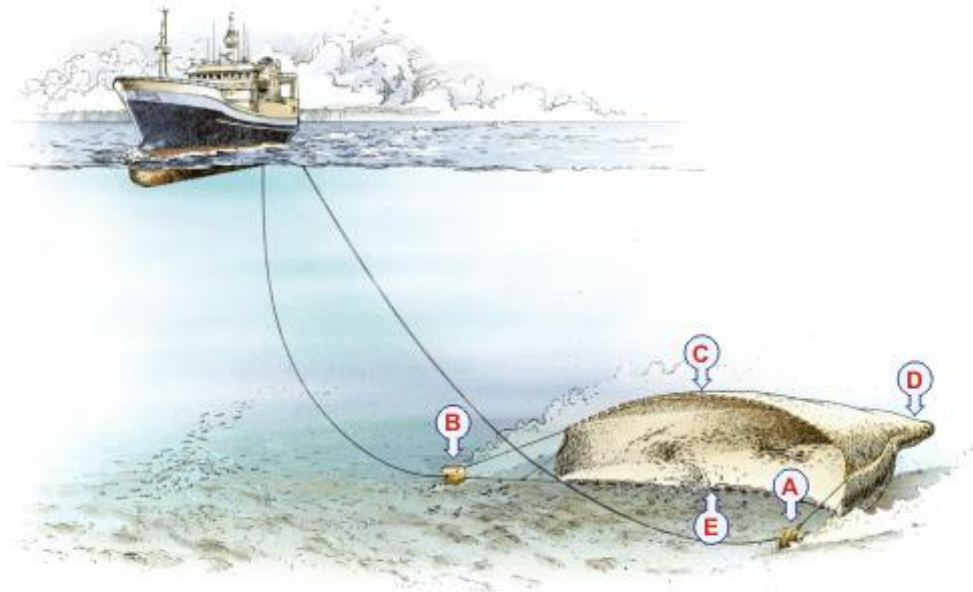


VMS



(CD012220-002)

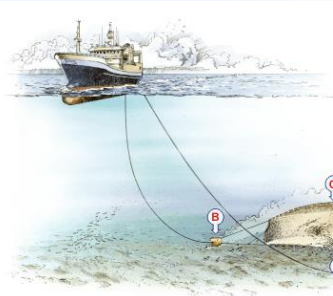
Stefanos Kavadas



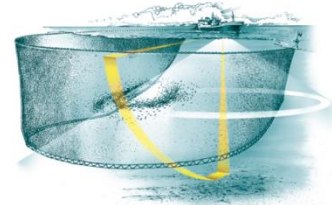
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Greek professional fishing fleet



294 trawlers



252 purse seines



15374 coastal fishing vessels

15920 total fishing vessels →
(according to the fleet register)

Reduction of the total fishing fleet in terms of:
number 28.21%
engine power (KW) 37.02%
GT 34.89%

All trawlers are equipped with VMS, while 225 purse seiners and a small number of coastal vessels have total length greater than 15 meters and therefore are equipped with VMS.



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VMS data, other supported data sets

VMS data are provided by the Hellenic Ministry of Mercantile Marine (following a procedure to request VMS data). VMS data are characterized as confidential, and only the results obtained from analysis of data may be published. The available data sets cover the period from October 2008 until today.

The Fisheries Data Center of the Institute of Marine Biological Resources and Inland Waters is responsible to host the raw data, evaluate, analyze and distribute the results of the analysis of VMS data producing maps or statistical tabulated matrices.



VMS data, other supported data sets

Moreover, a set of important data is used in the analysis process in order to extract the most precise estimates of fishing effort. These data refers to:

- fleet registry (characterized the fishing technique)
- legislation (for protected and periodically closed areas, distance from coast or allowed depth zones)
- bathymetry (to estimate fishing effort by depth zone)
- specific licenses given to fishing vessels for a period to target a fishery (tuna, sword fish, etc)
- environmental and meteorological data
- fisheries statistics data from official authorities
- Collected data sets in the framework of DCR and DCF



VMS structure, Software & Hardware platforms

Expand VMS structure (adding distance from coast, estimated depth)

Oracle RDBMS hosts VMS data

The main part of analysis is implemented under PLSQL (plan to transfer in Java/Phyton/R)

ArcGIS v10 is used for the visualization of the results

The Geonetwork and Geoserver are used to describe the metadata and serve the spatial data respectively



METHODOLOGY TO ANALYSE VMS DATA: ESTIMATION OF FISHING EFFORT FOR THE FLEET OF OPEN SEA FISHERY

For the analysis and construction of thematic maps, six steps were implemented:

1. quality control of VMS data,
2. identify groups of vessels with the same fishing strategy
3. characterize the signals as “fishing”, “steaming”
4. integration of fisheries legislation in order to define the allowed fishing grounds
5. estimation of fishing effort and spatial distribution of fishing fleet
6. mapping techniques



METHODOLOGY TO ANALYSE VMS data: ESTIMATION OF FISHING EFFORT FOR THE FLEET OF OPEN SEA FISHERY

Results

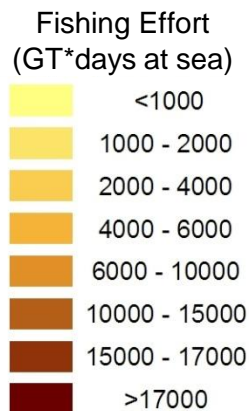
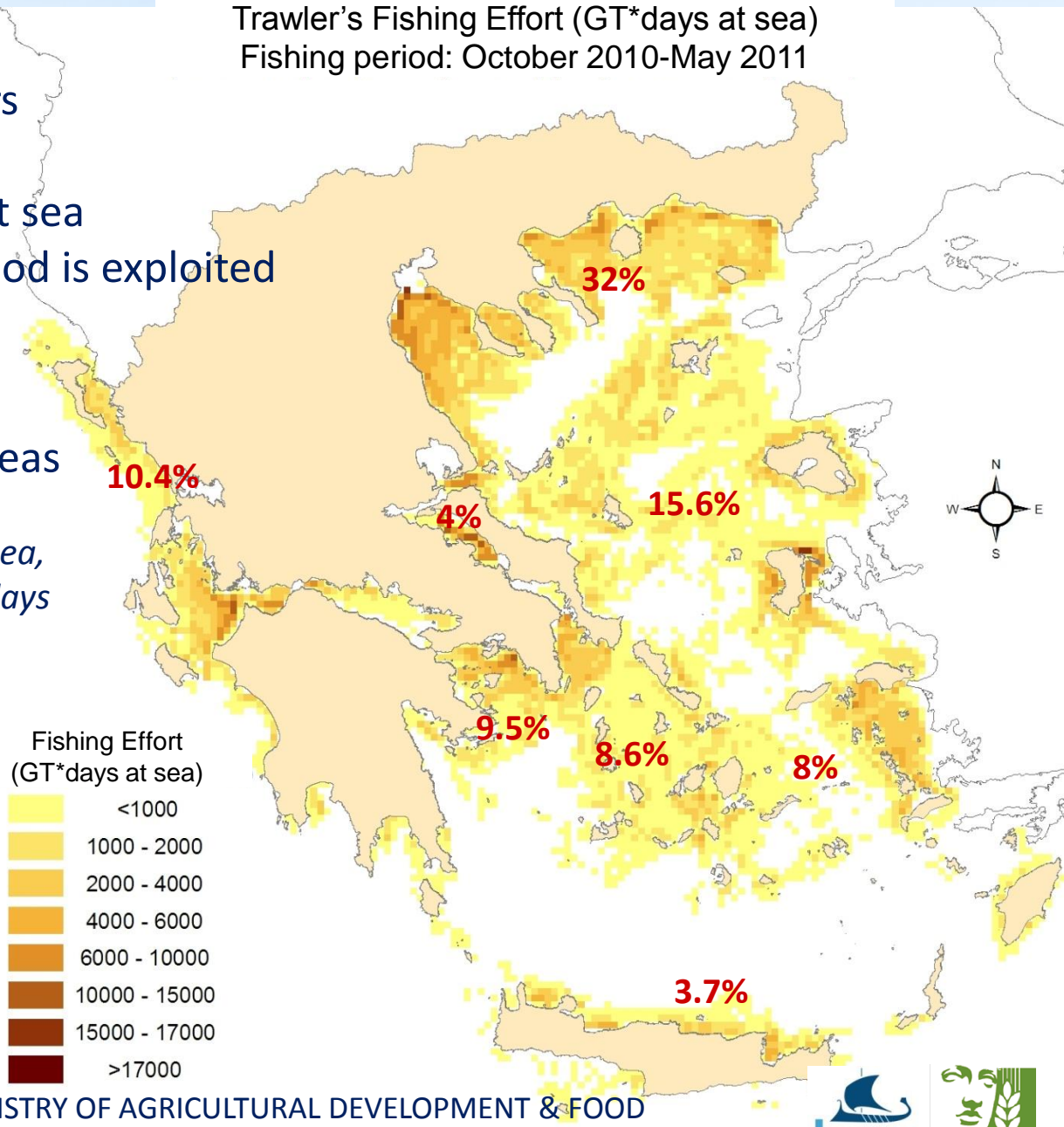
Cartographic maps of high resolution can be used to identify the fishing grounds of Greece, to estimate the fishing pressure and to study the spatial and temporal movement of the fishing fleet. The results of the analysis of VMS data, can be useful for the scientific community and for the fisheries administrators, giving the possibility to make predictions and scenarios to control the fishing effort, to elaborate management plans for the sustainability of stocks. Monthly and annual estimates of fishing effort were calculated. From the results, N. Aegean region is the most important fishing ground in the country, while it assembles the 32% of annual fishing effort of trawlers and 41.63% of purse seines. In the Aegean sea the fishing effort represents the 88.3% for the trawlers and 90.2% for the purse seines, while in Ionian sea the corresponding values are 11.7% and 9.8%.

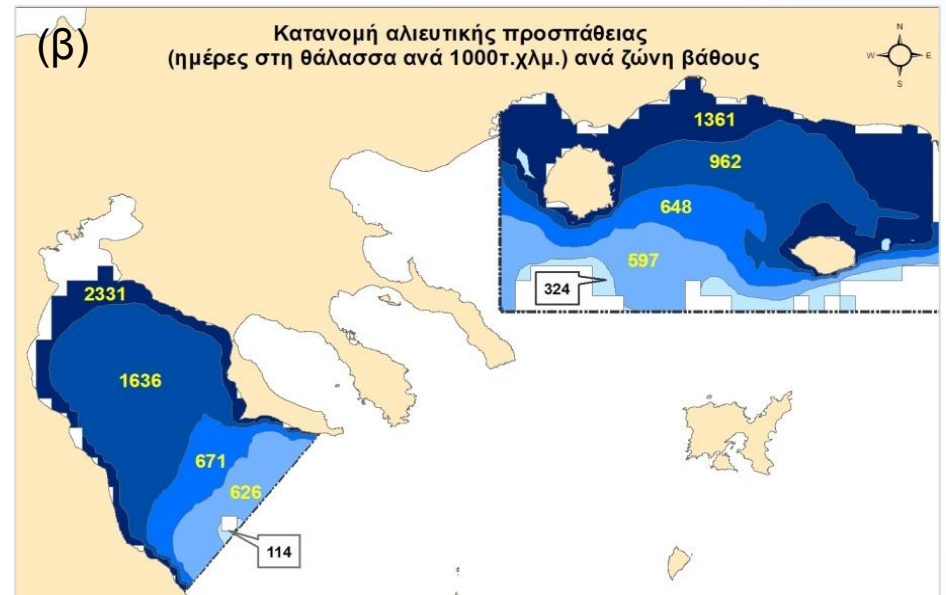
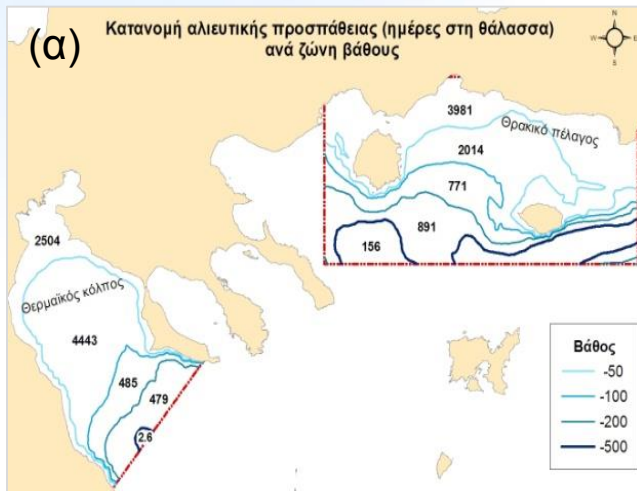


Trawler's Fishing Effort (GT*days at sea)
Fishing period: October 2010-May 2011

313 operating trawlers
51.770 days at sea,
5.278.916 GT*days at sea
72.32% of fishing period is exploited

Aegean: 277 trawlers,
Ionian: 62 trawlers,
29 trawlers in both areas
*80% of trawlers
were activated in Aegean Sea,
88.3% contribution in GT*days*



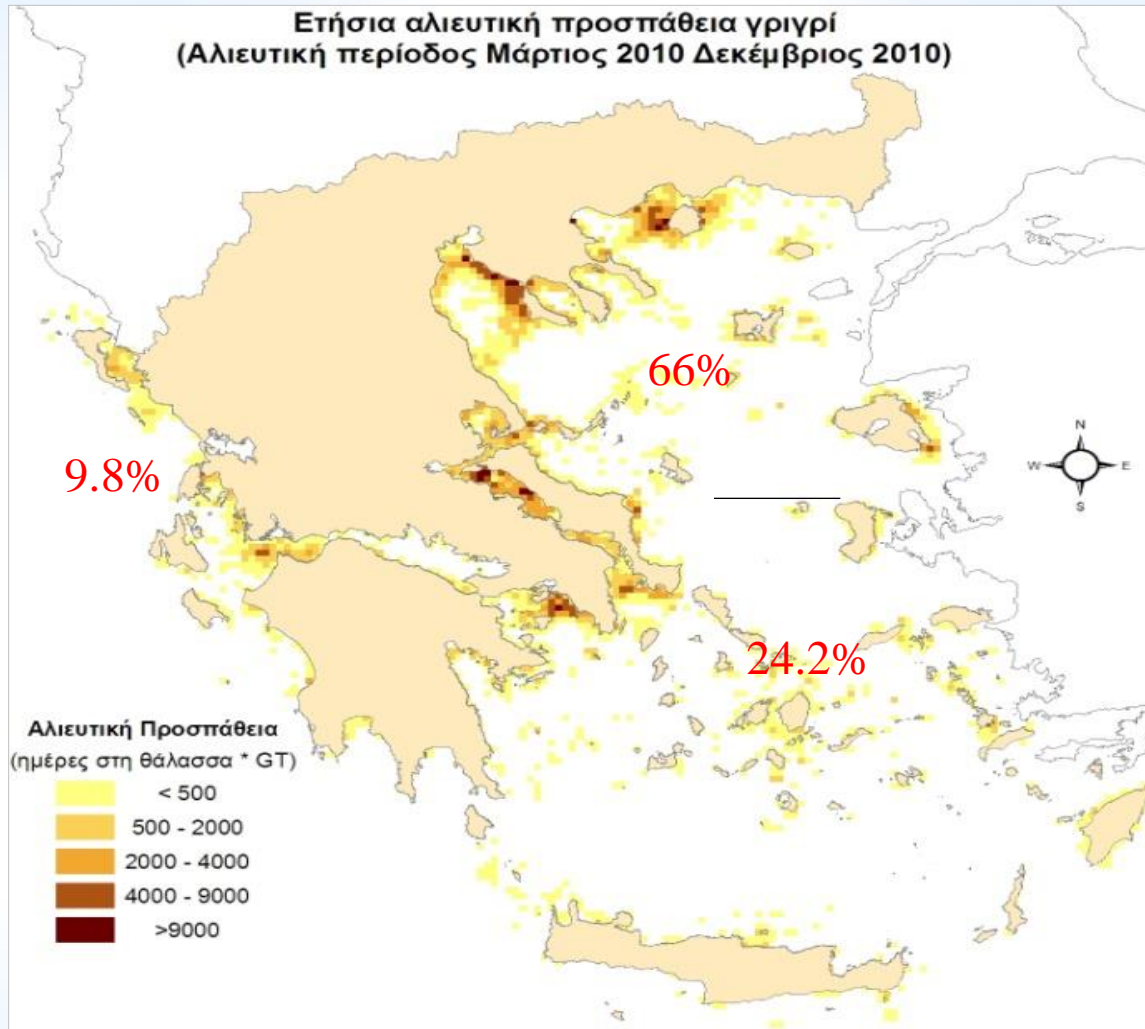


Fishing effort distribution by depth zone (α) and fishing effort expressed as days at sea by 1000 km² and depth zone (β).





Ετήσια αλιευτική προσπάθεια γριγκρί (Αλιευτική περίοδος Μάρτιος 2010 Δεκέμβριος 2010)



VMS data analysis for Scientific and Management purposes

USING VMS FISHING EFFORT ESTIMATES TO EVALUATE FISHERIES STATISTICS DATA: A CASE STUDY FOR THE NORTH AEGEAN SEA

Kavadas S., Maina I., Siapatis A.

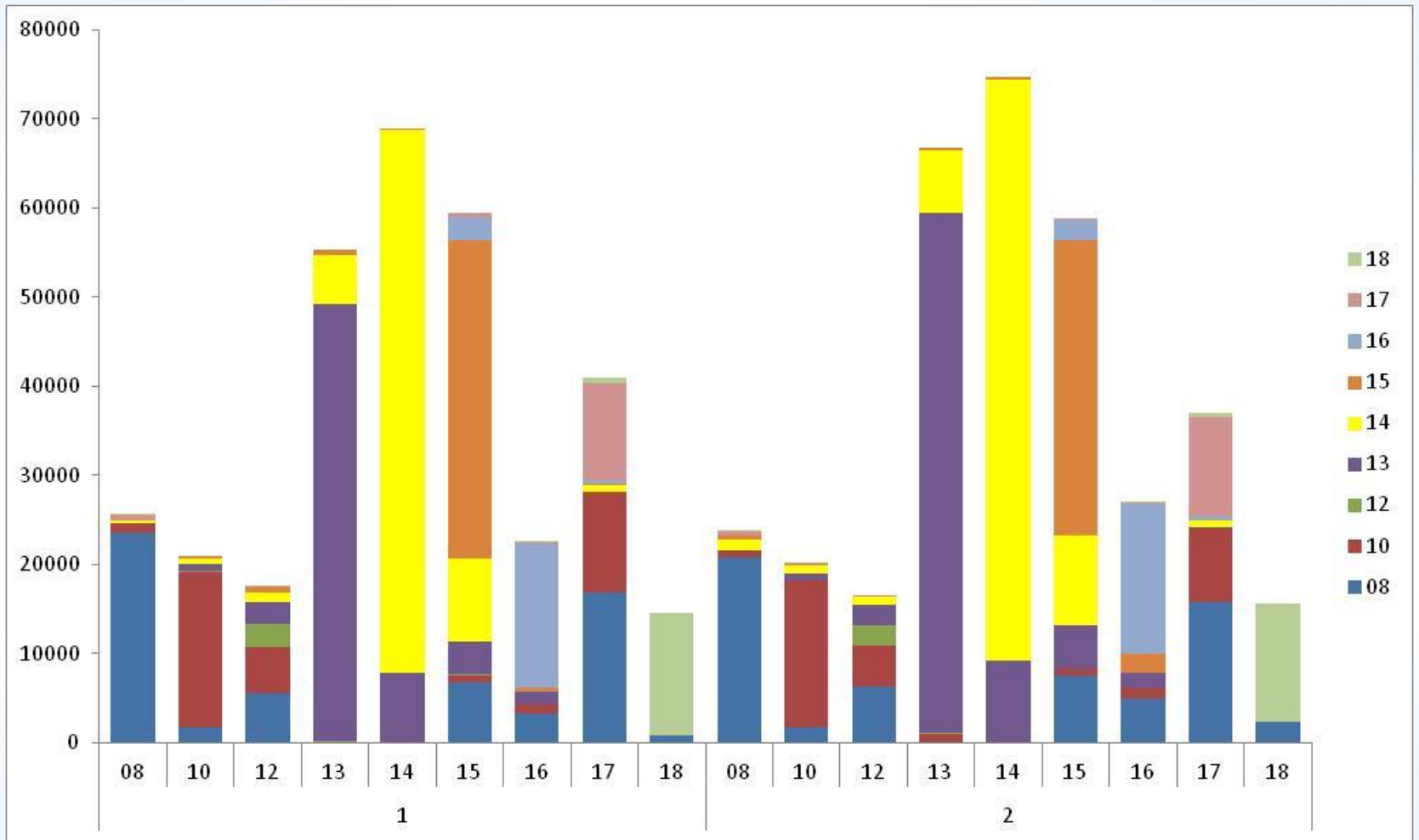
- How reliable are the estimated fishery data provided by the statistical authority?
- How the information from VMS data analysis can contribute for better estimates of catch quantities?

Hellenic Statistical Authority (EL.STAT) takes not into account migrations and movements of vessels between fishing areas

The study of migration pattern of trawlers (using VMS data) showed that a significant number of vessels operates also in other fishing areas

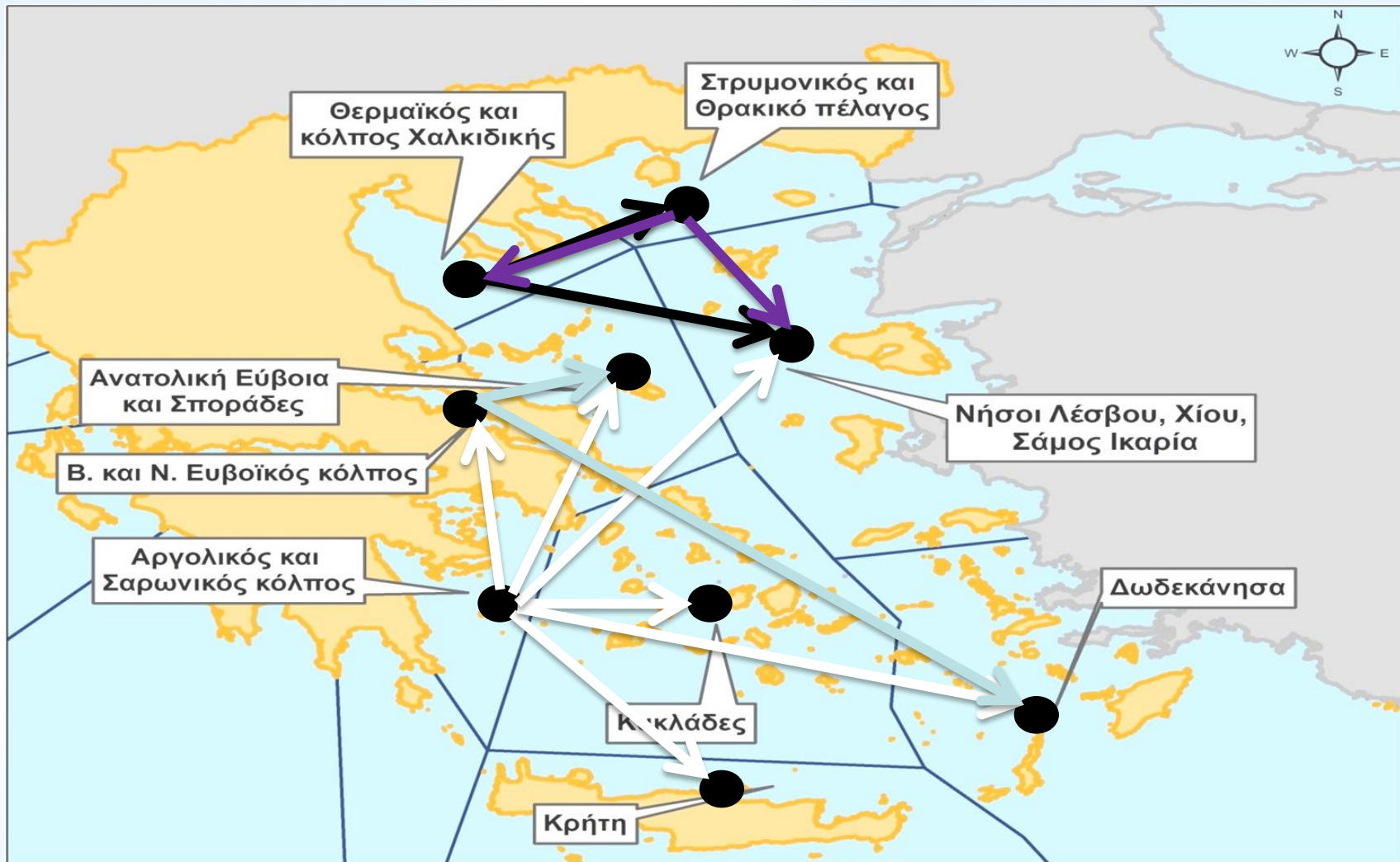
The fisheries production per fishing area estimated using the number of fishing vessels by registration port (in the extrapolation process)

Result: VMS data analysis can help for reliable estimates of fisheries production



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SPATIO-TEMPORAL PATTERNS OF FISHING PRESSURE ON BATHYMETRIC ZONES IN CENTRAL AND NORTH AEGEAN SEA USING VESSEL MONITORING SYSTEM DATA FOR OPEN SEA FISHERIES

Maina I., Kavadas S. , Dokos J.

Which bathymetric stratum is more heavily fished by trawlers and which by purse seiners?

Is it possible to recognize any spatial pattern with relevance?

The most fishable bathymetric stratum is:
<100m for trawlers and purse seiners

Spatial patterns with relevance:

Movement of the trawlers in deeper depth strata
(overexploitation, seasonal changes in environmental conditions)

High Fishing Pressure in depths <100m for purse seiners
(limited extend of pelagic species distribution in shallower waters)



Phd & Masters

Additionally, the Institute of Marine Biological Resources and Inland Waters supports Phd and MSc thesis in the VMS area of expertise.

Phd thesis:

Development of methodology for the analysis of data collected by the vessels monitoring system and the expected contribution to the sustainability of the fishery resources of Greece.

Responsible scientist: Stefanos Kavadas, Giorgos Tserpes.

PhD candidate: Irida Maina

MSc thesis: Determination of movement strategies of the purse seines fleet, correlated VMS data and environmental parameters.

Responsible scientist: Stefanos Kavadas, Athanasios Machias

MSc candidate: Alexandros Karambatos



quality control of VMS data

Remove or modify signals :

- Missing value(s)
- Incorrect location
- Repeated (same location, same time)
- Vessel speed
- Date



identify groups of vessels with the same fishing strategy

- The fishing fleet was grouped according to DCR/DCF by the main gear
- Special license given for a specific period was under consideration (trawlers in international waters, vessels for tuna)
- Polyvalent in the period June-September can activate as purse seine
- During the close period of purse seines, we can identify vessels to fish. This means that these vessels have a second license, so they characterized according to second license



METHODOLOGY TO ANALYSE VMS DATA: ESTIMATION OF FISHING EFFORT FOR THE FLEET OF OPEN SEA FISHERY

Methodology to estimate the fishing effort by cell (a user define cellsize)

Assumptions: The signals are characterized as “fish”

(a) Each group of signals spatially joined to the related cell (for ex. 1x1 km)

(b) Calculate the number of signals (p) per vessel (v) and day (d)

(c) Calculate the number of signals per cell (c), vessel and day

(d) Allocate weight in each cell per vessel and day. The resulting value is multiplied by tonnage (GT) and power engine (KW)

(e) Calculate the fishing effort per cell

$$T_{v,d} = \text{count}(p_{v,d})$$

$$T_{c,v,d} = \text{count}(p_{c,v,d})$$

$$E_{c,v,d} = T_{v,d,c} / T_{v,d} (\leq 1)$$

$$\sum E_{c,v,d} = 1 \text{ (μία ΗΘ)}$$

$$G_{c,v,d} = E_{c,v,d} * GT_v$$

$$W_{c,v,d} = E_{c,v,d} * KW_v$$

$$DS_c = \sum_v \sum_d E_{c,v,d}$$

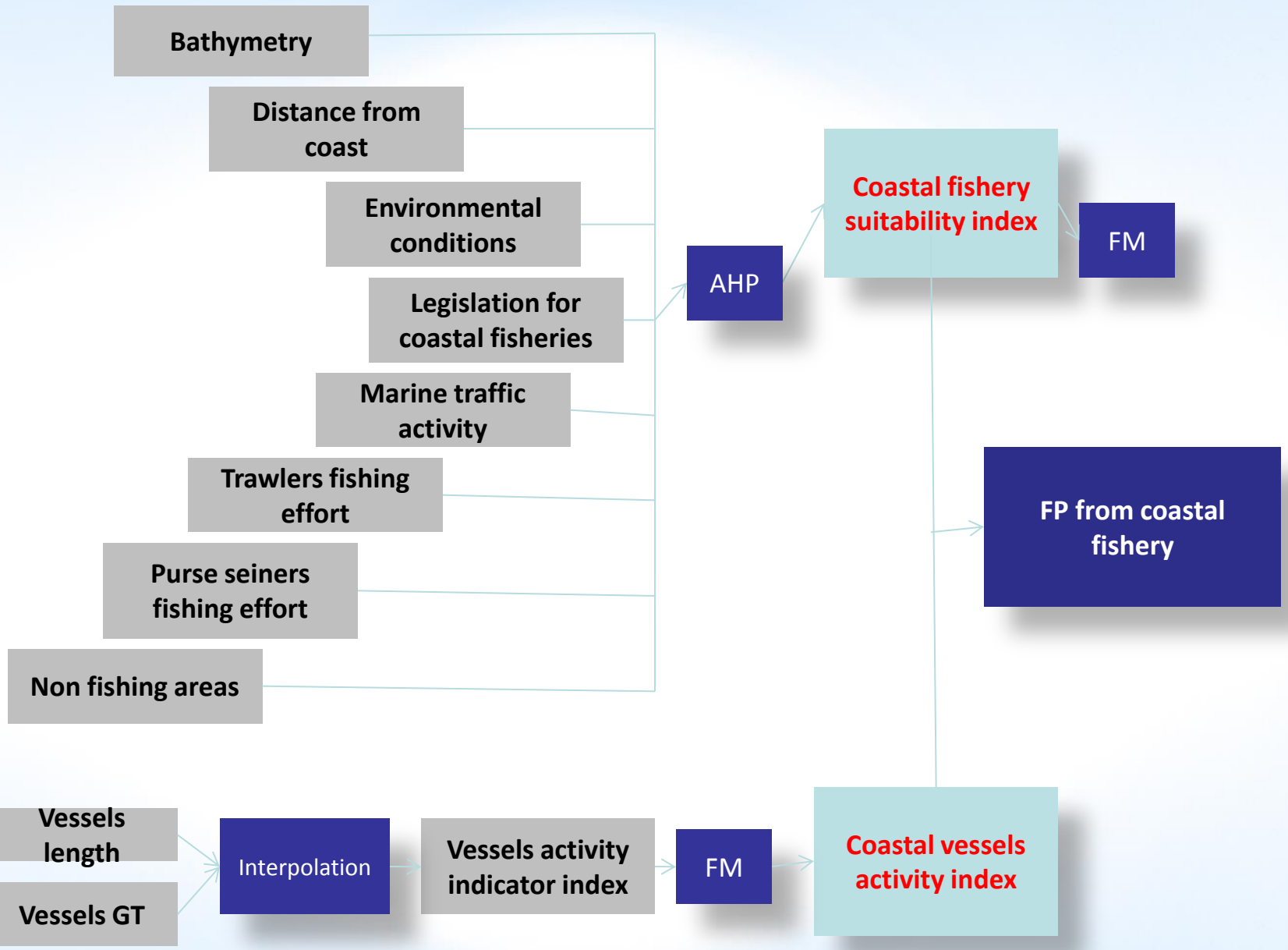
$$GTD_c = \sum_v \sum_d G_{c,v,d}$$

$$KWD_c = \sum_v \sum_d W_{c,v,d}$$

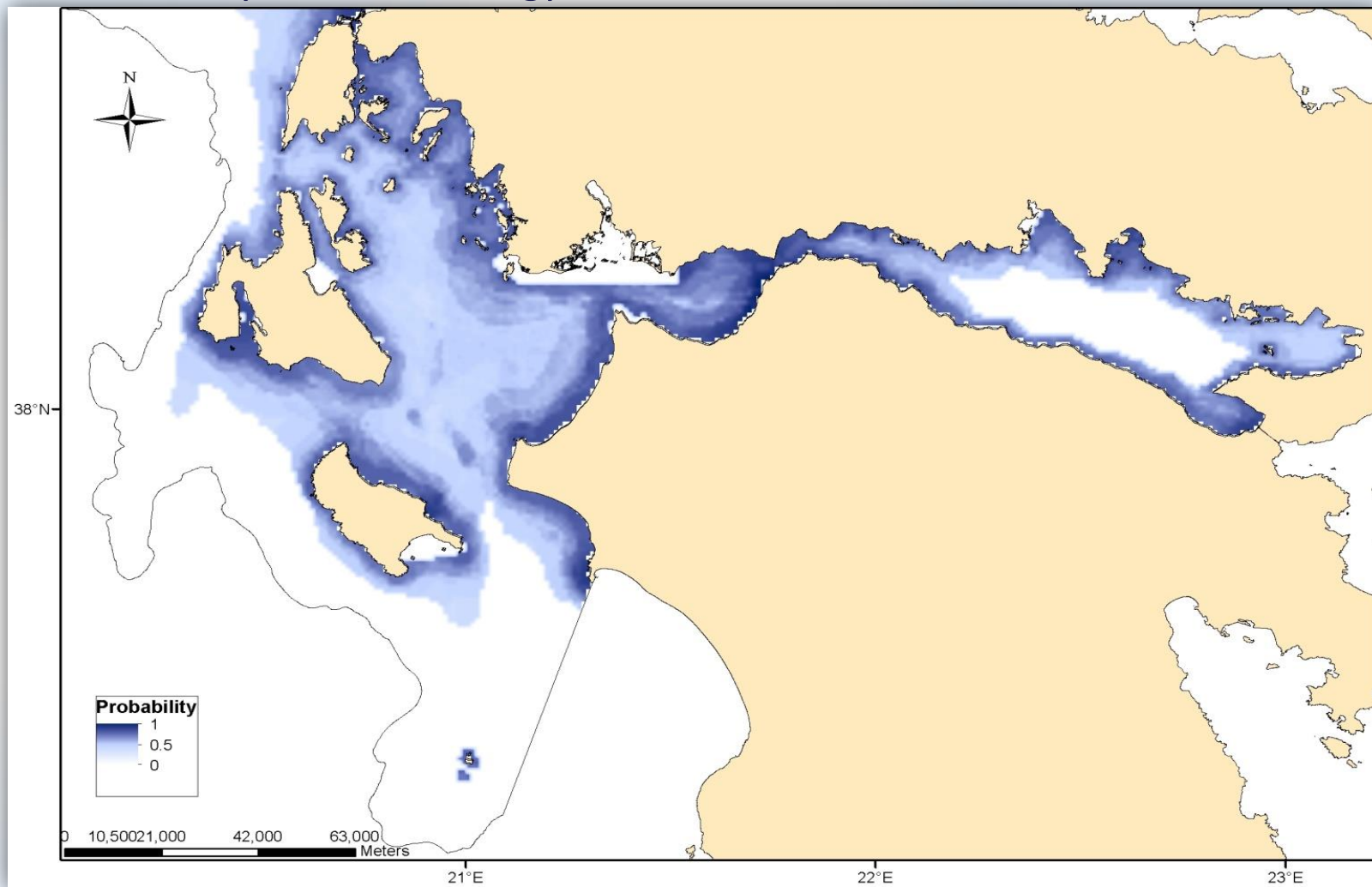
¹ GT, Gross tonnage

² kW, Kilowatt





Fishing pressure index from artisanal fishery based on a multi-criteria decision analysis methodology



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In Greece there is satisfactory implementation of the EU MCS and its provisions. It can be mentioned for example, the VMS, AIS and the recording and monitoring of fishing activities and landings. Monitoring and inspection is highly systematic and covers 100% the blue-fin tuna fishery which is under a recovery plan



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