**STECF
EXPERT WORKING GROUP EWG 19-02**

**on Management Strategy Evaluation for demersal species in the Adriatic Sea**

*Date: 1-5April 2019 Venue: JRC Ispra, Italy*

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**Background**

The Adriatic Sea is the most important FAO fishing area in the Mediterranean Sea both in terms of landings and size of the fleets.

Demersals (i.e. 35000 tons in 2016) make up 25% of the landings in the Adriatic. As for the small pelagics MAPs the EU Member States (MS) are responsible for the majority of the landings in the area with Italy, Croatia and Slovenia contributing to the 90 % of the demersal landings. Albania and Montenegro share respectively 10% and less than 1% of the demersal landings.

There is no management in place in the Adriatic, under GFCM, to control fishing mortality on a yearly basis and in line with scientific advice. Limited spatio-temporal measures are implemented both in Italy and Croatia and since 2017 the Pomo/Jabuka Pit FRA was established to protect juveniles of Hake and Norway lobster.

The most important demersal stocks in the Adriatic Sea are overfished and some are at a low biomass level. Overexploitation causes a significant loss in yield which damages fleets profitability.

There is a large overcapacity problem coupled with a shallow sea bottom area, which leads to very limited refuge for fish stocks from actively towed gears. The Adriatic Sea is classified as the EU area with the highest trawling footprint, identified as the area where 86% of the bottom surface is trawled with a high trawling frequency.

GFCM Scientific Advisory Committee has been tasked in 2018 to develop the scientific elements for an Adriatic demersal management plan to be adopted at GFCM level in 2019. The work under these TORs will be a contribution also to the SAC to facilitate the identification of the best possible management strategies.

**A management strategy evaluation is requested to evaluate trade offs and different performance indicators of a portfolio of management options ranging from input/output strategies, technical measures and different implementation time-frames.**

**The key commercial stocks for a demersal MAP have been previously identified by STECF EWGs[[1]](#footnote-1) and are also listed under GFCM SAC key priority stocks.**

**For the stocks given in Annex I, the EWG 19-02 is requested:**

**ToR 1.**  Assess the likely biological and socio-economic benefits, against a baseline status quo scenario, of implementing the management options described in the following TORs 1-5, with priority to the most important scenarios included in TORs 1-3. To test the management options use the established approach implemented in previous EWGs (STECF 2015b, STECF 16-21, STECF 18-01 and STECF 18-02 ) based on the FLR framework (Kell *et.al*, 2007).

For each scenario, STECF-EWG 19-02 is requested to run the appropriate forecast models in order to describe the likely situation of the fisheries up to 2035 and using the indicators given below:

- Fisheries indicators: fishing mortality relative to Fmsy (F/Fmsy);

- Biological indicators: abundance (SSB and total biomass), recruitment, probability of SSB falling below Blim, Risk vs catch level, Catch variability, Average catch.

- Socio-economic indicators: GVA, salary and employment, in line with the methodology outlined in STECF-EWG 16-02 or on the basis of different viable approaches.

**TOR 2 Operating Model**

**Identification of stock assessments:**

1. The biological operating model (OM) for the MSE shall be conditioned using the assessment results from the most updated stocks assessment produced by GFCM WGSAD and were necessary complemented by STECF assessments to account for stock assessment model uncertainty in the OM. The EWG shall give preference to models that allow estimation of uncertainty, in line with the recommendations of SAC and STECF EWG 17-07.
2. In the operating model evaluate alternative recruitment models (SR).
3. Use reference points from the stock assessments

**TOR 3.** **Management Procedure A**

For the Management Procedure (MP) test the following management scenarios:

1. Under the different MPs exploitation levels of all key stocks shall reach the maximum sustainable yield (Fmsy) by:
	1. 2020 (**Fmsy2020**),
	2. 2024 (**Fmsy2024**),
	3. Reduction of fishing mortality by 10% in 2020, 8% in 2021, and then linear reduction in F to achieve Fmsy by 2024 (**FIXREDUX**).
2. Simulate the management mechanism to mimic the advisory process of GFCM SAC and timing for adoption of management measures in GFCM, which operates on a N+2 basis.
3. Develop two management procedures for controlling F:

 A fishing effort regime (**EFFORT**), operating on relevant fleet segments, to be applied to all key stocks, and within this scenario evaluate the effects of presence/absence of hyperstability as defined and modelled in STECF 16-21 (**HYPER**).

A catch limit scenario to be applied exclusively for the stock of Common sole and Norway lobster (**CATCHLIM**).

**TOR 4.** **Management Procedure B**

Assuming that the effects of the Pomo/Jabuka Pit FRA are already accounted for in the most recent stock assessments and that this FRA will remain in place for the duration of the management plan, evaluate the effect of theoretical additional protection of nursery and spawning areas as follows:

* + - 1. For the stock of common sole simulate the effect of the implementation of a FRA divided in two areas: (a) one on the polygon identified as area of high persistence in front of the Venice lagoon in Figure 4 B in Scarcella et al. 2014[[2]](#footnote-2) and (b) according the polygon of Fig 1 proposed for the sole sanctuary in Bastardie et. al 2017[[3]](#footnote-3) (**FRA**).
			2. For Norway lobster simulate the effect of the establishment of a FRA protecting 20% of the area of high persistence of spawners (**FRA**).
			3. For European hake, simulate the effect of the establishment of a FRA protecting 20% of the area of high persistence of spawners (**FRA**).
			4. Evaluate the effect of the closure of the coastal zone up to 6 nautical miles to all active towed gear (OTB and TBB) (**6NM**)

**A synoptic table of all scenario runs is in Annex II.**

**ToR 5. Areas of high spatial persistence of key stocks**

Since protection of juvenile and adult spawners life stages can contribute to reduce fishing mortality and improve stock status, identification of the areas of high persistence can support management decision to manage some of these areas with fishing gear restricitons and in the context of marine spatial planning.

For stocks in Table 1, using the high density persistence analysis and R scripts developed in STECF EWG 17-15, provide detailed maps for GSA 17-18 of:

1. The high persistence areas of 1st year juveniles:
2. The recurrent spawning aggregations areas.
3. Analyse the percentage of overlapping of juveniles and adults persistent areas, by individual stocks and across all stocks in Table I, to explore the viability of the fisheries if managed trying to avoid either juveniles or spawners.

MEDITS data covering the longest time series as possible should be used and where appropriate (for *Solea solea* and possibly other stocks) SOLEMON data.

**ANNEX I**

**Table I** – List of stocks to be evaluated by the EWG 19-02.

|  |  |  |
| --- | --- | --- |
| **Area** | **Common name** | **Scientific name** |
| GSA 17-18  | Hake | ***Merluccius merluccius*** |
| GSA 17-18 | Red mullet | ***Mullus barbatus*** |
| GSA 17-18 | Norway lobster | ***Nephrops norvegicus*** |
| GSA 17-18-19 | Deep-water rose shrimp | ***Parapenaeus longirostris*** |
| GSA 17 | Sole | ***Solea vulgaris*** |
| GSA 17-18 | Spottail mantis shrimp | ***Squilla mantis*** |

*ANNEX II*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Run | Scenario | Stocks | Management Procedure | Fmsy target year | Recruitment model | Hyperstability | Technical measures |
| 0 | SQO | All in Tab 1 | SQUO | SQUO |   |   |   |
| 1 |   | All in Tab 1 | EFFORT | Fmsy2020 | BH | no | no |
| 2 |   | All in Tab 1 | EFFORT | Fmsy2024 | BH | HYPER | FRA/6NM |
| 3 |   | All in Tab 1 | EFFORT | Fmsy2024 | geomean | No | no |
| 4 |   | All in Tab 1 | EFFORT | Fmsy2024 | BH | No | FRA/6NM |
| 5 |   | All in Tab 1 | EFFORT | Fmsy2024 | geomean | HYPER | no |
| 6 |   | All in Tab 1 | EFFORT | Fmsy2024 | BH | HYPER | no |
| 7 |   | All in Tab 1 | EFFORT | Fmsy2024 | geomean | No | FRA/6NM |
| 8 |   | All in Tab 1 | EFFORT | Fmsy2024 | BH | No | no |
| 9 |   | All in Tab 1 | EFFORT | Fmsy2024 | geomean | HYPER | FRA/6NM |
| 10 |   | All in Tab 1 | EFFORT | FIXREDUX | BH | HYPER | FRA/6NM |
| 11 |   | All in Tab 1 | EFFORT | FIXREDUX | geomean | No | no |
| 12 |   | All in Tab 1 | EFFORT | FIXREDUX | BH | No | FRA/6NM |
| 13 |   | All in Tab 1 | EFFORT | FIXREDUX | geomean | HYPER | no |
| 14 |   | All in Tab 1 | EFFORT | FIXREDUX | BH | HYPER | no |
| 15 |   | All in Tab 1 | EFFORT | FIXREDUX | geomean | No | FRA/6NM |
| 16 |   | All in Tab 1 | EFFORT | FIXREDUX | BH | No | no |
| 17 |   | All in Tab 1 | EFFORT | FIXREDUX | geomean | HYPER | FRA/6NM |
| 18 |   | SOL + NEP | CATCHLIM | Fmsy2020 | geomean | No | no |
| 19 |   | SOL + NEP | CATCHLIM | Fmsy2024 | geomean | No | no |
| 20 |   | SOL + NEP | CATCHLIM | Fmsy2024 | BH | No | FRA/6NM |
| 21 |   | SOL + NEP | CATCHLIM | Fmsy2024 | geomean | No | FRA/6NM |
| 22 |   | SOL + NEP | CATCHLIM | Fmsy2024 | BH | No | no |
| 23 |   | SOL + NEP | CATCHLIM | FIXREDUX | geomean | No | no |
| 24 |   | SOL + NEP | CATCHLIM | FIXREDUX | BH | No | FRA/6NM |
| 25 |   | SOL + NEP | CATCHLIM | FIXREDUX | geomean | No | FRA/6NM |
| 26 |   | SOL + NEP | CATCHLIM | FIXREDUX | BH | No | no |

1. List EWGS 17-15 etc [↑](#footnote-ref-1)
2. Scarcella, Giuseppe, Fabio Grati, Saša Raicevich, Tommaso Russo, Roberto Gramolini, Robert D. Scott, Piero Polidori et al. "Common sole in the northern and central Adriatic Sea: spatial management scenarios to rebuild the stock." *Journal of sea research* 89 (2014): 12-22.

February 2014 Netherlands Journal of Sea Research 89 [↑](#footnote-ref-2)
3. Bastardie, Francois, Silvia Angelini, Luca Bolognini, Federico Fuga, Chiara Manfredi, Michela Martinelli, J. Rasmus Nielsen, Alberto Santojanni, Giuseppe Scarcella, and Fabio Grati. "Spatial planning for fisheries in the Northern Adriatic: working toward viable and sustainable fishing." *Ecosphere* 8, no. 2 (2017). [↑](#footnote-ref-3)