Fishing vessels as scientific platforms
or
Ignore fishermen's engagement and miss the (additional) scientific platform

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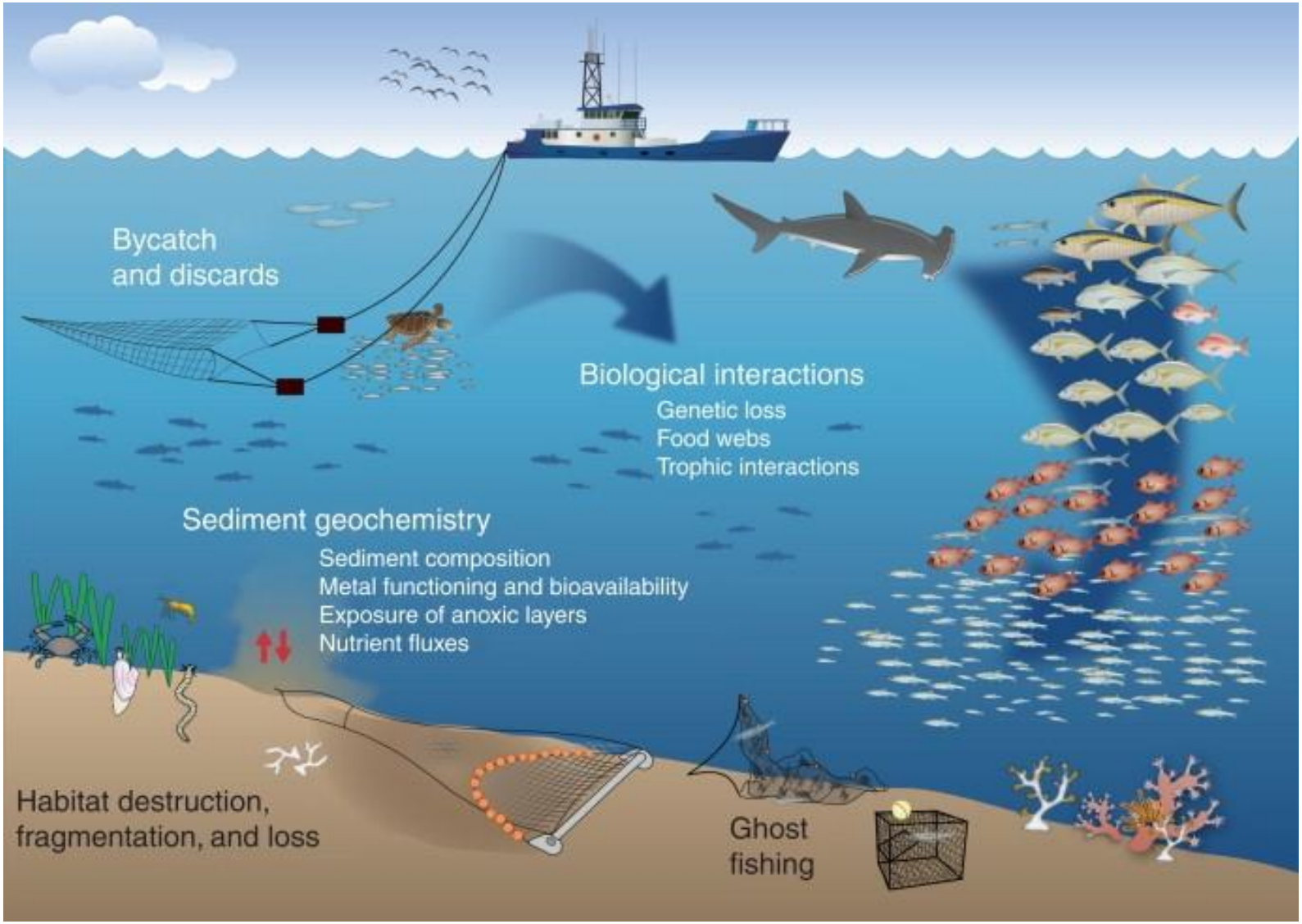
EFARO– "Smart data collection for the future monitoring of the sea" - Brussels, May 17th, 2017

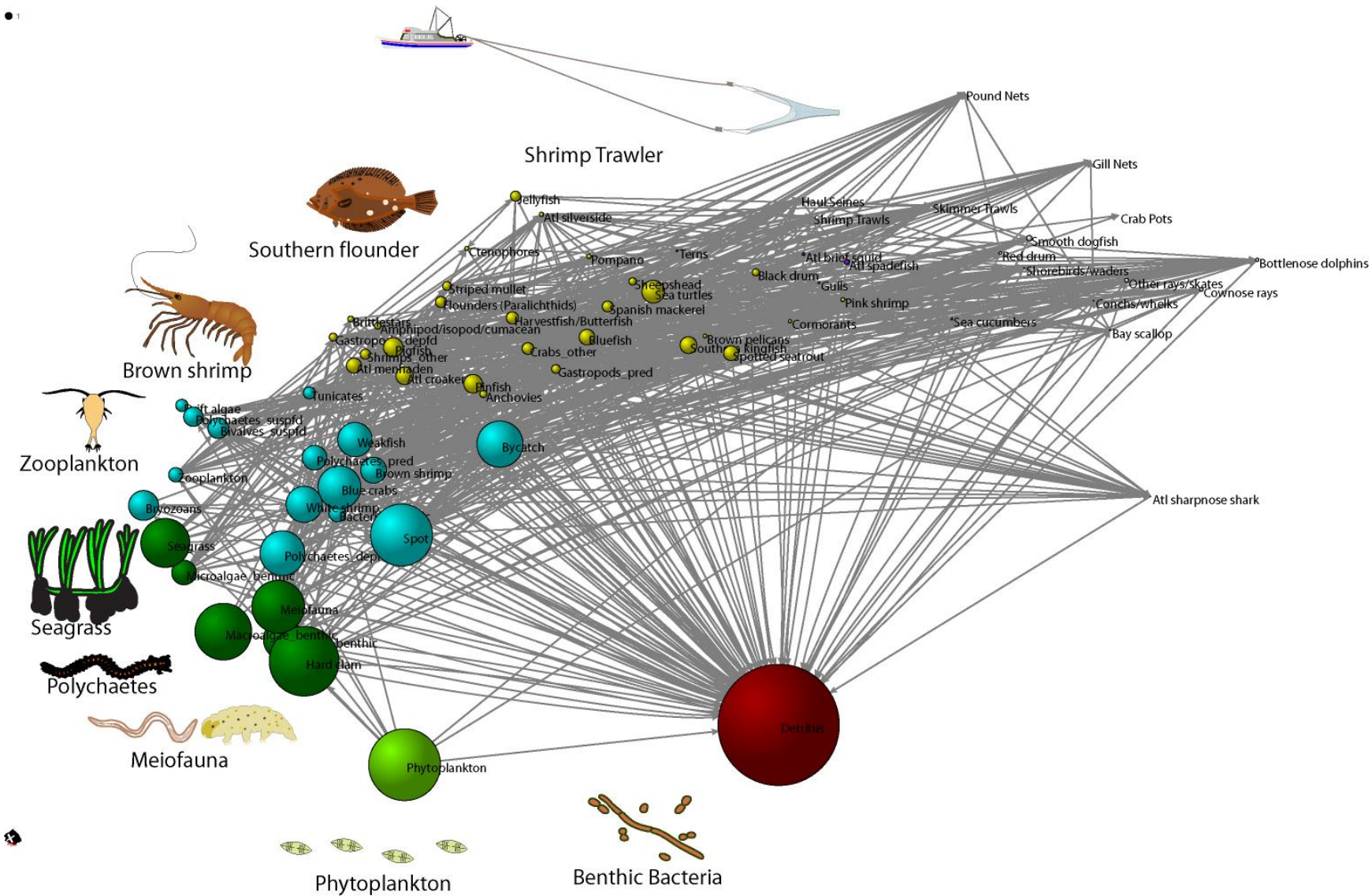
Outline of the talk

- From single stock to ecosystem approach: science, policy drivers and data gaps
- Fishing vessels as scientific platforms: examples, pros and cons
- Fostering the use of FVs as scientific platform

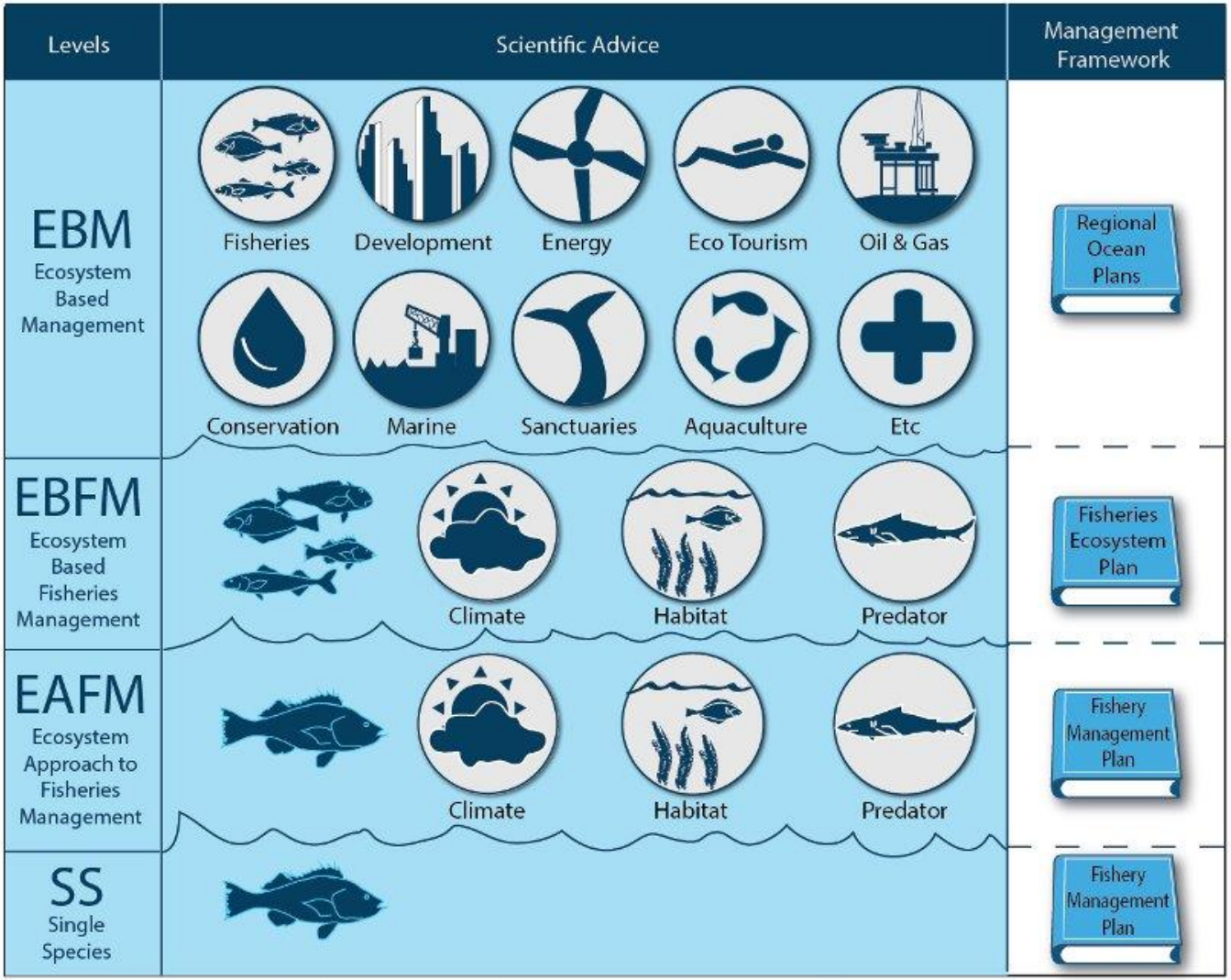
The impact of fishing goes beyond target species



Single stocks interacts with other stocks, ecosystem components and drivers



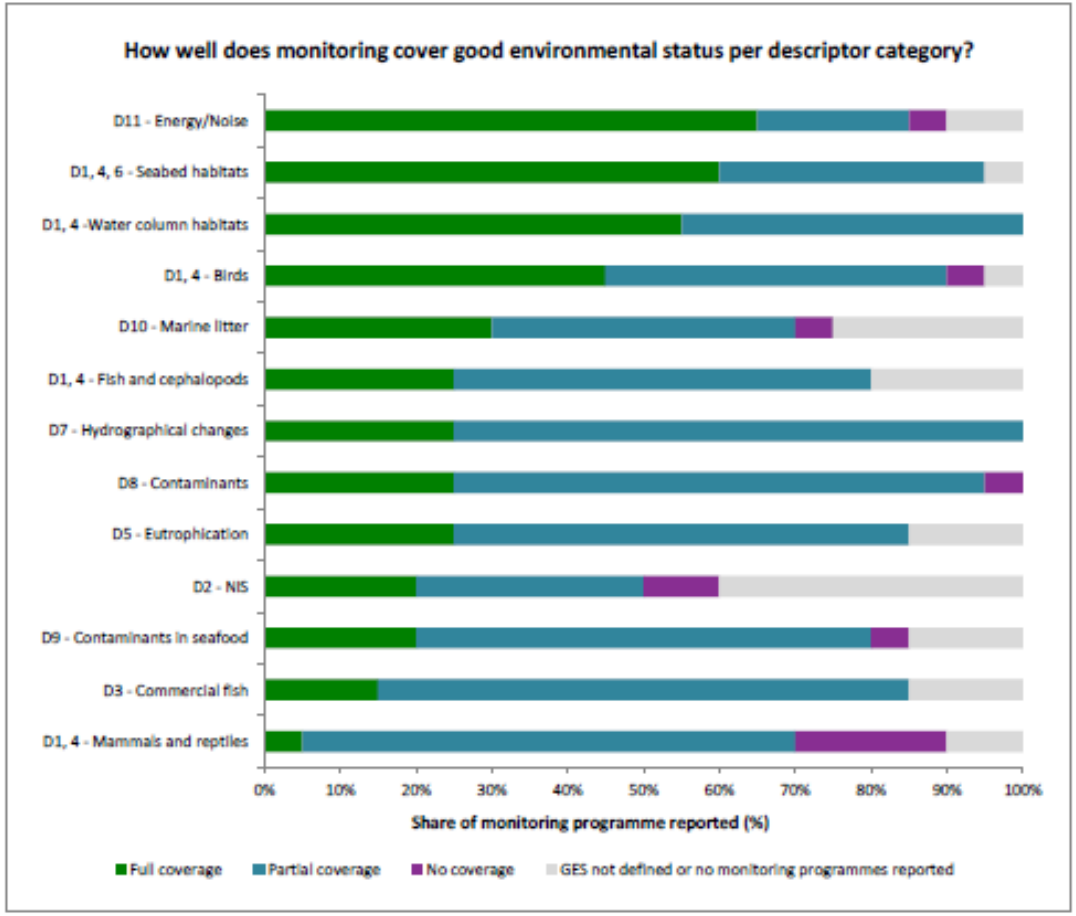
Oceans should be managed according to an EBM

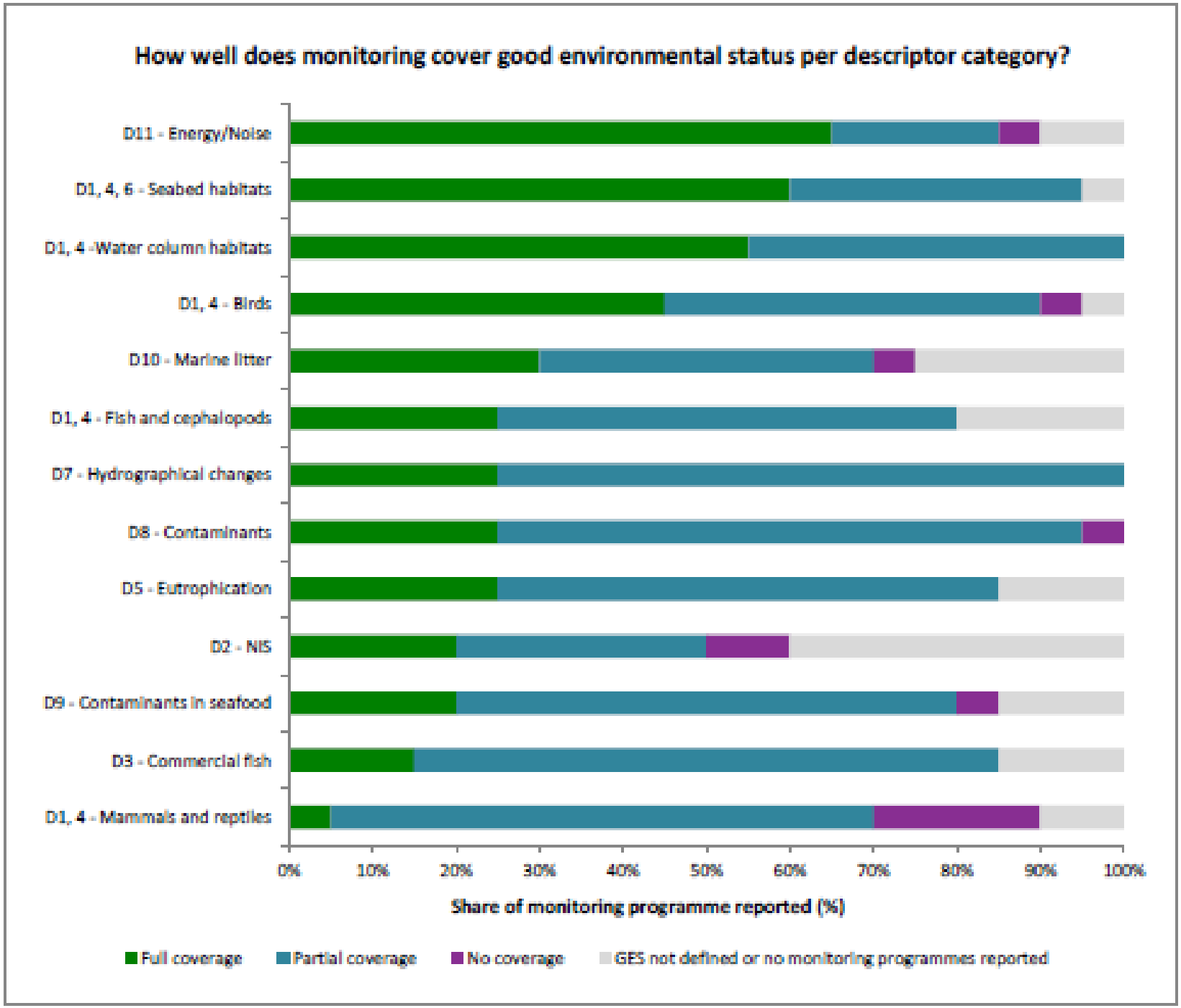


EU Marine Policies are driving the increase in data requirement for monitoring

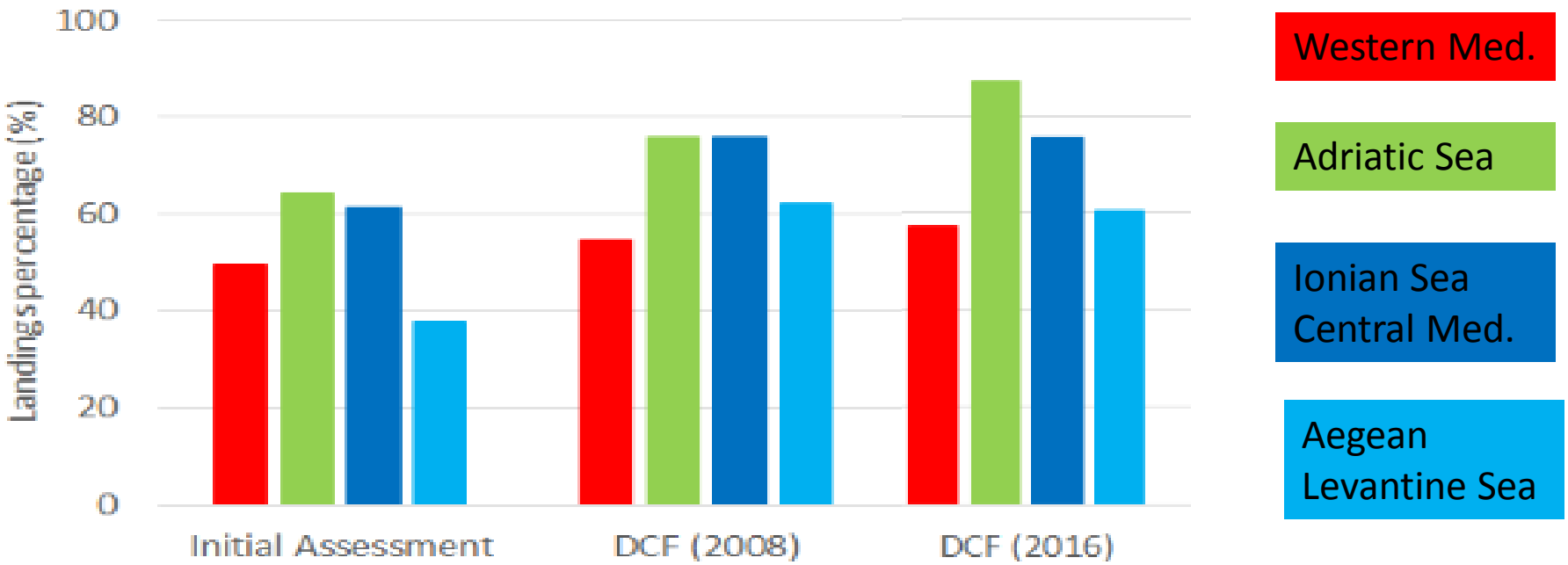
- Refomed CFP (2013) (e.g. data in support of LTMP, Landings obligations, FRA setting, etc.)
- Marine Strategy Framework Directive (2008) (i.e. in relation to 11 Descriptors, in particular 1, 3, 4, 6)
- Maritime Spatial Planning (2014)
- Blue Growth

Member States' monitoring programmes under the MSFD will mainly ensure only partial coverage of GES (COM(2017) {SWD(2017) 1 final})




How well does monitoring cover good environmental status per descriptor category?
D11 - Energy/Noise
D1, 4, 6 - Seabed habitats
D1, 4 -Water column habitats
D1, 4 - Birds
D10 - Marine litter
D1, 4 - Fish and cephalopods
D7 - Hydrographical changes
D8 - Contaminants
D5 - Eutrophication
D2 - NIS
D9 - Contaminants in seafood
D3 - Commercial fish
D1, 4 - Mammals and reptiles
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Share of monitoring programme reported (%)
Full coverage
Partial coverage
No coverage
GES not defined or no monitoring programmes reported

DCF provides data for assessing large share of landings also within MSFD



However, in some areas (e.g. Med) the coverage is still not optimal (and only a portion of data have been used in MSFD Initial Assessment)

Raicevich et al. (under revision - Frontiers in Marine Science)

Data requirement includes –among others

DCF/CFP

- Data in support of SA and LTMP (biological parameters, catches, discards, etc.)
- Spatio-temporal data
- SSF characterization

MSFD/MSP

- Fish fauna
- Benthic fauna/habitats
- Endangered species
- Oceanographic data
- Litter
- Noise

Within several reports and documents (ICES, 2013; JRC, 2014), data needs and monitoring platforms have been investigated. However, fishing vessels are most often not considered or their contribution is underestimated.

Cons

- Fishery dependent spatial distribution
- Difficult standardization of data
- Needs targeted techinical development
- Not all FVs are suitable as Scientific Platforms

Pros

- Cheap platform
- (Almost) Widespread spatial distribution
- Optimal platform to assess fishing impact
- May entails benefting from fishers' experience based knolwedge

FVs are already used for collecting data within established monitoring programmes

- Daily records on catches/discards (i.e. log-book) – By Fishers
- Position (VMS, AIS) – CCTV – Authomatic recording
- Catches, biol. param.; threatened species, etc. – By Observers

Some examples of applications

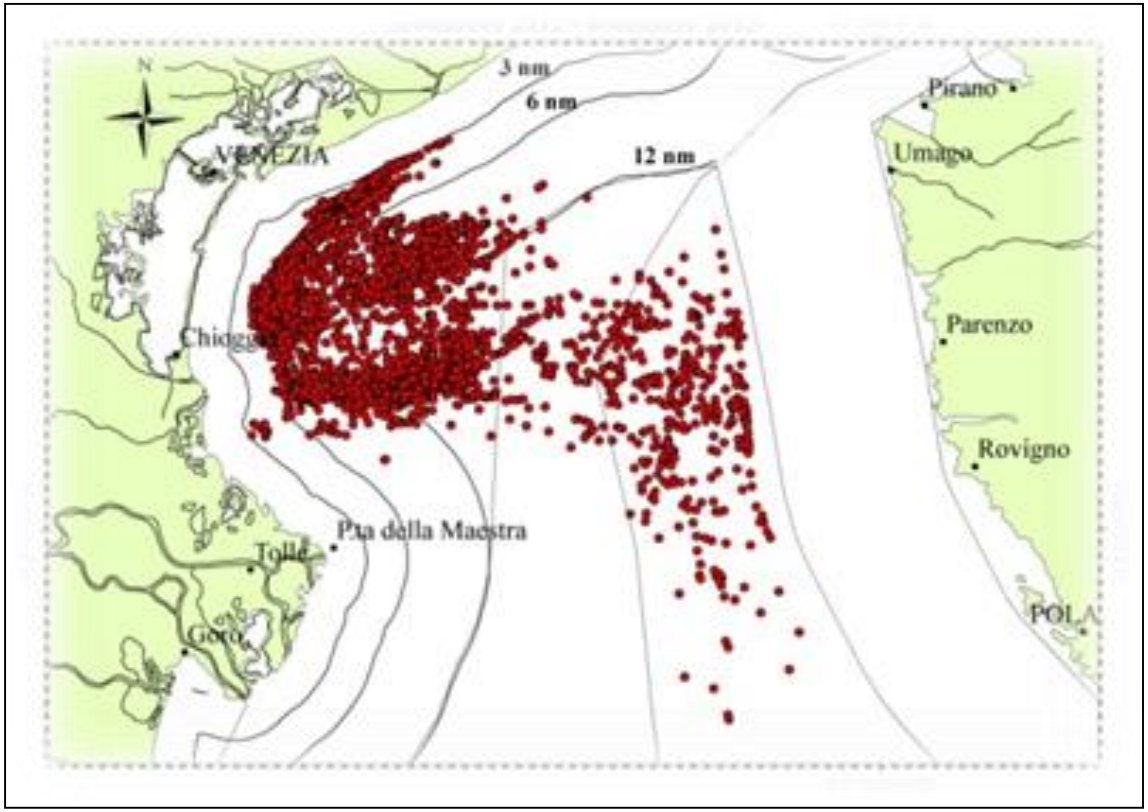
Contents lists available at ScienceDirect

Regional Studies in Marine Science

journal homepage: www.elsevier.com/locate/rsma

Collection and validation of self-sampled e-logbook data in a Mediterranean demersal trawl fishery

Monica Mion [a], Camilla Piras [a], Tomaso Fortibuoni [a], Igor Celić [a,b,c], Gianluca Franceschini [a], Otello Giovanardi [a,d], Andrea Belardinelli [d], Michela Martinelli [d], Saša Raicevich [a,d,*]



- 5 FFVV
- 8 monitored species (selected by fishermen)
- 4800 hauls in 1 year

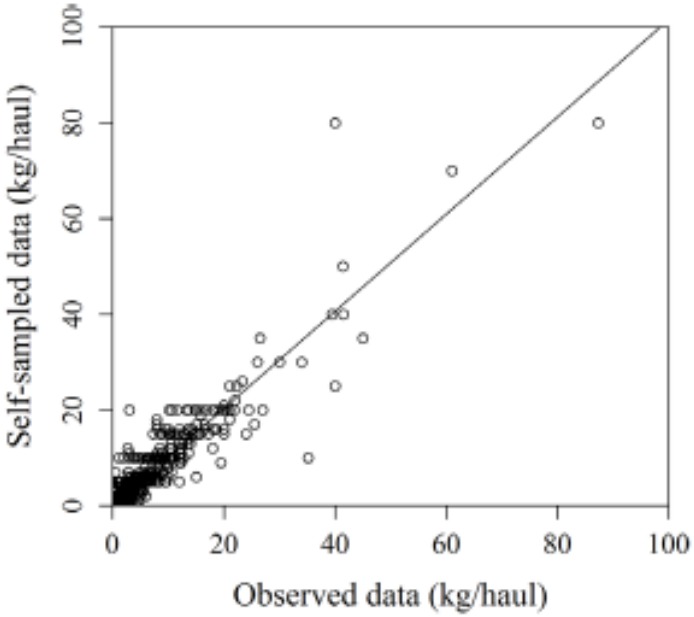
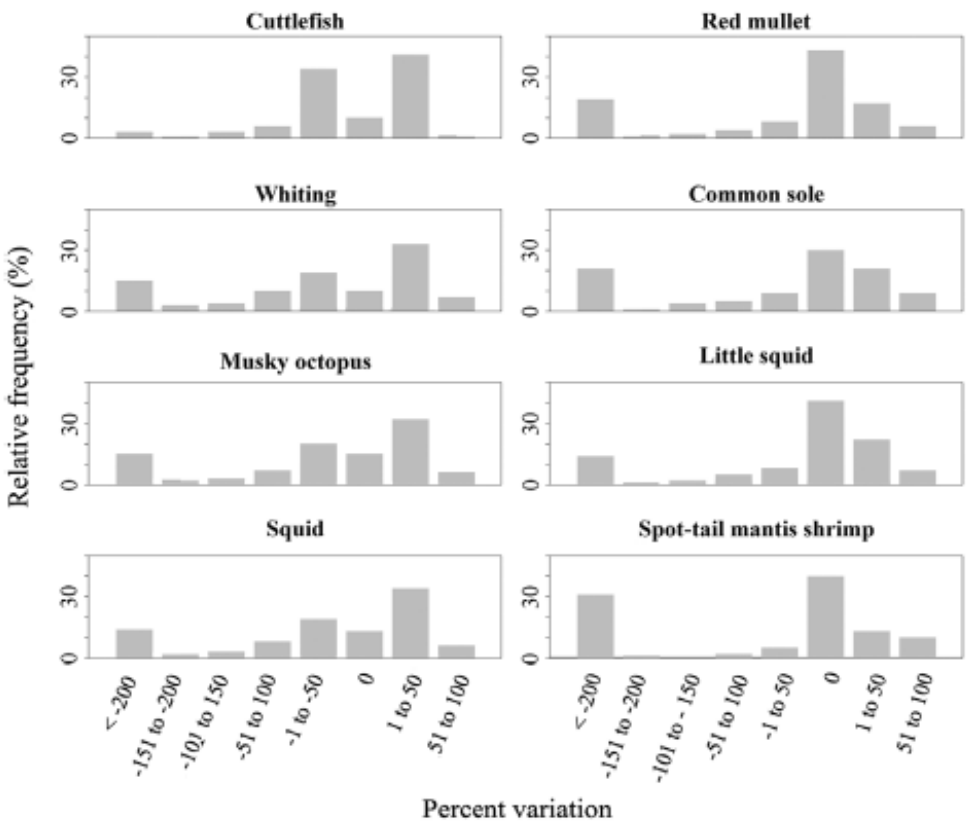
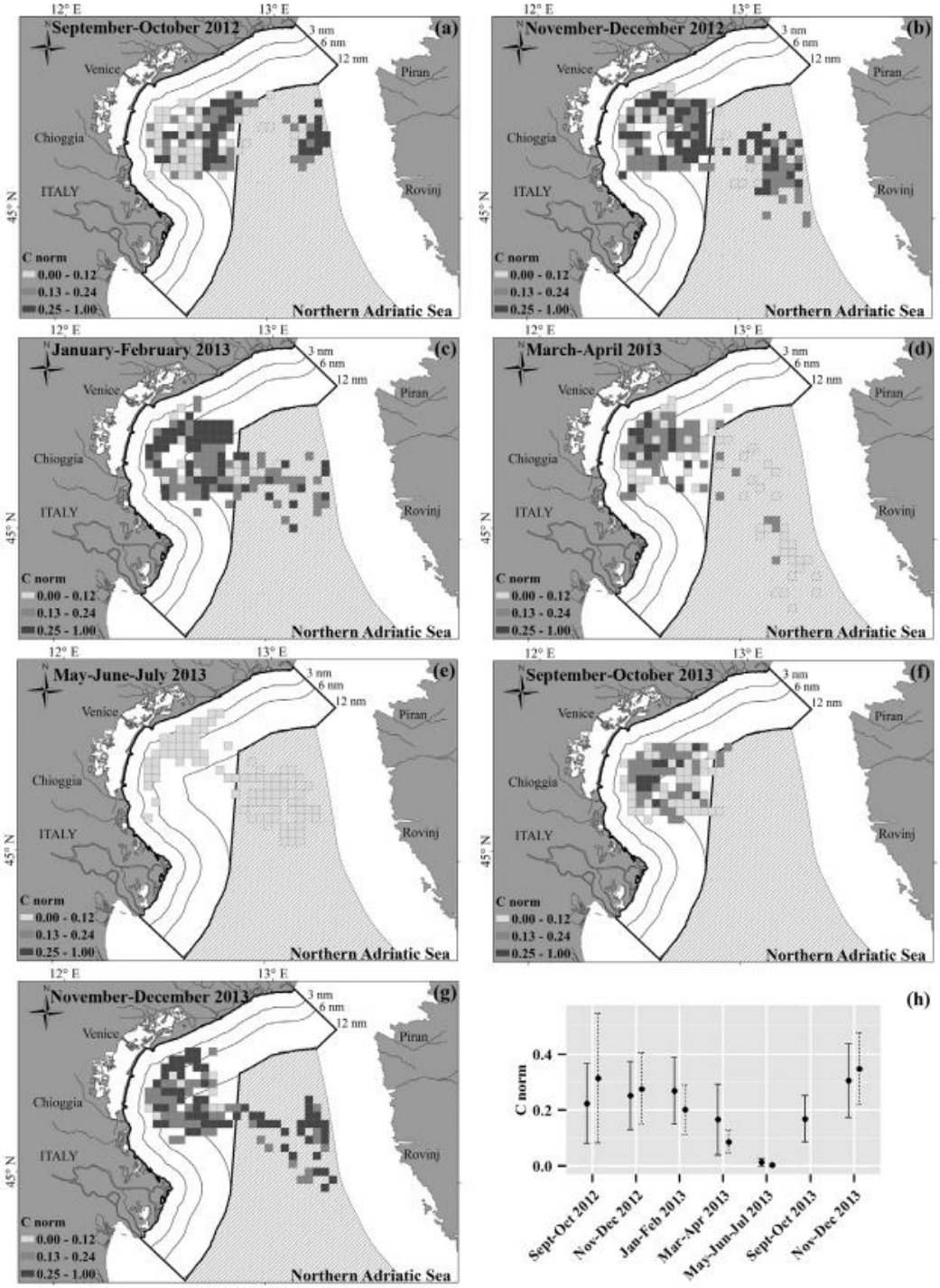


Fig. 3. Relationship between self-sampled and observed data (kg/haul). Linear regression forced through the origin. Regression parameters are $\beta_0 = 0.00$; $\beta_1 = 1.00$ (95%CI [0.98–1.01]); $R^2 = 0.93$; $n = 1992$.

Self-sampled data match independent data from observers

Considering daily catches (as in official logbooks) may introduce high bias in estimated CPUE at high spatial resolution





This approach allows reconstructing spatio-temporal distribution and migration of target species

Contents lists available at ScienceDirect

Fisheries Research

journal homepage: www.elsevier.com/locate/fishres

A photographic method to identify benthic assemblages based on demersal trawler discards

Camilla Piras[a], Monica Mion[a], Tomaso Fortibuoni[a], Gianluca Franceschini[a], Elisa Punzo[b], Pierluigi Strafella[b], Marija Despalatović[c], Ivan Cvitković[c], Saša Raicevich[a,b,*]

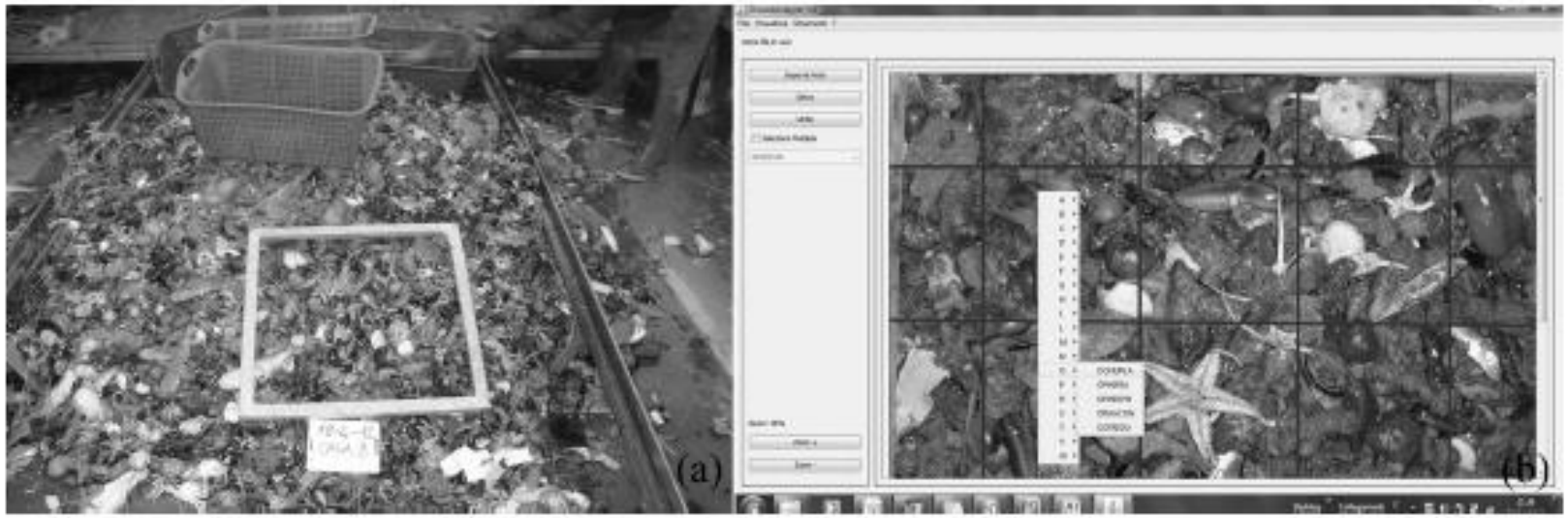


Fig. 2. Square-shaped frame (0.5 × 0.5 m) used to collect discard pictures (a) and a screenshot from Discard Analyzer 1.0 (b).

Pictures: 0.5*0.5 (quadrat) – 3 pictures/sample
Benthos collection and analyses (10-20 kg/sample)
107 sampling stations in total

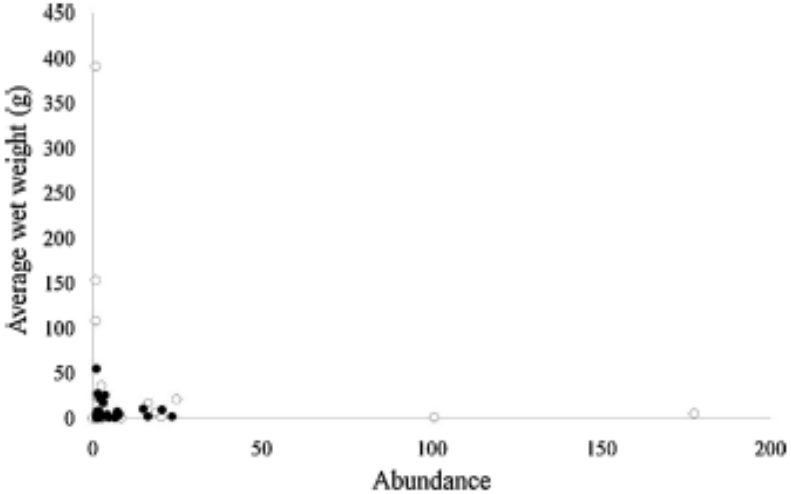


Fig. 4. Relationship between the average biomass (wet weight; g) and abundance: ○ = species detected by both the photographic and laboratory methods; ● = species not detected by the photographic method.

Low abundance/small size species are underestimated

There is a high agreement on benthic assemblage spatial repartition between photographic and «traditional» methods.

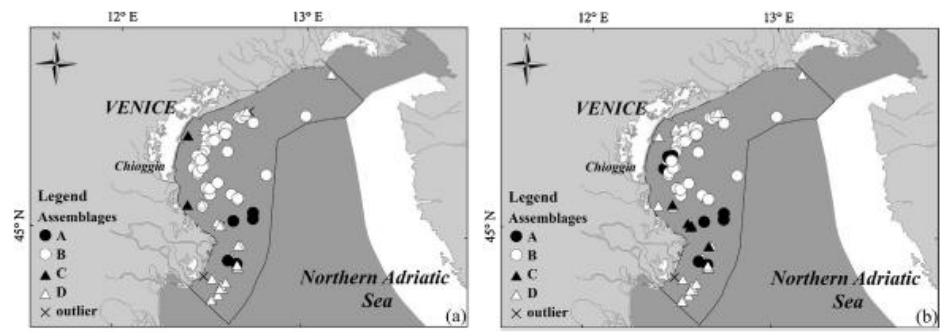


Fig. 6. Spatial distribution of assemblages classified at the local spatial scale according to cluster analysis (group average) performed on abundance data (% transformed) estimated by the laboratory (a) and photographic (b) methods.

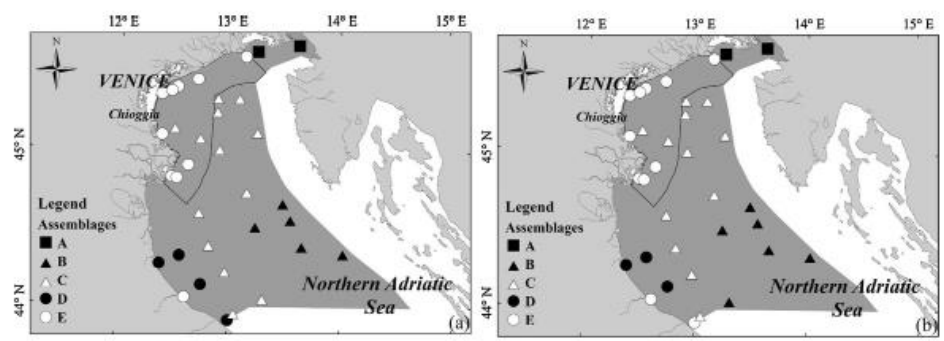


Fig. 7. Spatial distribution of assemblages classified at the regional scale by cluster analysis (group average) performed on the abundance data (% transformed) obtained using the laboratory (a) and photographic (b) methods.

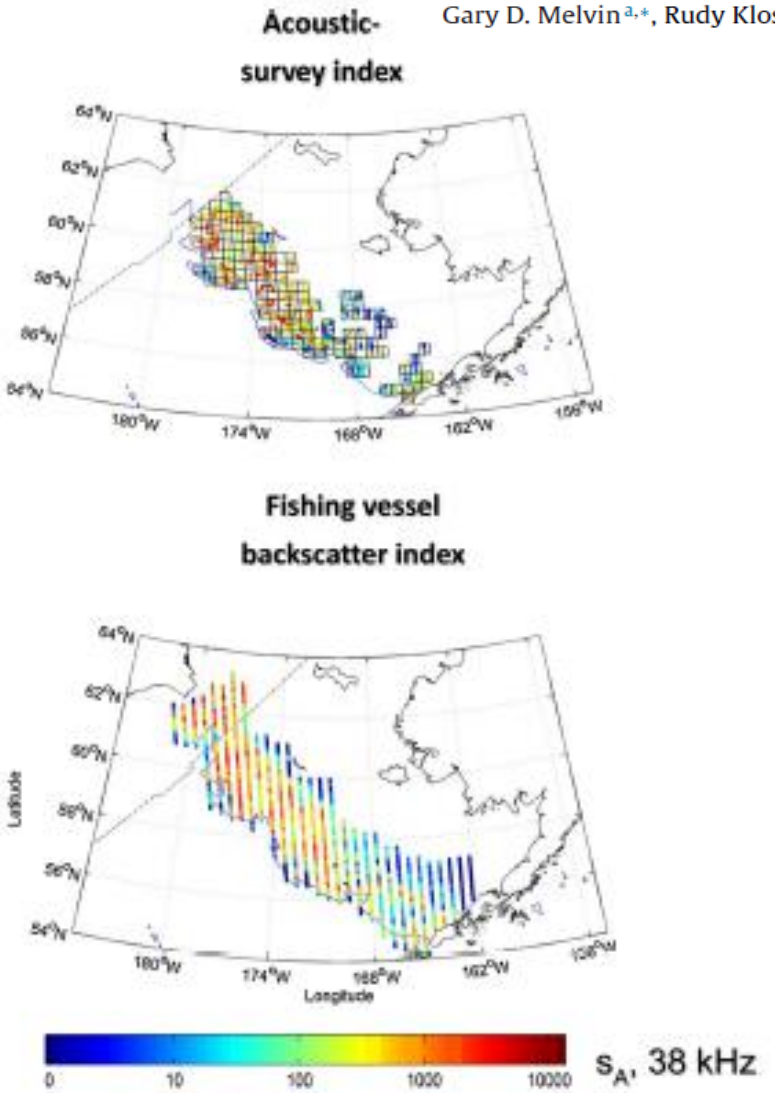
Contents lists available at ScienceDirect

Fisheries Research

journal homepage: www.elsevier.com/locate/fishres

The adaptation of acoustic data from commercial fishing vessels in resource assessment and ecosystem monitoring

Gary D. Melvin[a,*], Rudy Kloser[b], Taina Honkalehto[c]



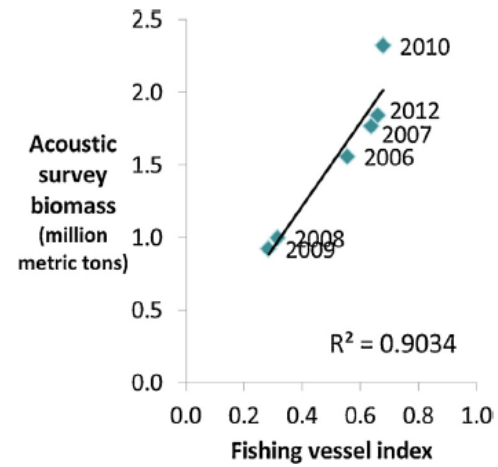


Fig. 5. Regression of acoustic-trawl survey biomass (million metric tons) on the fishing vessel backscatter index value (2006–2012).
(modified from Honkalehto et al., 2014)

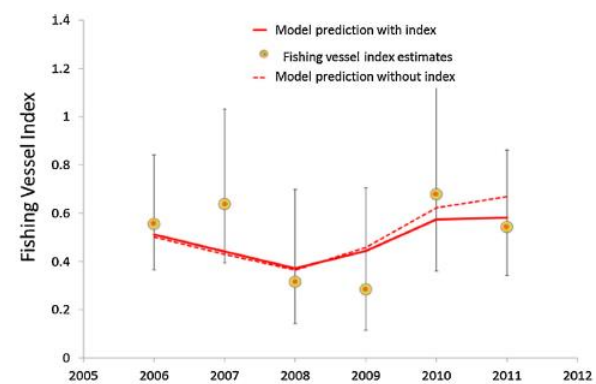


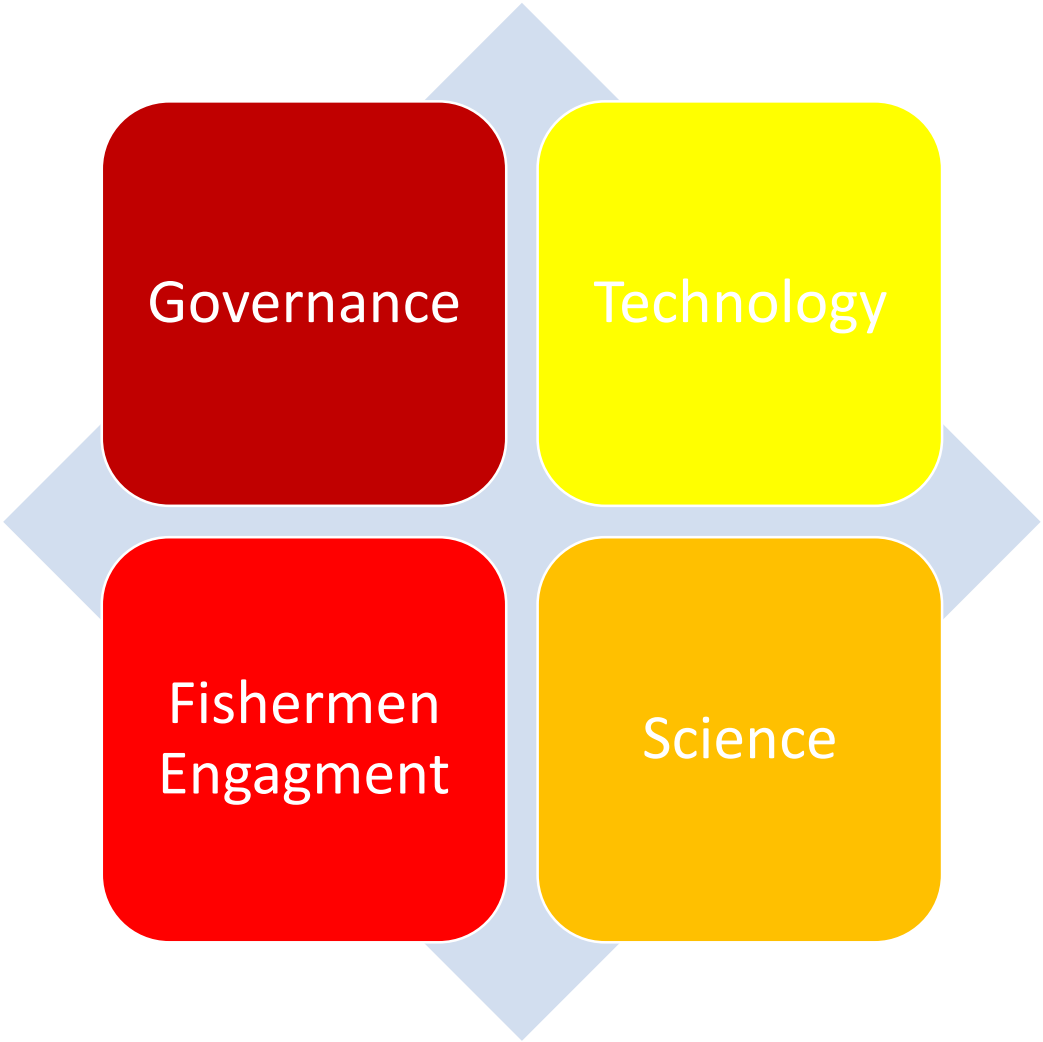
Fig. 6. Stock assessment model predicted pollock biomass with and without the new fishing vessel index (2006–2011). Note that the assessment model prediction is a simultaneous fit to the fishing vessel index as well as several other sources of abundance data which are not shown here.
(modified from Ianelli et al., 2011)

Quality of data increases with increased intervention on FV and their fishing strategies

Table 1
Summary of fishing vessel level interventions and the potential benefits to scientific data collection.

Intervention	None	Low	Medium	Large
Technology	No calibration, data of limited benefit for presence and absence of scatterers only, assumes data is collected digitally with no input to user settings	Calibration of echosounder and digital collection of the data on the available frequencies-provides the minimal requirements for data use	As low but running the echosounders on prescribed settings and recording data to the appropriate depths and minimising interference from other instruments *etc*	Modify or manufacture the vessel to have low noise, multi or broadband frequency with scientific grade echosounders, special modifications to improve data quality-with gondolas or drop keels
Data quality and processing	Qualitative and limited	Comparison between vessels and depending on acoustic noise provides quantitative data for scientific use, opportunistic observations	Data can be fully utilised and worked into regional and global data bases	Provides data of high scientific quality with low cost of analysis and maximum benefit for uptake with multi-frequency or broad band species allocation methods
Survey strategy	None	Minimal	Survey design for all phases depending upon the gear type	Same as medium intervention
Fishing trip-transit	Provides repeat transects to fishing port to fishing grounds	Quantitative evaluations of acoustic backscatter along the transit path, as well as inter annual and vessel comparisons	Intra and inter-annual and vessel comparisons for both ecosystem monitoring and stock assessment, as well as model input	High quality quantitative acoustic data suitable for assessment, ecosystem modeling and, as well as many scientific aspects of the data

Can we establish proper monitoring using FV as scientific platform to support policy implementation and scientific knowledge/advice?



Technology & Science

- Need for technical development/improvement of authomatic recording system, sensors, etc.
- Technical adaptation of FV when required (e.g. Acoustic survey)
- Training to fishermen/scientists
- Assess optimal sampling scheme within fishery-dependent context
- Test on pilot studies the feasibility of methods, approaches
- Modify (some) procedures (and develop new methods) to take the most from new data (Massive Data Sets, etc.)

Governance

- Support technological and scientific development, according to a strategic vision
- Define a framework that allows to complement «new data» to current data collection into fisheries and marine environment management (e.g. in stock assessment, MSFD monitoring, etc.)
- Define quality requirements
- Define a policy on data usage and dissemination
- Foster a process that facilitates fishermen engagement

Fishermen engagement

- Fishing vessels are not «neutral» scientific platforms
- There are different models of collaboration between scientists and fishermen, it is needed to move from the Deference Model to Community science model (Wilson, 2009)
- Stakeholders collaboration should be supported
- Incentives could be (also) monetary, but the most important incentive is to allow fishermen co-construct with scientists the knowledge base to fishery management
- This entails to engage them in the whole process (from technological development to implementation)
- This entails agree on data usage (**monitoring/science vs. contol**) and ownership
- Relevant examples of fishermen engagement exist in EU (e.g. GAP2 project, www.gap2.eu)

Conclusions

- Fishing vessels are (already) successfully used as scientific platform
- There is large room for enhancing their adoption allowing better/different data to be collected on several fsheries/ecosystem components
- Technical and scientific development is partially needed
- An ad hoc governance system of data must be implementented
- Fishermen engagement is essential to make these effort effective

Thank you!

Fishermen and scientists processing catches together within GAP2 Adriatic Sea survey