Management of small pelagic fishery in the Adriatic Sea: a review of the socio-economic impact

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Introduction

Management of small pelagic fisheries in the Adriatic Sea (GSA 17 – GSA 18) is defined by GFCM recommendation established in 2013, and further precautionary and emergency measures established in the subsequent years.

This study aims at providing knowledge on the socioeconomic impacts of different management scenarios of small pelagic fish stocks in the Adriatic Sea.

It investigates the status of the current research on anchovies (Engraulis encrasicolus) and sardines (Sardina pilchardus) management in the case study area.

The main goal is to summarize the results and available information on the socio-economic impact of two main specific management measures: fishing effort reduction and establishment of TACs.

Knowledge gaps and the need for further research are identified and discussed.

Outline

- Research methodology

- Main results

- Discussion and research gaps
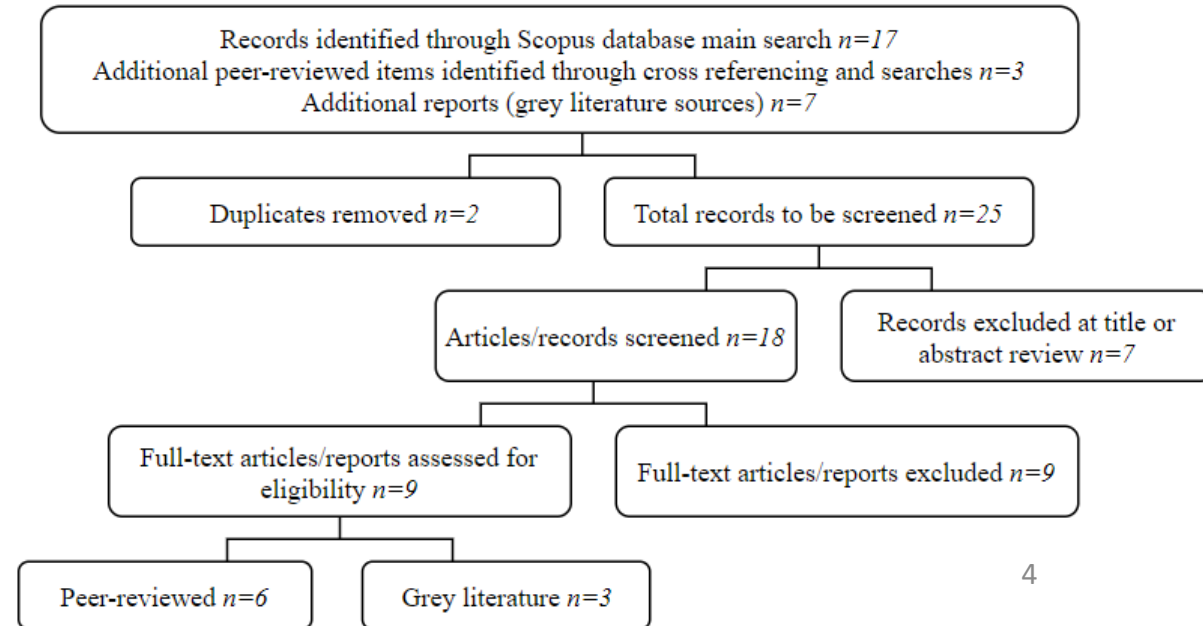
- Conclusions and further research

Research methodology

Full articles/reports assessed
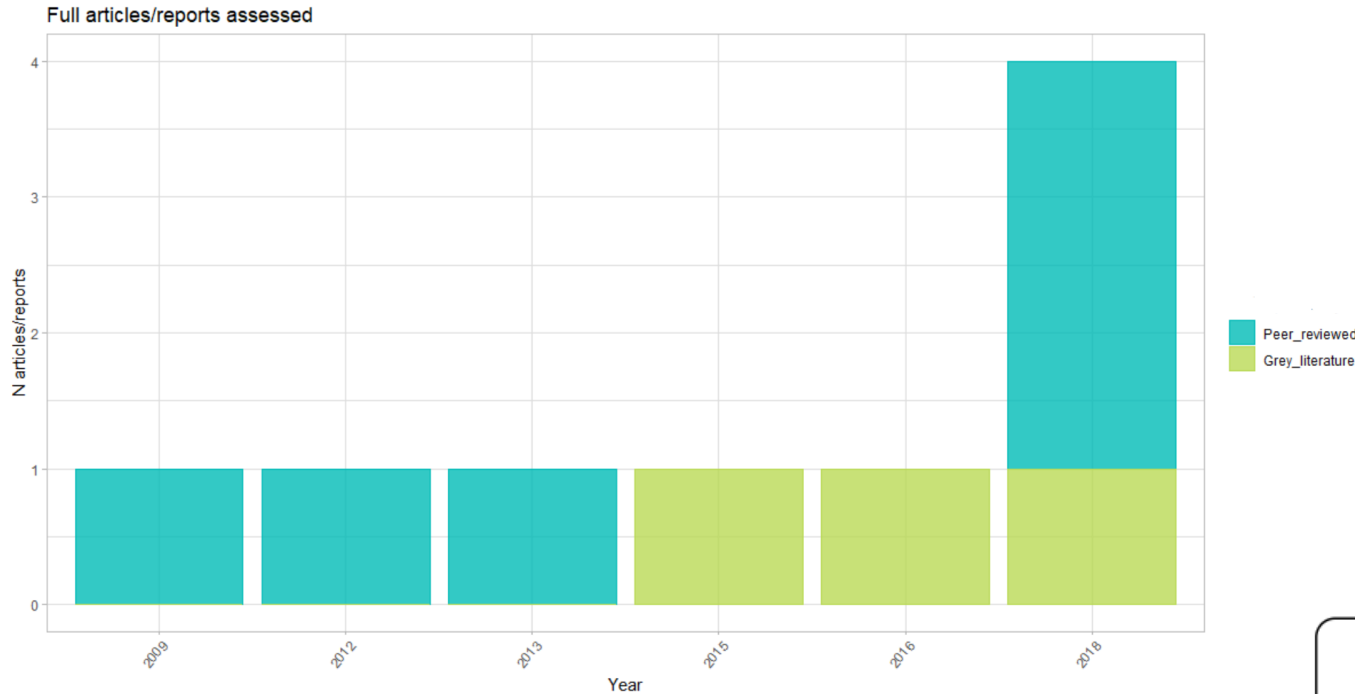
Studies selection criteria:

a) written in English

b) focused on the Adriatic Sea and small pelagic fish (sardine and anchovies)

c) related to the evaluation/analysis of fishery management regulations applied/to be applied in the Adriatic basin involving the selected species

d) dealing with socio-economic assessments/simulations of the impact of fishery management measures in the case study area

- Systematic search on SCOPUS

- Key : "Adriatic", "small pelagic*" and "management"

- Few peer-reviewed results

- Research expanded to include grey literature sources: STECF, SAC

- Few quantitative assessments retrieved, all of them are ex—ante simulation of management measures

- Ex–post analyses were not retrieved

Records identified through Scopus database main search $n=17$
Additional peer-reviewed items identified through cross referencing and searches $n=3$
Additional reports (grey literature sources) $n=7$

Duplicates removed $n=2$

Total records to be screened $n=25$

Articles/records screened $n=18$

Records excluded at title or abstract review $n=7$

Full-text articles/reports assessed for eligibility $n=9$

Full-text articles/reports excluded $n=9$

Peer-reviewed $n=6$

Grey literature $n=3$

4

Main socio-economic indicators

ECONOMIC INDICATORS

CR/BER (Current Revenues/Break Even Revenues): indicator of the economic sustainability of a fleet. The BER is the level of revenues needed to cover both fixed and variable costs (when profits=0). When the ratio is > 1, the fleet is economically viable (and viceversa)

Revenues (€)

Profits (Revenues – Costs) (€)

SOCIAL INDICATORS

Salary (€)

Employments (units)

FTEs (Full Time Equivalents): each unit is equivalent to a person working full time

Results I/IV – Effort management

Indicator	Target Fmsy (even/uneven)	Target E=0.4 anchovies (even/uneven)	Reduction 20% effort	Reduction 50% FD	Reduction 50% VS	Notes
CR/BER	++/- (2021)	+/+ (2021)	n.a.	n.a.	n.a.	++ if indicator > 1; + if 0.9 < indicator < 1; - if 0.7 < indicator < 0.9; -- if indicator < 0.7
Salary	+/- (2021)	+/+ (2021)	n.a.	n.a.	n.a.	++ if the increase of the indicator is > 20%; + if 0 < increase of the indicator < 20%; - if 0 < decrease of the indicator < 20%; -- if the decrease of the indicator is > 20%
Employment	-/- (2021)	-/- (2021)	n.a.	n.a.	n.a.	
Revenues	--/-- (2021)	-/- (2021)	n.a.	n.a.	n.a.	
Risk CR/BER<1	n.a.	n.a.	-- (2020), -- (2025), -- (2030)	-- (2020), -- (2025), -- (2030)	++ (2020), - (2025), -- (2030)	++ if risk < 20%; + = if 20% < risk < and 50%; - if 50% < risk < 80 %; -- if risk > 80%

Target Fmsy/E=0.4 → target fishing mortality at MSY/E=0.4 levels

Even → same percentage reduction applied to each fleet segment

Uneven → different percentage of reduction applied to each fleet segment according to their impact on the stocks

Reduction 20% effort: reduction applied either on fishing days or number of vessels, with almost the same results

Reduction 50% FD: reduction applied exclusively on fishing days

Reduction 50% VS: reduction applied exclusively on the number of vessels

Results II/IV – TAC management

Indicator	TAC1	TAC2	Target E=0.4	Spat. temp. closures	Max catch 2014	HCR	Bpa2020	Notes
CR/BER	n.a.	n.a.	++ (2024), ++ (2032)	++ (2024), -- (2032)	++ (2024), -- (2032)	++ (2024), ++ (2032)	++ (2024), ++ (2032)	++ if indicator > 1; + if 0.9 < indicator < 1; - if 0.7 < indicator < 0.9; -- if indicator < 0.7
Salary	n.a.	n.a.	++ (2024), + (2032)	++ (2024), -- (2032)	+ (2024), -- (2032)	++ (2024), ++ (2032)	+ (2024), ++ (2032)	++ if the increase of the indicator is > 20%; + if 0 < increase of the indicator < 20%;
FTEs	n.a.	n.a.	-- (2024), -- (2032)	- (2024), -- (2032)	-- (2024), -- (2032)	-- (2024), -- (2032)	-- (2024), -- (2032)	- if 0 < decrease of the indicator < 20%; -- if the decrease of the indicator is > 20%
Risk CR/BER<1	++ (2020), + (2025), ++ (2030)	-- (2020), -- (2025), -- (2030)	n.a.	n.a.	n.a.	n.a.	n.a.	++ if risk < 20%; + = if 20% < risk < and 50%; - if 50% < risk < 80 %; -- if risk > 80%

TAC1: if SSB<Bpa, set TAC=0 (fishing ban). Set TAC so that F < F(E=0.4) otherwise

TAC2: if SSB<Bpa, reduced fishing mortality on younger specimen. A TAC is set at 2014 levels and reduced by 5% each year

Target F(E=0.4): target fishing mortality=0.64 for anchovies and 0.47 for sardines

Spat.-temp. closures: reduced fishing mortality on younger specimen and reduced fishing mortality of 4-8%

Max catch 2014: maintain catches at 2014 levels (GFCM/40/2016/3)

HCR: if SSB<Blim → TAC=0. If SSB>Bpa → F=F(E=0.4)

Bpa2020: Set F such that Bpa is reached in 2020 and fish at F(E=0.4) afterwards

Results III/IV – Final considerations

- Most of peer reviewed studies are based on Italian fleet data only, while grey literature studies use aggregated data by nationality or by fleet segments including Croatian and Slovenian fleets.

- Ex–ante socio-economic results should be **carefully** interpreted due to model assumptions

- CER/BER projections show good performances under some specific scenarios (uneven reduction of fishing effort towards Fmsy, HCR, Bpa2020 and TACs set so that F=F(E=0.4))

- Wage projections are highly increasing in the long run under HCR, and Bpa2020 scenarios

- Employment is always negatively affected both by TAC and effort limitations. Effort management scenarios seem to have lower impact on this indicator. In some cases (e.g. HCR and Bpa2020 the decrease in employment is offset by salary increases)

- Effort reduction is always followed by a decrease in revenues, even if such decrease seems to be less than proportional to the reduction in effort applied (Mulazzani et al., 2018)

Results IV/IV – Final considerations

- TAC scenarios are based on separated non-transferable quotas simulations. The application of separated quotas may have different consequences on fishing activity depending on when the quota for the preferred target species is reached (Mulazzani et al., 2013)

- Impact diversified among different fleet segments according to vessel's size (Silvestri & Maynou, 2009) and/or nationality (SAC, 2018), length and fishing gear (Spedicato et al. 2016). Larger vessels are more advantaged when technological progress is considered (Silvestri & Maynou, 2009)

- Croatian purse seines seem to be the most negative affected vessels in term of economic performances (Spedicato et al., 2016; SAC, 2018). The magnitude of the impact depends on the scenario and the study considered.

Main research gaps and further research

- Lack of updated ex–post evaluations: no quantitative information on how current and past policies have effectively affected fleet segments;

- More in-depth analysis on profitability and price fluctuations are required (Biscaro & Liviero, 2012)

- Studies on the combined implementation of policy measures are required (Celić et al., 2018)

- Lack of studies on further management measures such as transferable fishing concessions (Spagnolo, 2006; Mulazzani et al., 2018)

Ongoing study

- _Aim:_ to study the fishing system of small pelagics in the Adriatic Sea and the optimal dynamic effort level to ensure at the same time profit maximization and stock sustainability

- _Data:_ Italian fleet socioeconomic data. Source: MIPAAF (Italian Ministry of Agricultural, Food and Forestry Policy)

- _Methods:_ Bioeconomic model → profit maximization (constraint: stock growth equation)

- _Results:_ Maximum Economic Yield dynamic estimation.

  Results of this work can be used for the purpose of defining policy objectives compatible with biological sustainability while aimed at ensuring the economic efficiency of the fishery.

Thank you for your attention

Complete list of studies

Biscaro, Q., & Liviero, A. (2012). A price analysis and management model for Adriatic Small Pelagic fish(anchovies and pilchards). *New Medit, 11*, 17–26.

Celić, I., Libralato, S., Scarcella, G., Raicevich, S., Marčeta, B., & Solidoro, C. (2018). Ecological and economic effects of the landing obligation evaluated using a quantitative ecosystem approach: a Mediterranean case study. (R. Prellezo, A cura di) *ICES Journal of Marine Science, 75*, 1992–2003. doi:10.1093/icesjms/fsy069

Lembo, G., Scarcella, G., Sabatella, E., Vrgoč, N., Bitetto, I., Facchini, M. T., & Spedicato, M. T. (2015). *Deliverable 2. Final report of the SEDAF project "Improved knowledge of economic aspects related to the most important fisheries in the Adriatic Sea"*. SEDAF Final Report, 2015. 148 pp.

Lucchetti, A., Belardinelli, A., D'Andrea, L., Marčeta, B., Martinelli, M., Russo, T., & Virgili, M. (2018). Small pelagic purse seines in the Adriatic Sea: A spatial analysis and technical overview in relation to Mediterranean Regulation provisions. *Marine Policy, 98*, 104–114. doi:10.1016/j.marpol.2018.09.031

Mulazzani, L., & Malorgio, G. (2013). Regional management of multi-species fisheries on the basis of shared stocks and property rights: a Mediterranean case. *Scientia Marina, 77*, 439–448. doi:10.3989/scimar.03693.05b

Mulazzani, L., Camanzi, L., Bonezzi, A., & Malorgio, G. (2018). Individual transferable effort quotas for Italian fisheries? A preliminary analysis. *Marine Policy, 91*, 14–21. doi:10.1016/j.marpol.2018.01.033

SAC. (2018). Report of the Workshop on the assessment of management measures (WKMSE). *Report of the Workshop on the assessment of management measures (WKMSE)*. FAO, GFCM. Tratto da http://www.fao.org/gfcm/technical-meetings/detail/en/c/1142161/

Silvestri, S., & Maynou, F. (2009). Application of a bioeconomic model for supporting the management process of the small pelagic fishery in the Veneto Region, northern Adriatic Sea, Italy. *Scientia Marina, 73*, 563–572. doi:10.3989/scimar.2009.73n3563

Spagnolo, M. (2006). *Elementi di economia e gestione della pesca.* Milano: F. Angeli.

Spedicato, M. T., Bitetto, I., Facchini, M. T., Accadia, P., Carpi, A., Musumeci, C., & Lembo, G. (2016). *Study on the evaluation of specific management scenarios for the preparation of multiannual management plans in the Mediterranean and the Black Sea.* Luxembourg: Publications Office of the European Union.

Complete list of studies

Reference	Methodology/Model	Economic indicators
Silvestri & Maynou (2009)	MEFISTO	Profits
Biscaro & Liviero (2012)	ARIMAX & simulation model	Revenues, costs, contribution margin
Mulazzani & Malorgio (2013)	Production function & value-added maximization	Value added
Lembo et al. (2015)	BEMTOOL	Revenues, salaries, employment, current revenues/break even revenues
Spedicato et al. (2016)	BEMTOOL	Revenues, salaries, employment, current revenues/break even revenues, ROI
Celić et al. (2018)	Ecosystem model (EwE)	Revenues
SAC (2018)	FLR/MSE tool & BEMTOOL	FLR/MSE: Current revenues/break even revenues, Net profits margins, ROFTA; BEMTOOL: Current revenues/break even revenues
Lucchetti et al. (2018)	Data collection and descriptive analysis	n.a.
Mulazzani et al. (2018)	Semi-quantitative approach	Revenues, value added