The background of the slide is a grayscale photograph of a fishing boat's deck. In the foreground, there are thick ropes and a net with white floats (buoys) attached to it. The net is draped over the side of the boat, extending towards the water. The overall scene is slightly out of focus, emphasizing the text overlay.

Small pelagic stock assessment in the Adriatic Sea – management and consequences

European Parliament - hearing – January 2018

Lav Bavčević PhD

Advisory Service

Starting position EU Reg- 1380/2013

All the objectives are equally important - not just MSY - especially not until 2020 if it endangers other objectives

Article 2

Objectives

1. The CFP shall ensure that fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies.

2. The CFP shall apply the precautionary approach to fisheries management, and shall aim to ensure that exploitation of living marine biological resources restores and maintains populations of harvested species above levels which can produce the maximum sustainable yield.

5. The CFP shall, in particular:

- (a) gradually eliminate discards, on a case-by-case basis, taking into account the best available scientific advice, by avoiding and reducing, as far as possible, unwanted catches, and by gradually ensuring that catches are landed;
- (b) where necessary, make the best use of unwanted catches, without creating a market for such of those catches that are below the minimum conservation reference size;
- (c) provide conditions for economically viable and competitive fishing capture and processing industry and land-based fishing related activity;
- (d) provide for measures to adjust the fishing capacity of the fleets to levels of fishing opportunities consistent with paragraph 2, with a view to having economically viable fleets without overexploiting marine biological resources;
- (e) promote the development of sustainable Union aquaculture activities to contribute to food supplies and security and employment;
- (f) contribute to a fair standard of living for those who depend on fishing activities, bearing in mind coastal fisheries and socio-economic aspects;
- (g) contribute to an efficient and transparent internal market for fisheries and aquaculture products and contribute to ensuring a level-playing field for fisheries and aquaculture products marketed in the Union;
- (h) take into account the interests of both consumers and producers;
- (i) promote coastal fishing activities, taking into account socio-economic aspects;
- (j) be coherent with the Union environmental legislation, in particular with the objective of achieving a good environmental status by 2020 as set out in Article 1(1) of Directive 2008/56/EC, as well as with other Union policies.

Small pelagic fish in the Adriatic Sea entered in the focus on the GFCM-SAC SubCommittee on Stock Assessment (SCSA)- Izmir, 22-26 September 2008:

- Anchovy - The stock can be considered as fully exploited
- Sardine - The stock can be considered as overexploited.
- In conclusion, it is recommended not to increase the fishing effort: such an increase would be particularly unwise for sardine.
- Since then we have had the following situation:
- Anchovies – Catch reduction for 54%, SSB reduction for 70% and reduction of recruitment for 57%
- Sardines- Catch increase for 370%, SSB increase for 14%, increase of total biomass for 90% and increase of recruitment for 117%

Proposal for a multi-annual plan for the management of small pelagic stocks in the Adriatic-a brief overview with comments

- Targets and reference points – annex I and annex II

Stock	Target fishing mortality range consistent with achieving maximum sustainable yield (F_{MSY})		Stock	Minimum spawning stock biomass reference point (in tonnes) ($MSY B_{trigger}$)	Limit biomass reference point (in tonnes) (B_{lim})
	Column A	Column B			
Anchovy	0.23 – 0.30	0.30 – 0.364	Anchovy	139 000	69 500
Sardine	0.065 – 0.08	0.08 – 0.11	Sardine	180 000	36 000

- **There is no socioeconomic analysis related to the proposed measures.**
- **There is no regional approach. Instead, a global approach to the region is applied!**
- **STECF(PLEN-17-03) actually reject the EK proposal of the plan, and recommends the escapement strategy, still keeping the TAC as unique management measure, so it seems that TAC is the real target of the plan.**
- **This was just one of the turns that have recently happened**
- „STECF recommended that three years’ worth of data on impacts should be used to assess the multiannual plans.” So the plan gets a form of the experiment.

Stock assessment and scientific advice problems discussed through this presentation

- Problem of uncertainty
- Interpretation problems
- Conceptual problem
- Socioeconomic and political consequences

Stock assessment of sardines and anchovies(GSA 17 and GSA 18)

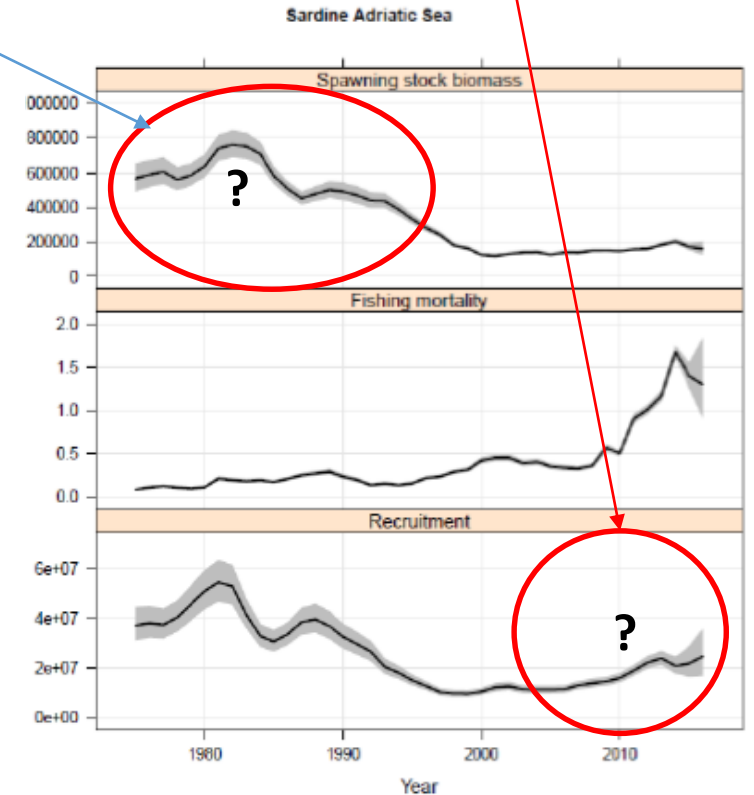
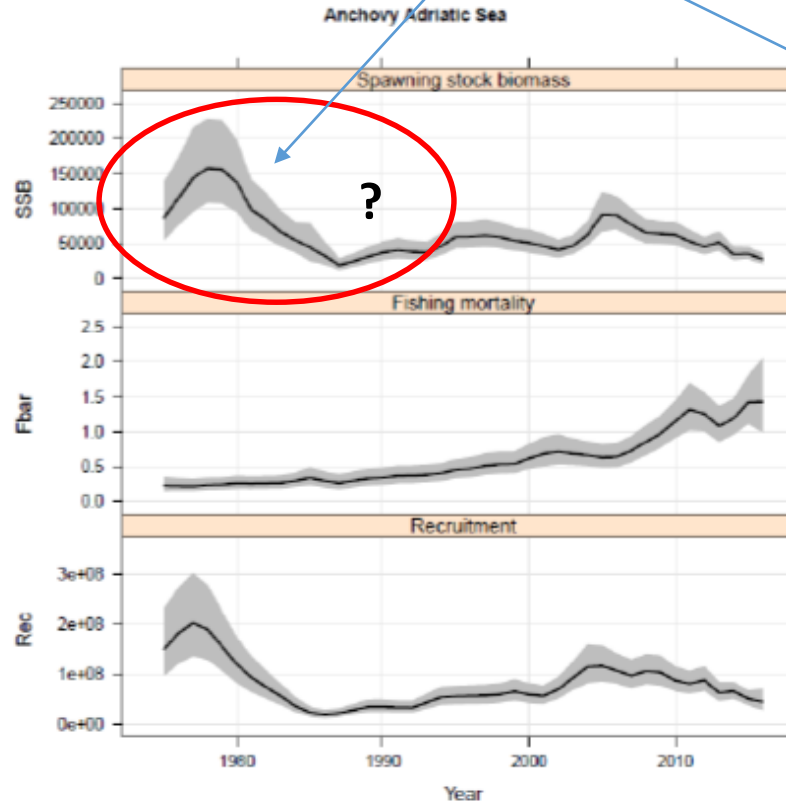
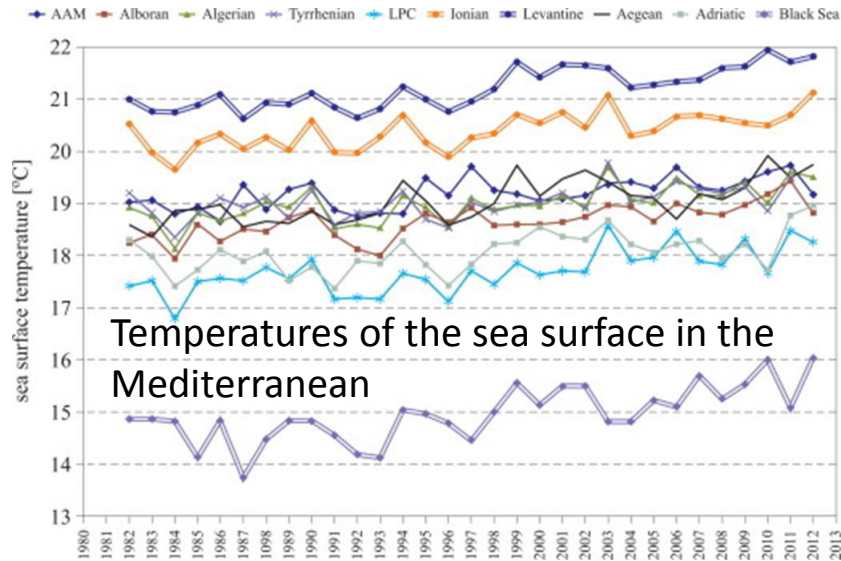
Results and referent points in the recent documents

Species	Reports	Blim (t)	Bpa (t)	Fmsy	SSB-2015 (t)	Fcur- 2015
Sardines	SAC 2017 STECF 16-22 STECF 17-15/17-03	125317 223000 112922	250636 446000 156913	0.715 (0,08 -0,25) 0.44	183783 383080 173165	1.485 1.94 1.4
Anchovies	SAC STECF 16-22 STECF 17-15/17-03	45910 140000 20155	91872 196000 28007	0.554 (0,3 -0,5) 0.57	86595 214272 35739	0.99 1.27 1.42

- The results have been obtained from the same data!
- The reasons of such differences lie in the uncertainty, and the assumptions that have been made to obtain the consistence of the model.
- The more we go into the past, the more assumptions are done to obtain the results

Results of Estimation of Spawning stock biomass (SSB), fishing mortality (Fbar) and Recruitment (Rec)

'maximum sustainable yield' means the **highest theoretical equilibrium yield** that can be continuously taken on average from a stock under existing average environmental conditions **without significantly affecting the reproduction process;**



- Bearing in mind climate changes and assumptions used in the model, is it acceptable to take into consideration the estimates of the period before 2000 and to boil them into „the EXISTING environmental conditions“?
- If recruitment of sardines has been increasing for the last ten years, could the sardine stock be qualified to be in bad condition?

Uncertainties that have not been taken in consideration

- The main source of sampling comes from the catch. The catch is not random sample from the stock. Catch is influenced by the market situation, fish availability, weather conditions and current costs.
- **Total catch has important influence on the estimated values, so the deliberately reduced catch of sardines from 2014 – 2016 resulted with the estimation of reduction of the biomass!!!**
- The echo survey has been done improperly. There are not enough acceptable fisheries independent data to tune the results of the assessment.

Problems of the interpretation STECF PLEN 17-03

- „The assessment results from EWG 17-09 show for sardine a low level of SSB since 2004 but without any recent further decline”
- According to the presented data from 2004-2016, the SSB increased 14% or from 2001 to 2016 33%, and total biomass increased +113 % or +119% respectively.
- „and a slightly increasing recruitment in recent years”
- From 2004 the recruitment increased + 117%!
- „The fishing mortality remains very high but in the last 2-3 years may have started to decline”
- Compared to 2014 the fishing mortality has decreased 22%.
- Because of the different assumptions in assessment of anchovies there is a big difference between SAC and STECF estimations.

Conceptual problem

The STECF emphasizes the conceptual problem in applying MSY, but it has further the view that quotas should be applied

(STECF PLEN 17-01):

- „On previous occasions STECF (STECF 2016c) has discussed the problems of providing robust estimates of FMSY for sardine and anchovy stocks in GSAs 17 and 18 (Adriatic Sea). **Such estimates are sensitive to the assumptions made in the estimation procedure, especially with regard to the stock-recruitment relationship.**”
- „The time-series of stock and recruitment data indicate that for sardine and anchovy in the Adriatic, **there is a strong unbounded linear relationship between spawning stock biomass (SSB) and recruitment (Fig. 2.7.1); and conversely, there is also a strong correlation between recruitment and the following SSB: high recruitment gives rise to a large stock in subsequent years, but when the recruitment declines, so does the stock. This pattern is also evident in the time series prior to the mid-1990s, which was a period of relatively lower fishing mortality compared to the current level (although the historical mortality level remains uncertain because of a possible underestimation of historical catch data).** This indicates that the subsequent decline in recruitment **may have been partly in response to environmental changes, and not only a result of declining SSB.** This is in line with a large number of published studies that indicate that **environmental conditions have a strong influence on recruitment success of small pelagic fish species.** In this situation, **it is difficult to resolve the issue of how dependent recruitment is on SSB and hence the form and the breakpoints of the stock-recruit relationship.**”

Conceptual problem – STECF(PLEN-17-03)

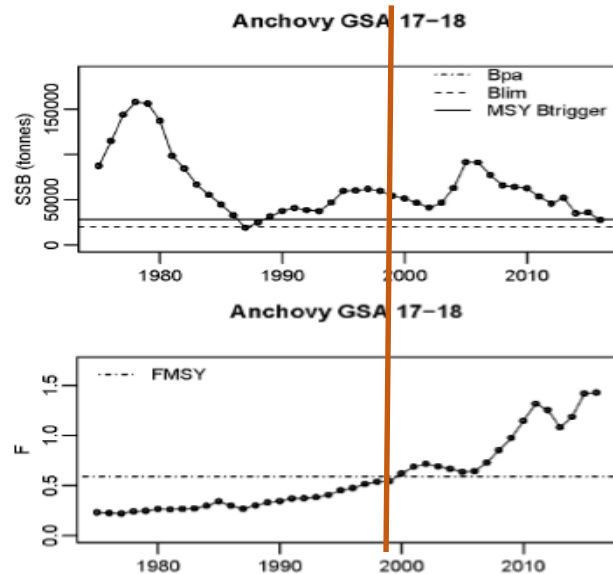


Figure 5.7.3. Trends in median SSB and F in relation to reference points, anchovy GSA 17-18. MSY Btrigger = B_{pa} .

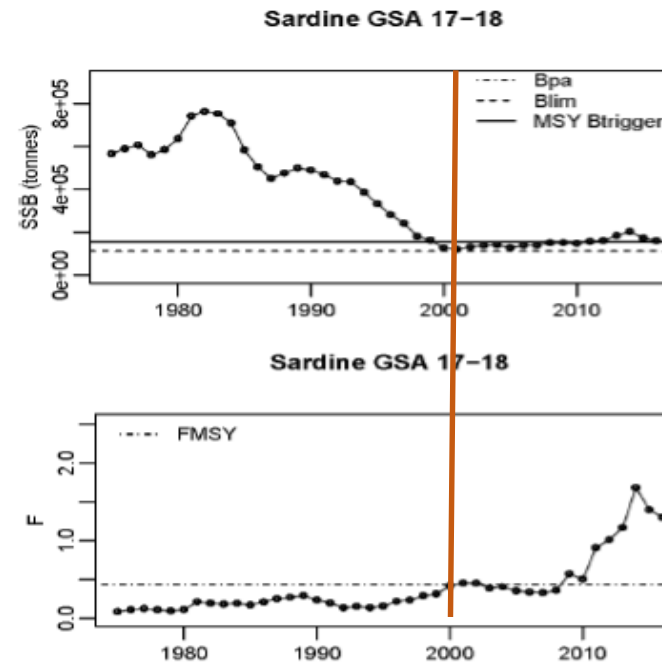


Figure 5.7.4. Trends in median SSB and F in relation to reference points, Sardine GSA 17-18. MSY Btrigger = B_{pa} .

- If the estimations before 2000 would be rejected, because they do not belong in existing average environmental conditions – It **can not be clearly stated that the biomasses are very low**.
- If the estimations before 2000 are valid, then **there is no catch limit which would prevent stock collapse**. This conclusion is based on the fact that in the conditions of very low fishing mortality, twice lower than F_{msy} , the spawning stock in that period decreased almost ten times.
- Anchovy and sardine are part of an assemblage. They alternate in time and space. Fishing may alter fluctuations in anchovy and sardine stocks, but it neither causes nor prevents these fluctuations. So it is not possible to maintain contemporaneously „good status” of both stocks.

Proposed management measures → consequences

most of the consequences are already explained in the „Opinion of the European Economic and Social Committee”

- The socioeconomic analysis has not been done and it is not possible to do it without the market evaluation
- Single species TAC can have a predictable effect on the market control but it doesn't have predictable consequences on the status of the stock.
- Reduction of the catches for 60% applied on a part of the Mediterranean fleet will lead them to an unfavourable market position, and encourages other fleets to increase the catch.
- Reduction of the catches for 60% will result with proportional loss of jobs and reduction of the raw materials for processing industry

Proposed management measures → consequences

- Eventual further decrease of TAC could result with extinction of the affected fishery
- Some vessel can shift fishing effort to other stocks as it was with quotas for tuna when significant effort (30%) has been transferred on small pelagic species.
- Encouraged with SAPARD, IPARD and Operative programs for fisheries, adopted by the EC and, Croatian entrepreneurs invested millions of euros in the processing plants (predominantly freezing equipment) supported by the EU fund
- Reduction of small pelagic fish means bankrupt of those investments with the obligation to return the obtained financial support to EU funds- because they have not produced for at least five years????
- In the case of implementing the quotas, differences between the fleets, fisheries and markets are the basis for serious conflict and could provoke politically irreversible consequences.

Management measures in the Republic of Croatia in 2018

- National measure of fishing closure for all vessels targeting small pelagic fish, during sardine spawning period (in December) of 10-30 days.
- Maximum 180 fishing days per year and 20 fishing days per month, or maximum 144 fishing days, targeting sardines and / or anchovies.
- Spatial closure of about 40% of territorial waters lasting 12 months per year.
- All vessels have an electronic logbook (which includes the registration of the fish size (pcs / kg) by species of sardines and anchovy and related fishing zone) and VMS.
- Emergency measures 2018:
 - Fishing closure during the spawning period of sardine, for the complete fleet authorised to catch small pelagic fish, in the period from 01.01. to 15.02.2018. Additionally from 15.02. until 28.02.2018. each vessel has a maximum of 5 fishing days with a maximum total catch limit of 35 tonnes per vessel
 - Fishing closure during the spawning period of anchovies, for the complete fleet authorised to catch small pelagic fish, in the period from 01.05.-31.05.2018 – Means the ban for all the relating fishing vessels 15 days in continuity, and maximum of 5 fishing days per vessel in the rest of the closure period.

Results of the applied measures in Croatia

- **Reduction of fishing days in 2016 for 20% and fishing effort 13% in regards to 2014**
- **In the last three years, the catch was cumulatively reduced by 27000 tonnes** with the expectation of further reduction of the catches. *The cumulative reduction refers to the period of 2015 2016 and 2017 and was calculated in relation to the catch in 2014*
- **Reduction of fishing mortality of sardines**
- **Reduction of growth overfishing due to the implementation of spatial temporal selectivity**

Objective

- **Targeting reduction of fishing mortality through management measures of spatial-temporal selectivity and reduction of the catches in accordance with socioeconomic reality**

Proposal

It is possible to influence the growth overfishing of sardines and anchovies but very few can be done on the recruitment overfishing

- Gradual introduction of the management measures
- Introduction of serious fishery independent real time monitoring
- Ensure the same conditions regarding surveillance and monitoring to all fleet segments
- Proposal of MEDAC should be improved - not rejected
- Improvement can be done on the bases of the measures undertaken in Croatia
- Ensure the full implementation as soon as possible and validate the results in 2021.

A photograph of a fishing boat at sunset. A large net is being hoisted by a crane, creating a dramatic silhouette against the bright orange and yellow sky. The water is calm, and the horizon is visible in the distance.

Thank you

“Small pelagic fish like sardine and anchovy undergo large natural fluctuations even in the absence of fishing. You can have the best harvest controls in the world but you’re not going to prevent the population from declining when ocean conditions change in an unfavorable way.”

NOOA 2015