



Study on the evaluation of specific management scenarios for the preparation of multiannual management plans in the Mediterranean and the Black Sea
(tender MARE /2014/27)

Management scenarios for the preparation of multi-annual management plans of demersal stocks in GSA 18 (Southern Adriatic Sea)

CASE STUDY on demersal stocks in GSA 18, Southern Adriatic Sea

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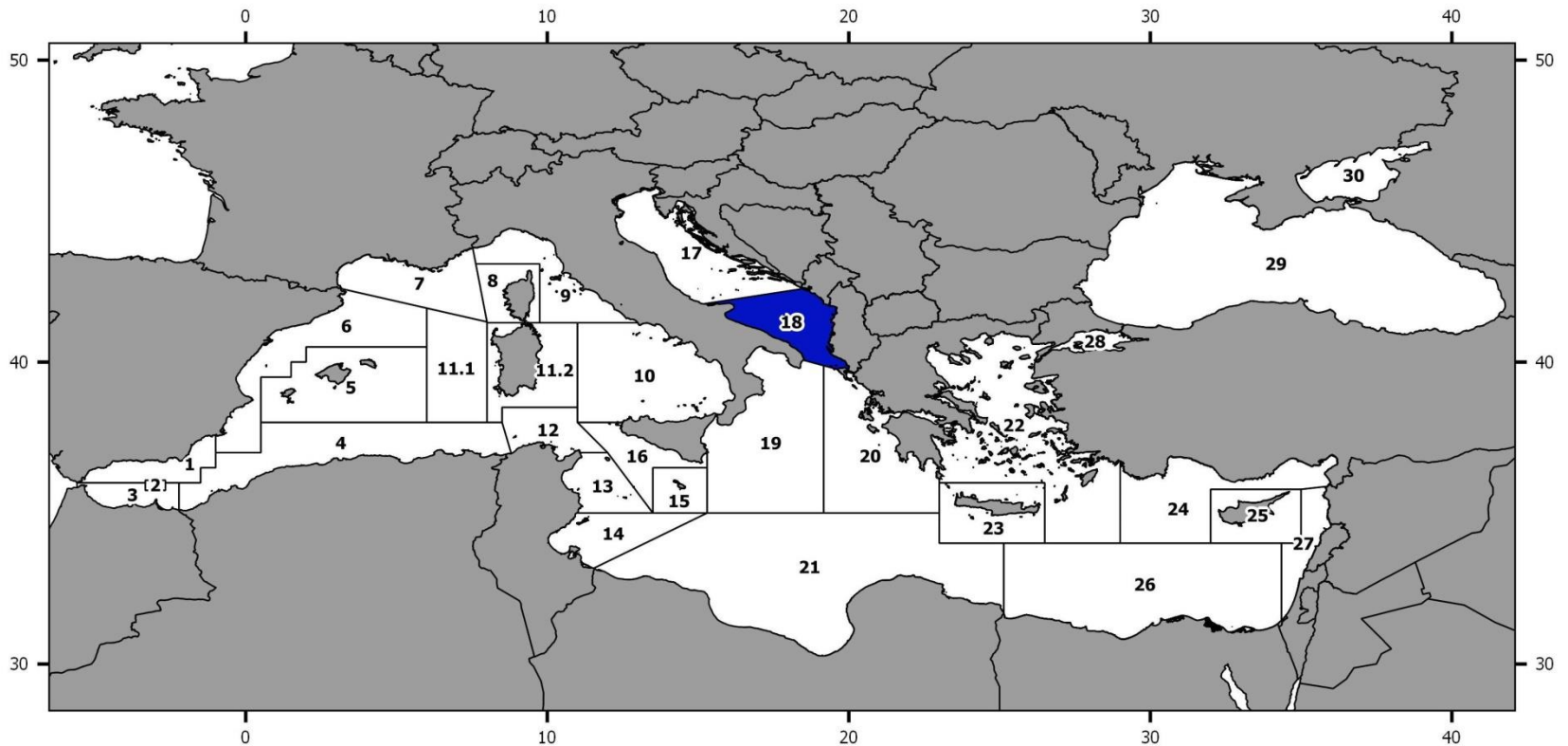
Seminar on the results of the "Assessment of management scenarios for the preparation of long-term plans in the Mediterranean"

Malta, November 10th 2015



Case study area

FAO-GFCM Geographical Sub-Area 18 (GSA 18, Southern Adriatic Sea)

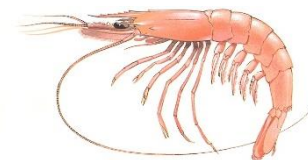


Assessed stocks

European hake (*M. merluccius*)



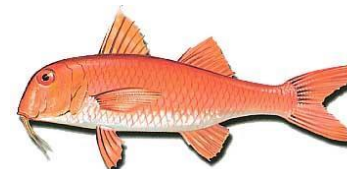
Deep-water rose shrimp (*P. longirostris*)



Norway lobster (*N. norvegicus*)



Red mullet (*M. barbatus*)



Involved Fleets

10 main fleet segments operating in the Adriatic, by country, geographical sub-areas, fisheries and vessel length stratum have been identified.

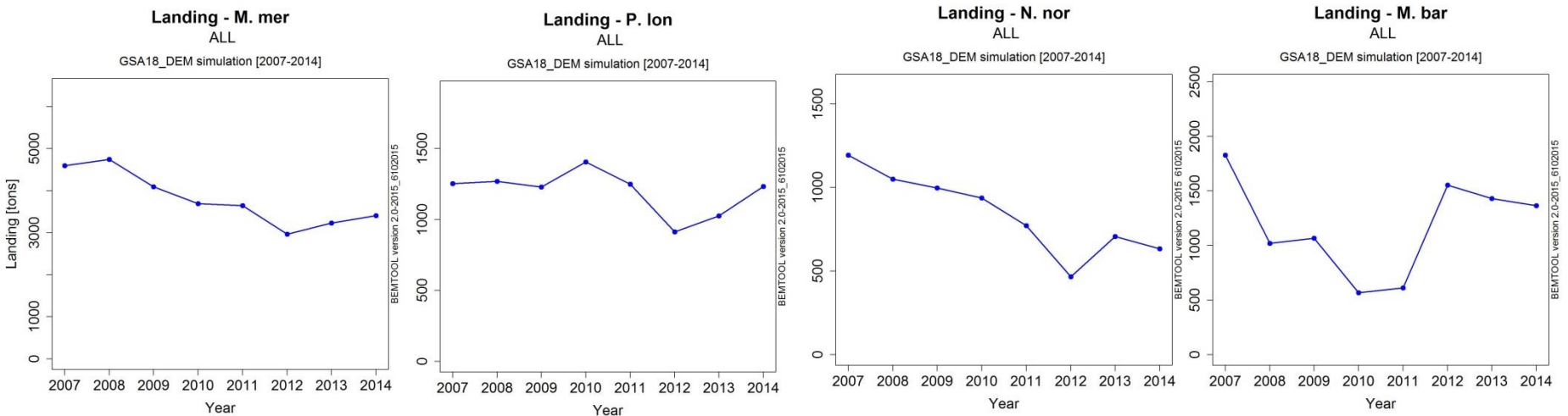
M. merluccius and *P. longirostris* are shared among the countries belonging to GSA 18 (Italy, Albania and Montenegro), while *N. norvegicus* is exploited essentially by Italy. Red mullet has been assumed exploited only by Italy, because of the uncertainty on the production and the exploitation pattern of the Eastern side of the GSA.

	Fleet name	Fleet code
1	Italian bottom trawlers from 6 to 12 m	ITA_DTS_0612
2	Italian bottom trawlers from 12 to 18 m	ITA_DTS_1218
3	Italian bottom trawlers from 18 to 40 m	ITA_DTS_1824_2440
4	Italian longlines from 12 to 18 m	ITA_HOK_1218
5	Italian small scale up to 12 m	ITA_PGP_0006_0612
6	Albanian bottom trawlers from 12 to 24 m	ALB_DTS_1224
7	Montenegrin small scale up to 12 m	MNE_DFN_0012
8	Montenegrin bottom trawlers from 6 to 12 m	MNE_DTS_0612
9	Montenegrin bottom trawlers from 12 to 24 m	MNE_DTS_1224
10	Montenegrin longlines up to 12 m	MNE_HOK_0012

Contribution of the stocks to the production of the specific fisheries

- ✚ landing of hake is mostly due to the Italian fleet: share 90%, of which 10% of long-liners;
- ✚ the share of deep water pink shrimp is approximately 66% Italian trawlers, 33% Albanian trawlers and 2% Montenegrin trawlers;
- ✚ red mullet and Norway lobster have been assumed exploited only by Italy, because of the uncertainty on the production and the exploitation pattern of the Eastern side of the GSA

Total landing of European hake, Deep-water rose shrimp, Norway lobster and Red mullet



M. Mer = European hake ***P. lon*** = Deep-water pink shrimp ***N. nor*** = Norway lobster ***M. bar*** = Red mullet

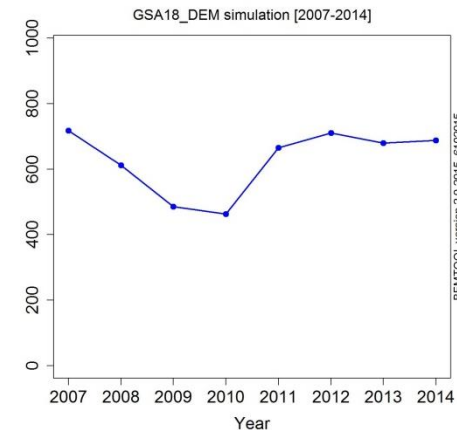
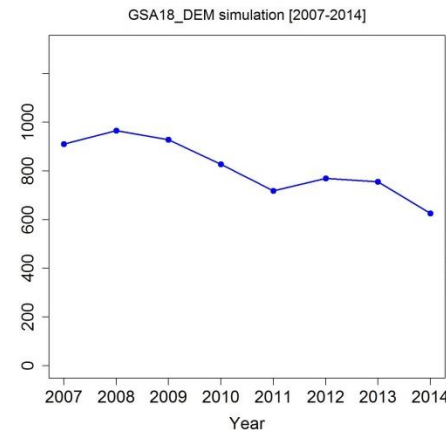
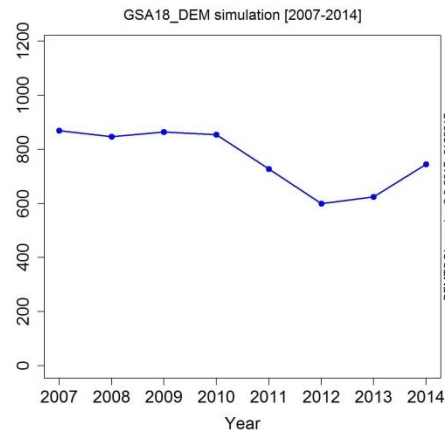
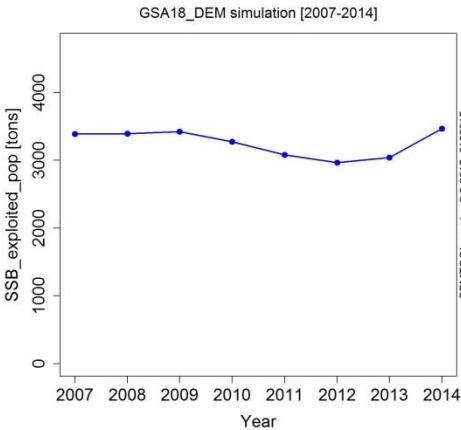
SSB of European hake, Deep-water rose shrimp, Norway lobster and Red mullet

SSB_exploited_pop - M. mer

SSB_exploited_pop - P. lon

SSB_exploited_pop - N. nor

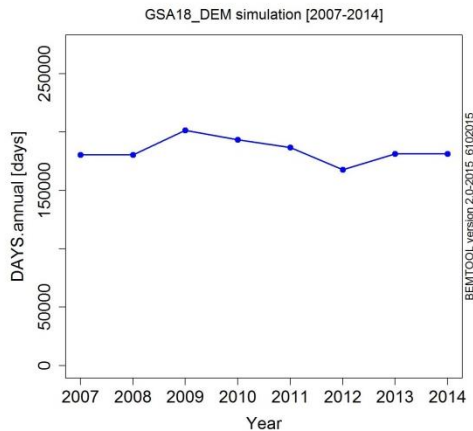
SSB_exploited_pop - M. bar



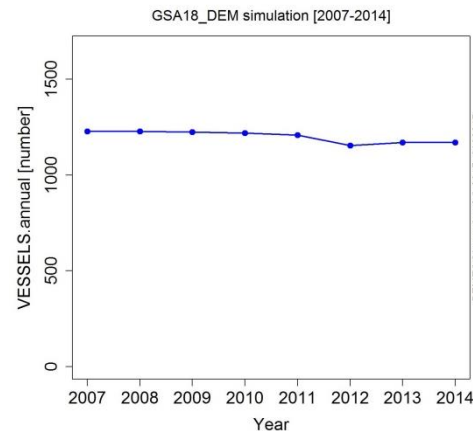
M. Mer = European hake **P. lon** = Deep-water pink shrimp **N. nor** = Norway lobster **M. bar** = Red mullet

Fishing capacity (nb. of vessels) and fishing activity (annual fishing days) of all segments combined

DAYS.annual
ALL

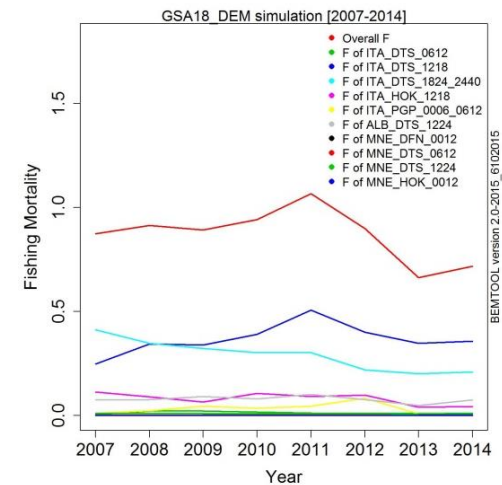


VESSELS.annual
ALL



Fishing mortality F of European hake (M. Merluccius) total and by fleet segment

Fishing Mortality - M. mer

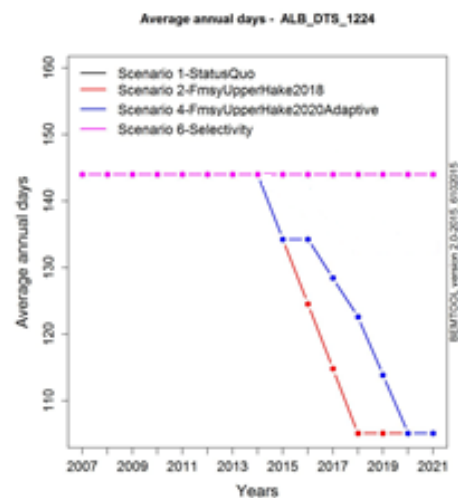
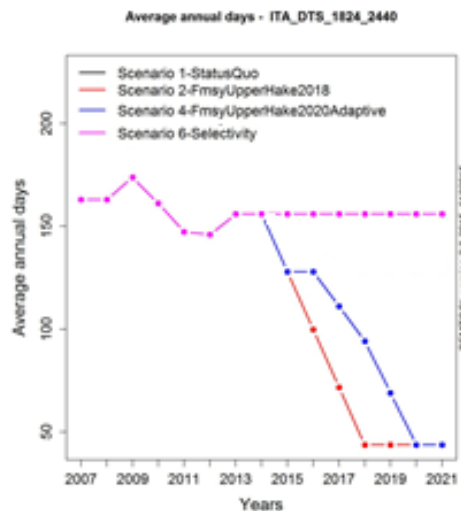


Reduction of Fishing Mortality

According to the state of exploitation of European hake

- a reduction of F by 73% is needed to reach F_{msy} upper to reach the F_{msy} combined
- a reduction of 70% on the overall fishing mortality would be needed the two approaches are quite similar

All fleets have been reduced, except Italian PGP0006-0012 and Montenegrin fleets, as their combined fishing mortality represented less than the 2 % of the overall combined fishing mortality of the target stocks



Scenarios

The scenarios were implemented according to 2 main objectives:

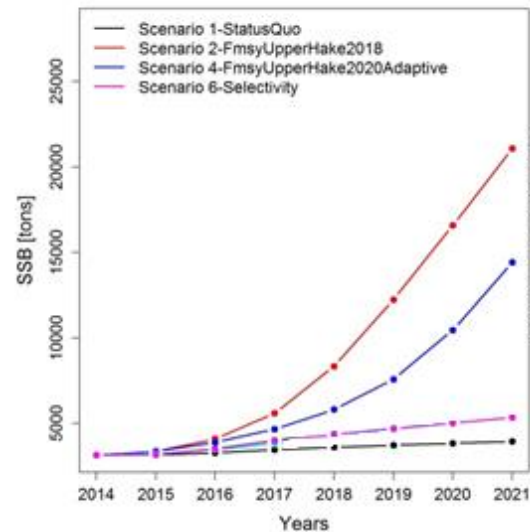
- to reduce the fishing mortality of hake (the most overexploited stock) to its reference point (F_{msy}^{upper})
- test selectivity

Scenario 1	Status quo to 2021
Scenario 2	Linear reduction towards upper F_{msy} of the most heavily exploited species in 2018 applied on both activity and capacity, up to 2017 included, then on the activity only. Application be differentiated by fleet.
Scenario 4	Adaptive reduction towards upper F_{msy} of the most heavily exploited species in 2020 applied only to activity from 2018 to 2020. Application be differentiated by fleet.
Scenario 6	Improving selectivity, delaying the size at first capture

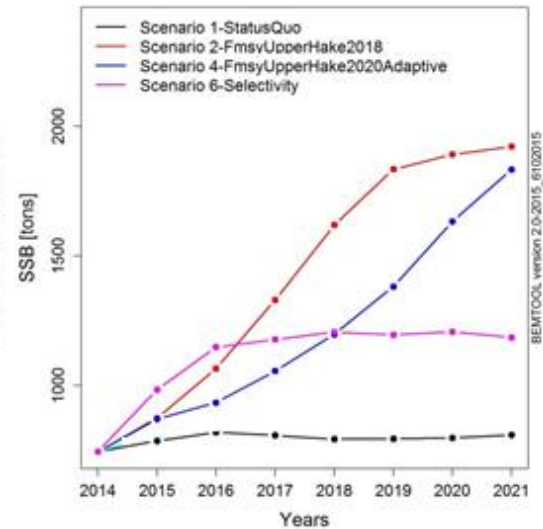
Forecasts of Spawning Stock Biomass (SSB) under the different scenarios

M. Mer = European hake
P. Ion = Deep-water pink shrimp
N. nor = Norway lobster
M. bar = Red mullet

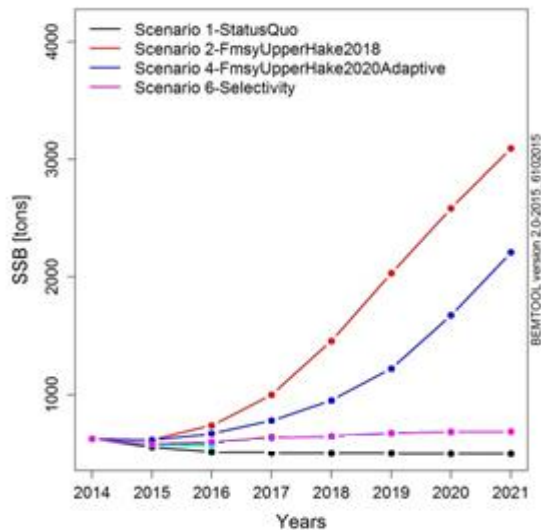
M. mer - SSB forecast



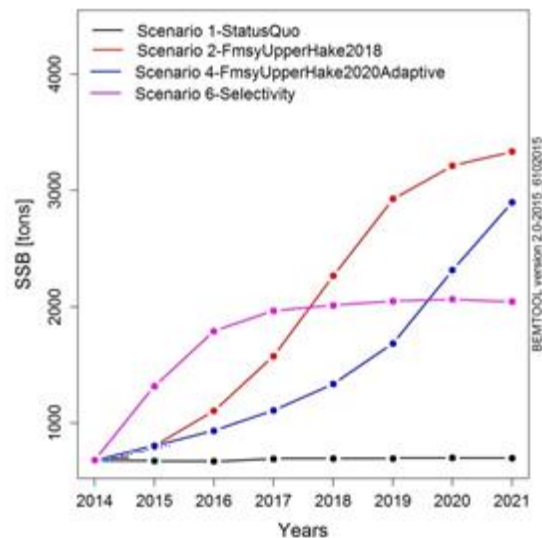
P. Ion - SSB forecast



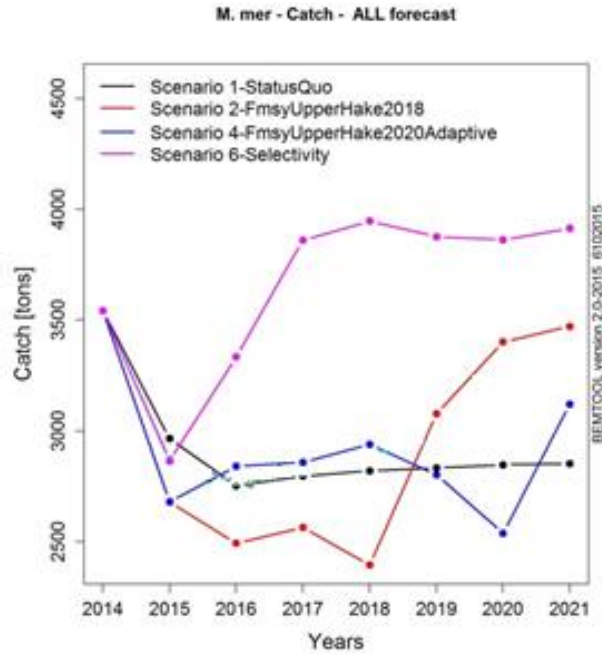
N. nor - SSB forecast



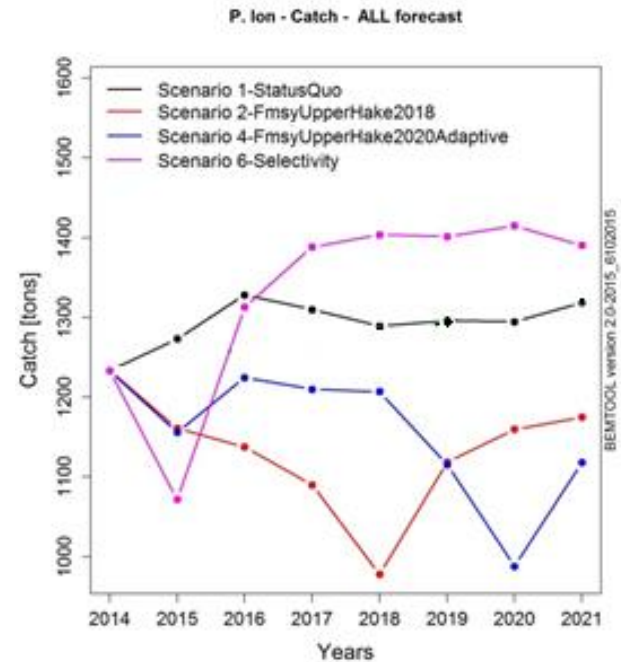
M. bar - SSB forecast



Forecasts of Catches under the different scenarios



M. Mer = European hake
P. Ion = Deep-water pink shrimp

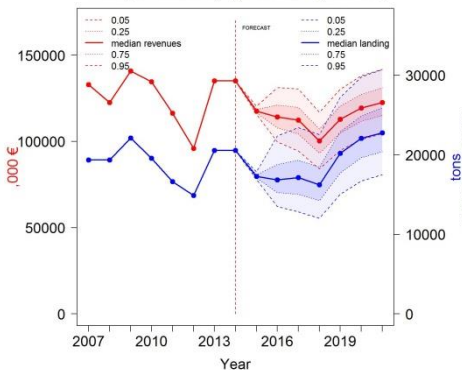


Two extreme situations

Forecasts of revenues and landings under Fupper 2018 European hake scenario for overall fleet and main fleet strata

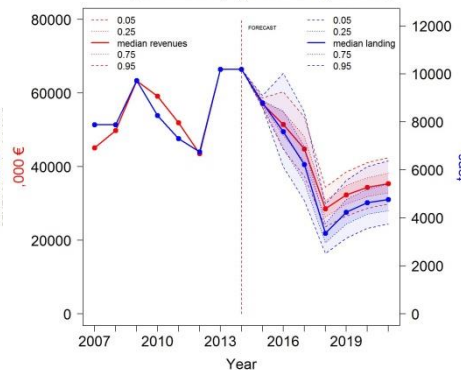
Revenues-Landing - Overall

GSA18_DEM HR2-FmsyUpperHake2018 [2007-2021]



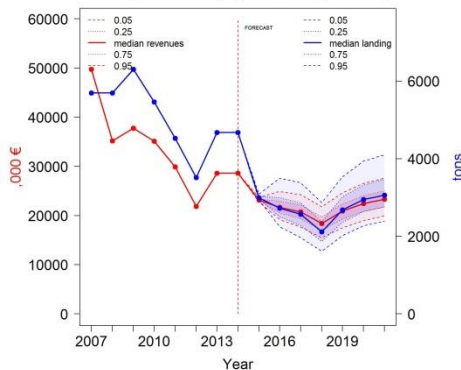
Revenues-Landing - ITA_DTS_1218

GSA18_DEM HR2-FmsyUpperHake2018 [2007-2021]



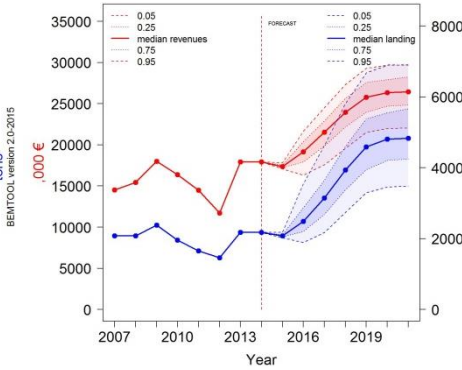
Revenues-Landing - ITA_DTS_1824_2440

GSA18_DEM HR2-FmsyUpperHake2018 [2007-2021]



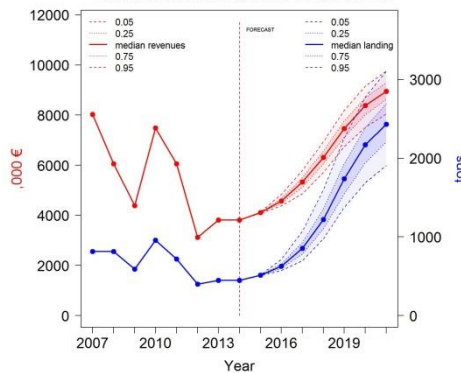
Revenues-Landing - ITA_PGP_0006_0612

GSA18_DEM HR2-FmsyUpperHake2018 [2007-2021]



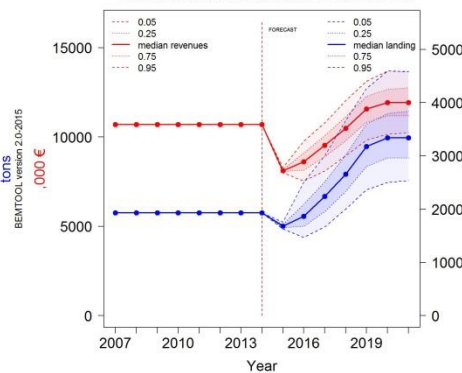
Revenues-Landing - ITA_HOK_1218

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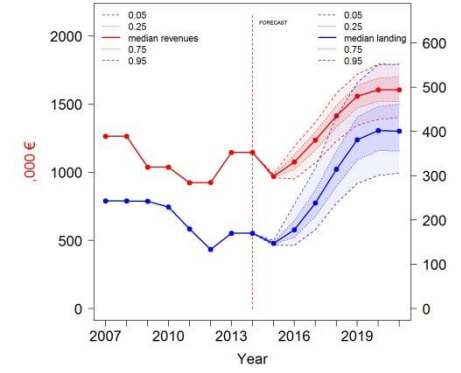
Revenues-Landing - ALB_DTS_1224

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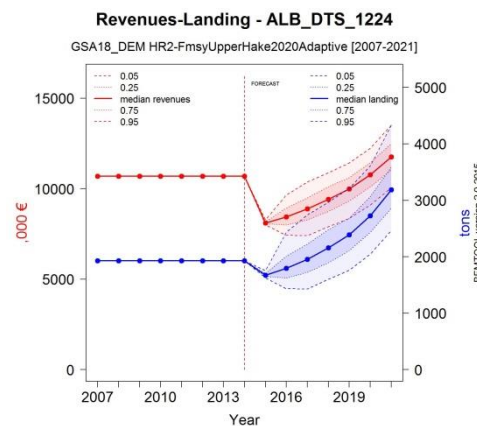
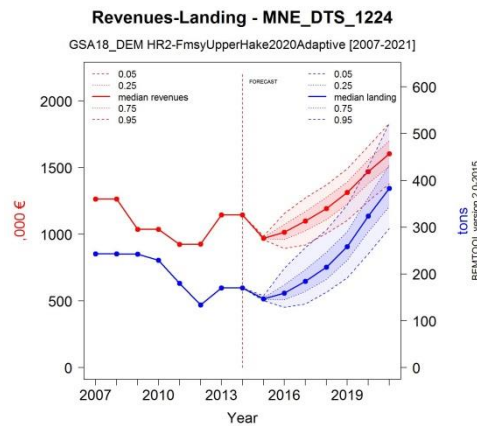
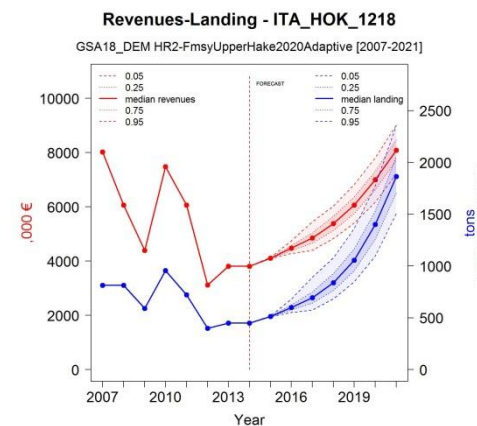
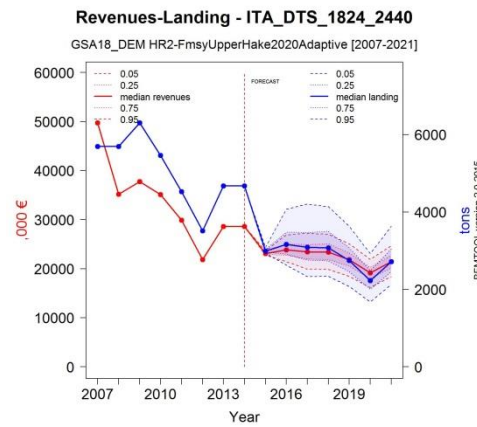
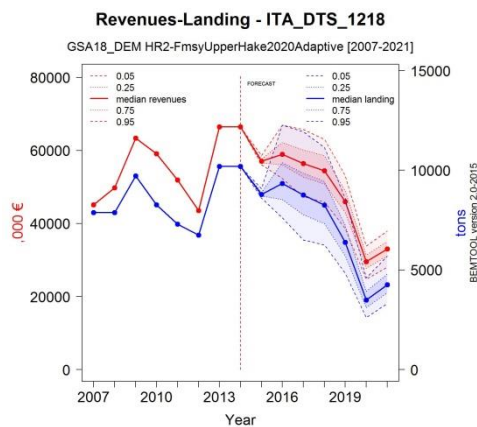
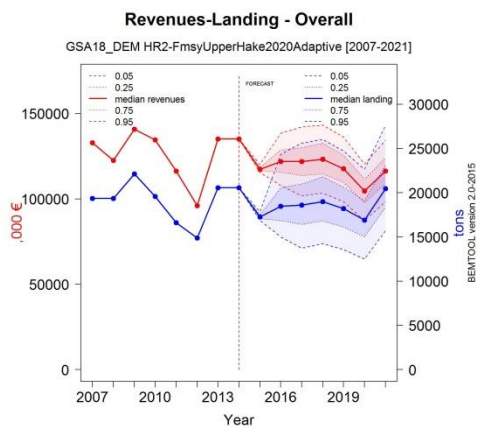


Revenues-Landing - MNE_DTS_1224

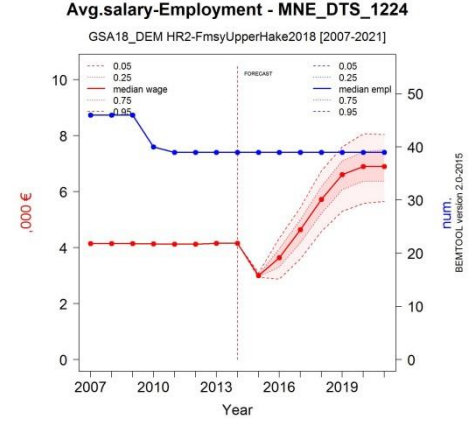
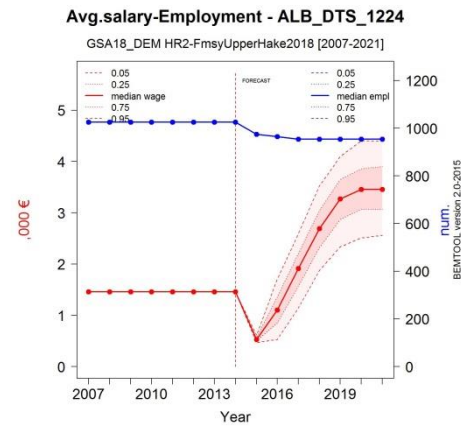
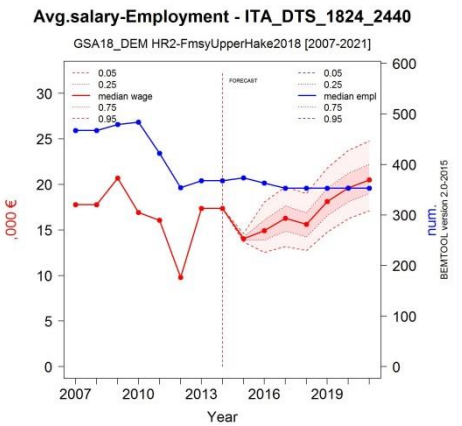
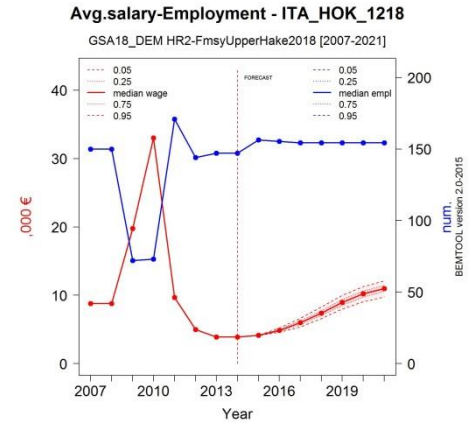
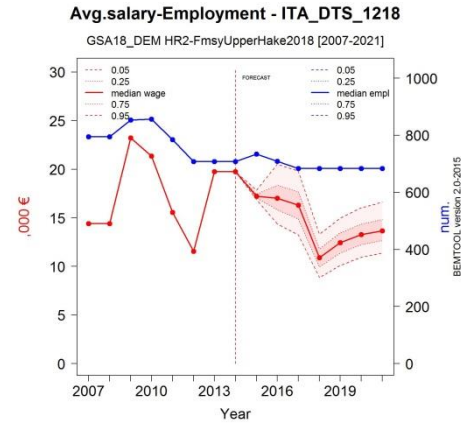
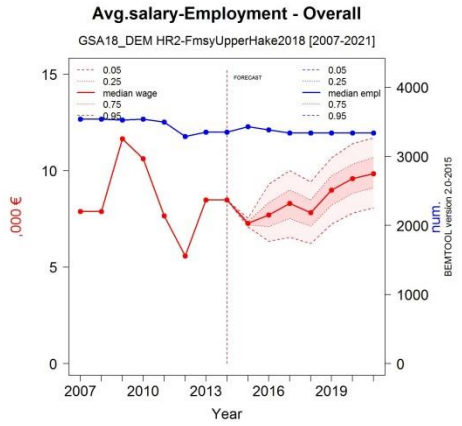
GSA18_DEM HR2-FmsyUpperHake2018 [2007-2021]



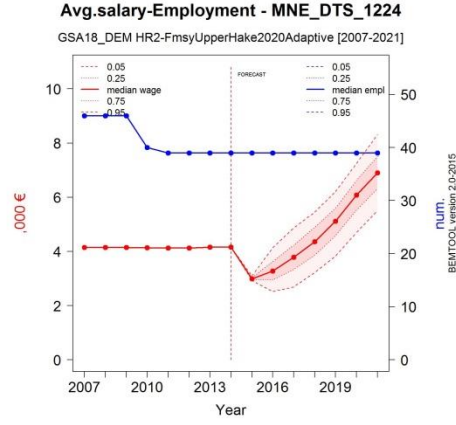
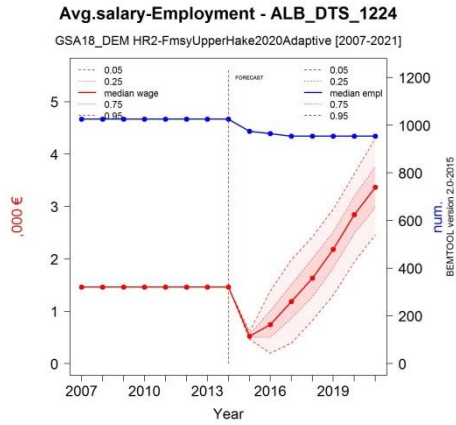
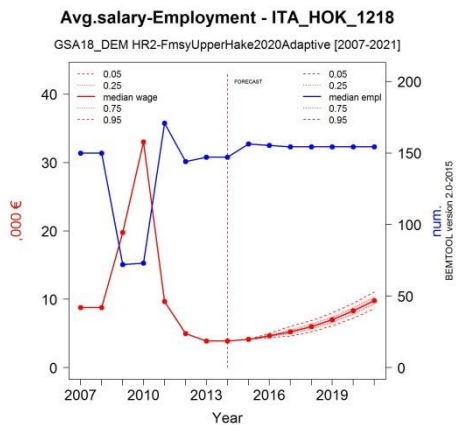
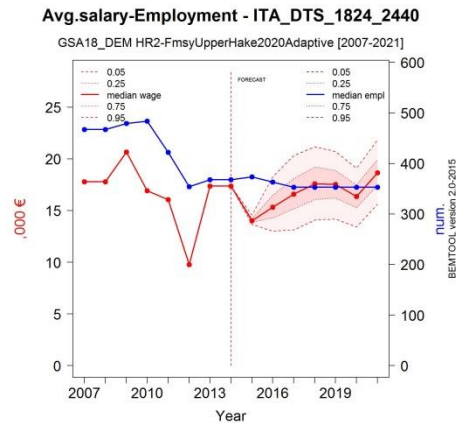
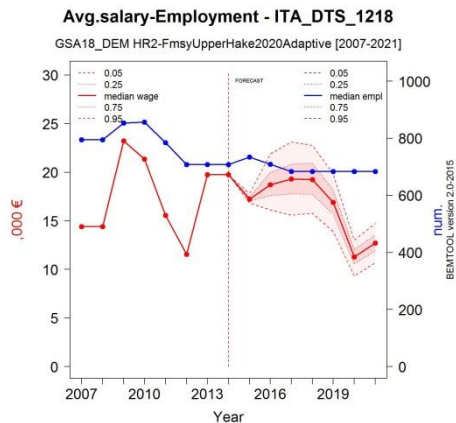
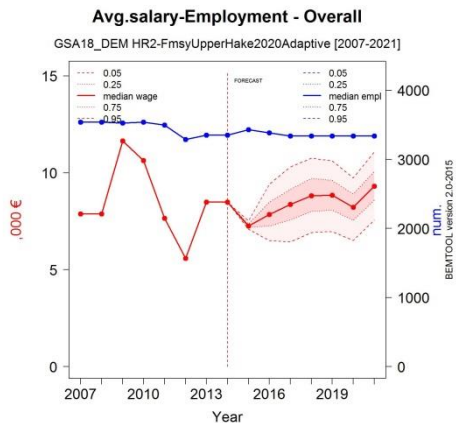
Forecasts of revenues and landings under Fupper European hake 2020 scenario for overall fleet and main fleet strata



Forecasts of average wage under Fupper 2018 European hake scenario for overall fleet and main fleet strata



Forecasts of average wage under Fupper European hake 2020 scenario for overall fleet and main fleet strata

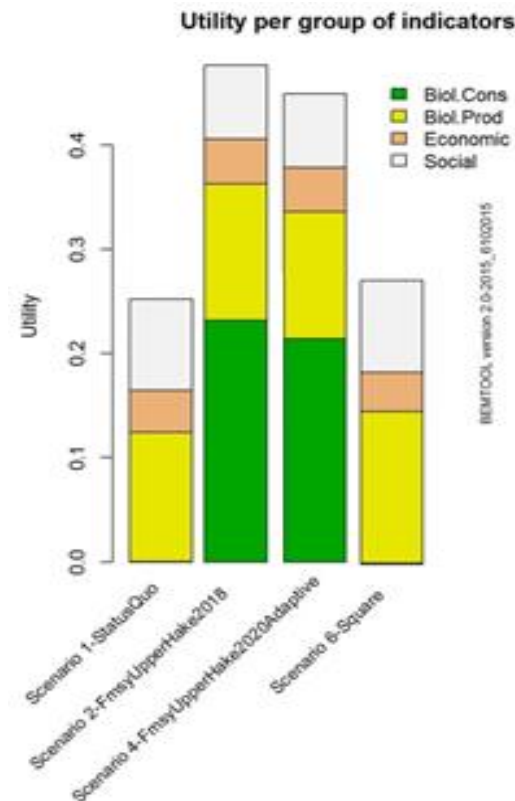


Traffic light table for all fleets combined

Scenario year 2021	Salary	CR.BER	Revenues	Empl	SSB hake	SSB pink shrimp	SSB Norway lobster	SSB red mullet	Catch hake	Catch pink shrimp	Catch Norway lobster	Catch red mullet
Scenario 2	103.3	37.3	0.0	-4.0	432.9	137.5	520.7	376.3	21.7	-10.9	-2.3	4.1
Scenario 4	85.7	28.3	-5.1	-4.0	264.7	126.4	343.3	314.1	9.4	-15.2	-29.3	-9.0
Scenario 6	-4.4	-8.9	-4.5	0.0	35.2	35.2	46.5	38.1	37.2	5.4	15.5	42.8

Multi-Criteria Decision Analysis (MCDA)

According to the (MCDA), the scenarios allowing to reach the highest overall utility are scenarios 2 and 4 (overall utility 0.48 and 0.45 respectively), while the lowest utility is given by status quo (overall utility 0.25).



Some concluding remarks

The performed scenarios allow to obtain a benefit on the SSB of the 4 stocks under consideration in respect to the status quo.

The best performance for SSB is showed by Scenario 2, whilst the worse result is observed in the status quo. Adaptive scenario (Scenario 4) shows a reduced short term benefit for SSB, but also a reduced decrease on the landings of the overall catch of all stocks in the short term.

Management Strategy Evaluation (MSE) applied on hake showed that moving to MSY will result in fluctuation in catches in the short-term though they will increase and stabilise over the longer-term. The probability of being below Blim decreases over the time of management.

The projections performed with BEMTOOL model showed that all the performed scenarios (to lesser extent scenario 6), allow to obtain a benefit in terms of salary and CR.BER.

According to MCDA the scenarios that allows to reach the highest overall utility are scenarios 2 and 4, while the lowest utility is given by Scenario 1, the status quo. This result is in agreement with the traffic light table.