kept in electronic form on the basis of a regulation of the European Commission. <u>https://webgate.ec.europa.eu/fleet-europa/search_en</u>



Data processing





Data analysing and visualization





Results for Poland (Home port – Hel)



Port Number of fishing vessels by fishing fleet register		Gross tonnage (GT) in thousands		Power in thousand kW		Data source	
Hel	21		1	.368.83 3801.40			AIS-PL
Day of measurement		The number of active fishing fleet for home port		The number of fishing fleet	departures of the from the port	The n	umber of calls of the fishing fleet to the port
2021-09-26		5			5		5

Variable	Average	Мах	Min
Time fishing activity (h)	8,4	9,5	7,5
Distance (km)	75,7	81,1	59,5
Speed (knot)	4,76	10,2	0.0
Draught (metres)	3.25	Х	Х

Day of measurement	Temperature [°C]	Precipitation [mm]	Wind speed [km/h]
2021-09-26	14	0,0	14

weather data, source - https://www.visualcrossing.com/weather-history/



Results for Poland (Home port – Kołobrzeg)

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Kołobrzeg

Average distance in km



Number of location data (records)



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Results for Denmark (Home port – Skagen)



	Skagen ØSTERBY
	VESTERBY
OCTOBE COTTOBE	
Zoom 1. out of port – Skagen – 2021-09-26	Zoom 2, out of port – Skagen – 2021-09-26

Port	n	Day of neasurement	The num fleet	ber of fishing in the port	The number of a fishing fleet	ctive	Data source
Skagen		2021-09-26		36	19		Satellite data - UN Global Platform
Variable		Averag	;e		Max		Min
Time fishing activity (h)		15,4		0,17			24,0
Distance (km)		129,5		1,4			353,2
Speed (knot) 4,4		4,4	13,5			0.0	
Draught (metres)		Х		Х			Х

Day of measurement	Temperature [°C]	Precipitation [mm]	Wind speed [km/h]
2021-09-26	13,5	0,0	28

weather data, source - https://www.visualcrossing.com/weather-history/



Results for Denmark (Home port – Skagen)





Results for Denmark (Home port – Skagen)





Comparison between land based AIS-PL data (streaming) and satellite AIS data for fishing fleet - port Hel



Port	Number of fishing vessels analyzed	Number of position AIS data – land based station	Number of position AIS data - satellite	
Hel	1	9010	209	



Comparison between land based AIS-PL data (streaming) and satellite AIS data for fishing fleet - port Hel



Port	Number of fishing vessels analyzed	Number of position AIS data – land based station	Number of position AIS data - satellite	
Hel	1	9010	209	



Comparison between streaming AIS data (land base station) and satellite AIS data for fishing fleet - port Hel





Gdynia

Satellite AIS data – zoom 1

Port	Time of	Number of fishing vessels	Number of position AIS data -	Number of position AIS data –
	measurement	analyzed	streaming	satellite
Hel	2021-09-26	5	39404	928



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Krymiral

Comparison between streaming AIS data (land base station) and satellite AIS data for fishing fleet - port Hel

Land based AIS data (streaming) – zoom 2



Satellite AIS data – zoom 2



Port	Day	Number of fishing vessels	Number of position AIS data -	Number of position AIS data –
		analyzed	streaming	satellite
Hel	2021-09-26	5	39404	928



Comparison between streaming AIS data (land base station) and satellite AIS data for fishing fleet - port Hel

Land based AIS data (streaming) – zoom 3



Satellite AIS data – zoom 3



Port	Day	Number of fishing vessels	Number of position AIS data -	Number of position AIS data –
		analyzed	streaming	satellite
Hel	2021-09-26	5	39404	928





- Obtaining and testing a new data source Vessel Monitoring System (VMS);
- Further develop a methodology and model to detect fishing behaviours based on AIS data;
- Develop model of exhaust emissions for the fishing fleet





Thank you for your attention!

Michał Bis – <u>m.bis@stat.gov.pl</u>

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