Framework Contract No EASME/EMFF/2016/032

Specific Contract 04

Improving the selectivity of trawl gears in the Mediterranean Sea to advance the sustainable exploitation pattern of trawl fisheries (IMPLEMED)

This project has received funding from the European Maritime and Fisheries Fund of the European Commission under contract EASME/EMFF/2019-1.3.2.6-01-SC04

IMPLEMED is a project funded by the European Union – DG MARE

Administrative Management: CINEA (former EASME) – European Climate, Infrastructure and Environment Executive Agency

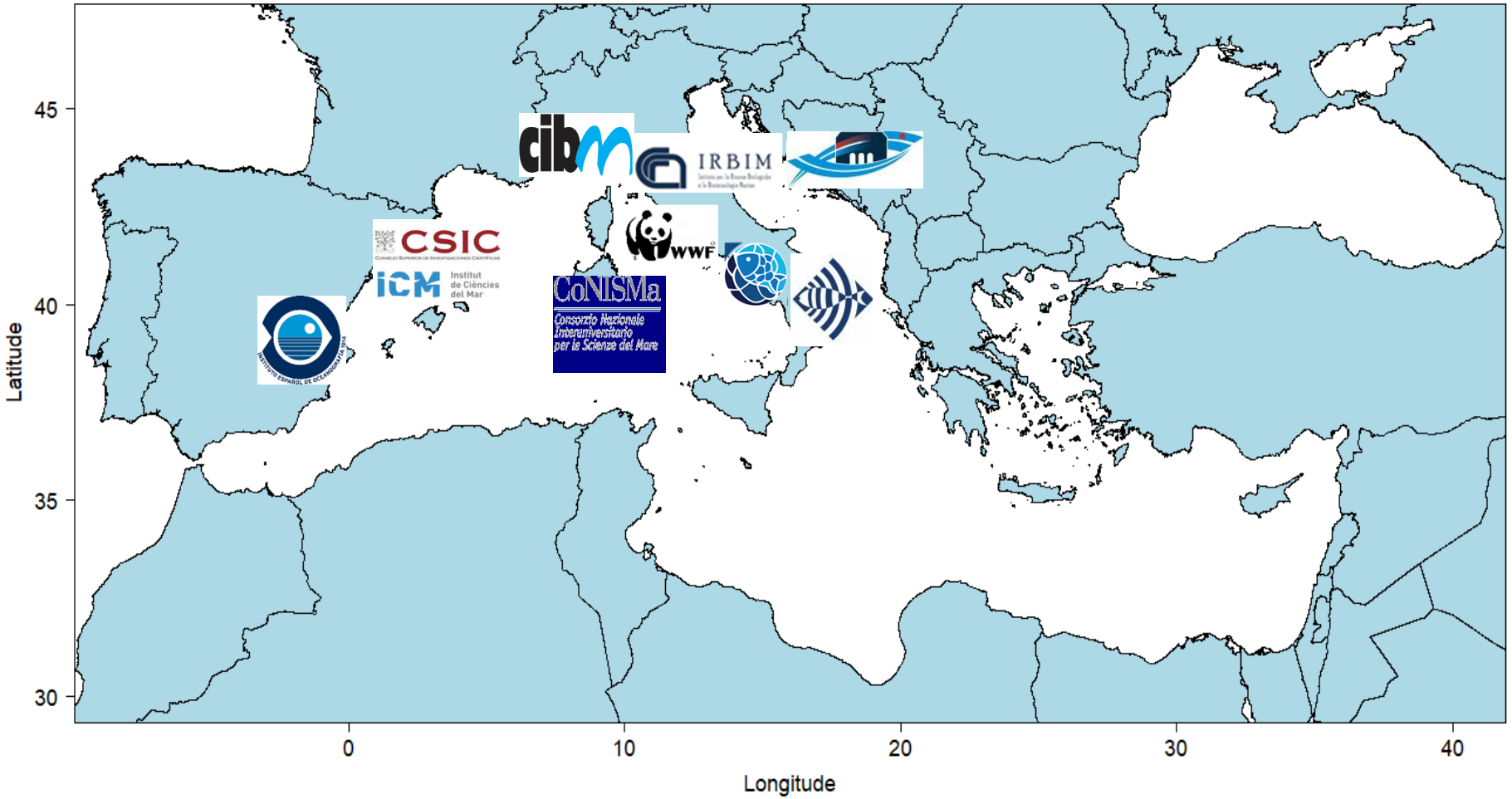
Start date of the project: 20th December 2019

End date of the project: 20th December 2021

Duration of the project: 24 months

This project is a tender: it differs from normal research projects in that the European Union already defines the objectives of the study to which researchers must give an answer.

Project coordinator: Mario Sbrana – Centro Interuniversitario di Biologia Marina ed Ecologia Applicata di Livorno (CIBM)



Consortium: 9 Partners (7 partners e 2 sub-contractors)
CONISMA participates with the University of Cagliari
CNR participates with CNR-IRBIM of Ancona

MAIN OBJECTIEPRINCIPALI OBIETTIVI DEL PROGETTO

Main objective:

- to **test selectivity devices** (with particular focus on the T90 and sorting grids), aimed at **improving the exploitation pattern and reducing discard rates** of regulated species, as well as non-commercial species, in trawl fisheries.

Specific objects:

- Review, examine and test selectivity devices to **increase selectivity in trawl nets;**
- Analyze the **improvement in selectivity and the reduction in discard rates** and assess the **bio-economic effects** of the implementation of such measures;
- **Engage fishers from the beginning;** share the methodology, the gear technical aspects and the results of the experiments with the stakeholders of the fishing sector, implementing a bottom-up approach.

Ares where the trials were performed

- GSA6 – Spain (Cataluña)
- GSA9 – Ligurian and north Tyrrhenian Sea
- GSA11 – Sardinian Sea
- GSA17 – Central-North Adriatic Sea

Devices experimented

- T90 mesh in the extension piece of the net
- Selection grids in the extension piece of the net
- 50 mm square mesh in the codend of the net

Target species

- European hake
- Red mullet
- Deep-water rose shrimp
- Norway lobster

PROJECT ACTIVITIES

1 REVISION OF THE STUDIES CARRIED OUT IN THE MEDITERRANEAN SEA

2 REVISION OF THE TECHNICAL REGULATION IN FORCE AT EUROPEAN UNION, NATIONAL AND LOCAL LEVELS

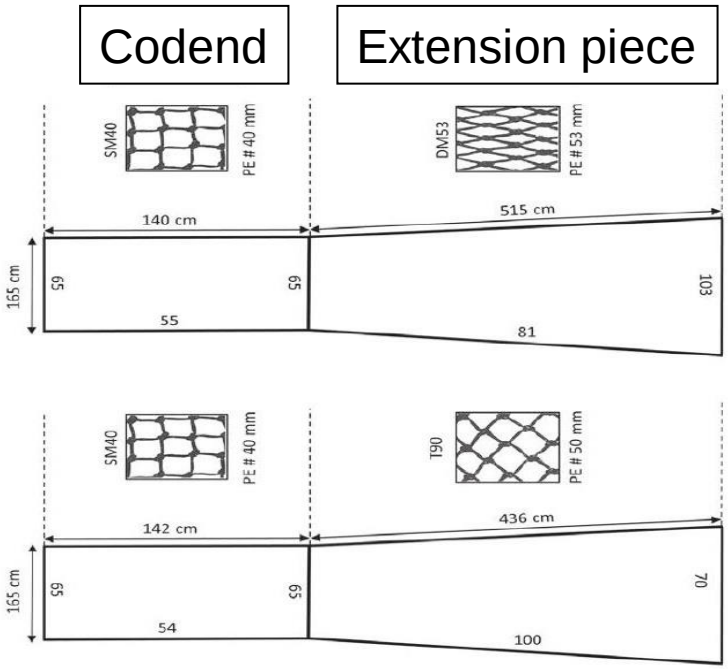
3 DEFINITION AND CONSTRUCTION OF THE DEVICES TO BE EXPERIMENTED

4 EXPERIMENTATION AT SEA OF THE DEVICES

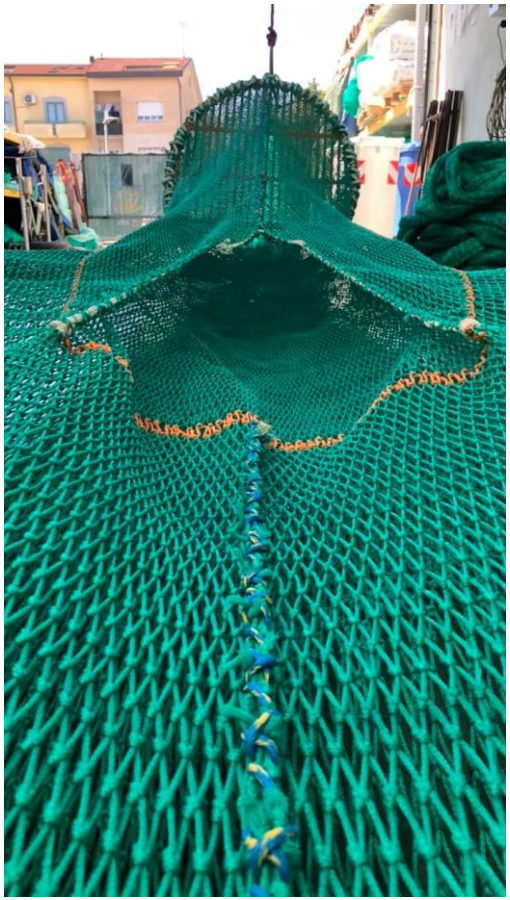
5 BIO-ECONOMIC ANALYSIS TO EVALUATE THE IMPACT OF THE USE OF SUCH DEVICES

6 INVOLVEMENT OF STAKEHOLDERS

T90 in the extension piece



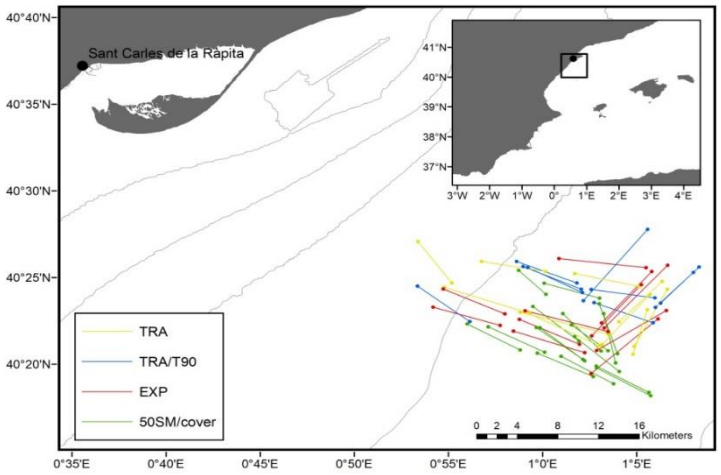
Selection grid

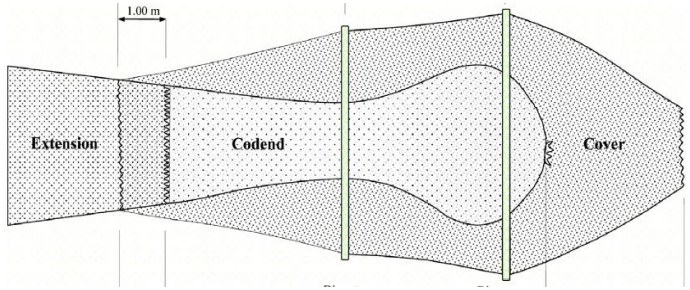


Case Study 1 – Experimentation of the 50 mm codend square mesh size And T90 in the extension piece.

Trials carried out in Spain with the cover-codend technique.

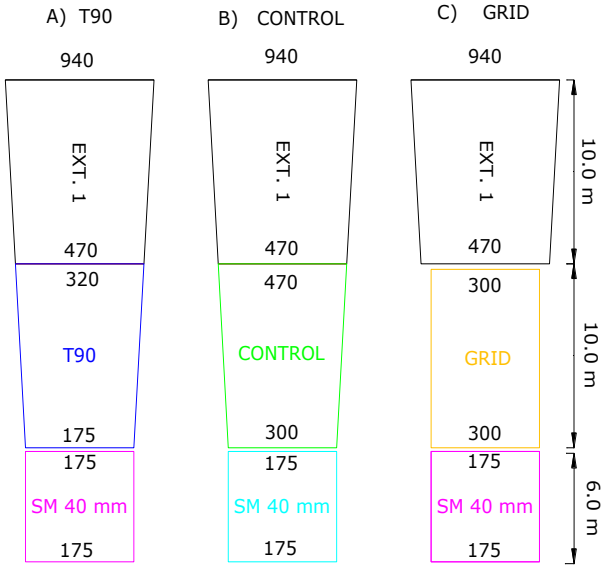
The results were also used in the Bio-economic model simulations for the Italian fleet in the Tyrrhenian Sea.



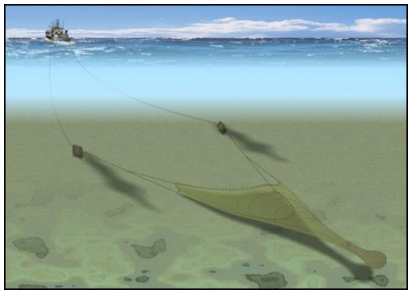


Case studies 2 & 3 – Experimentation of T90 and selection grid in the Northern Tyrrhenian Sea.

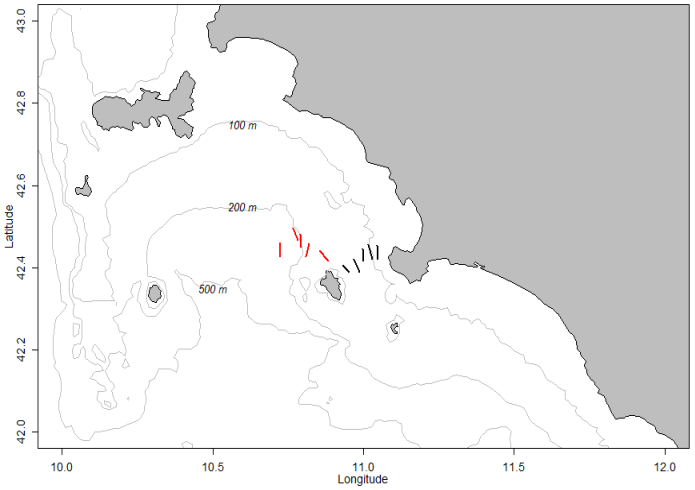
Period: from 3 to 27 August 2020.
Vessel: M/P Ciro I of Porto Santo Stefano (Tuscany)
Depth: 85-257 m



Scheme of the nets used during the experimentation. Extension piece and codend.

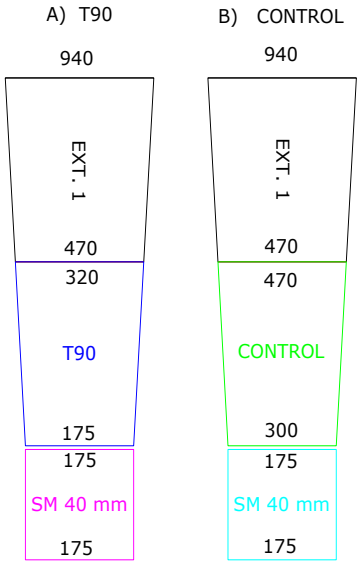


Total number of valid haulse:	81
Ccommercial net (Control):	27
T90:	27
Grid:	27

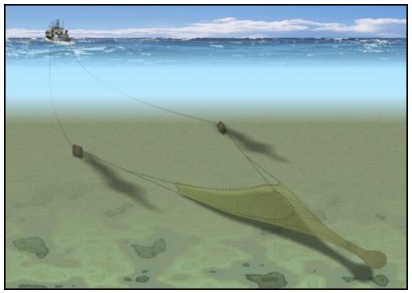


Pilot Study 1 – Experimentation of T90 in Sardinia.

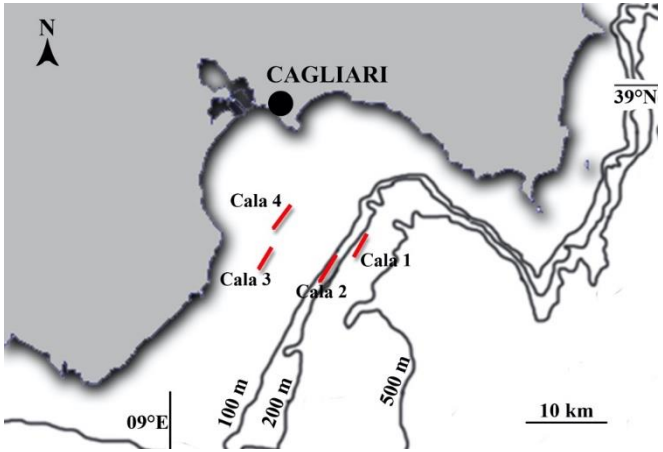
Period: from 15 to 16 October 2020.
Vessel: M/P Gisella of Cagliari (Sardinia)
Depth: 42-302 m



Scheme of the nets used during the experimentation. Extension piece and codend.



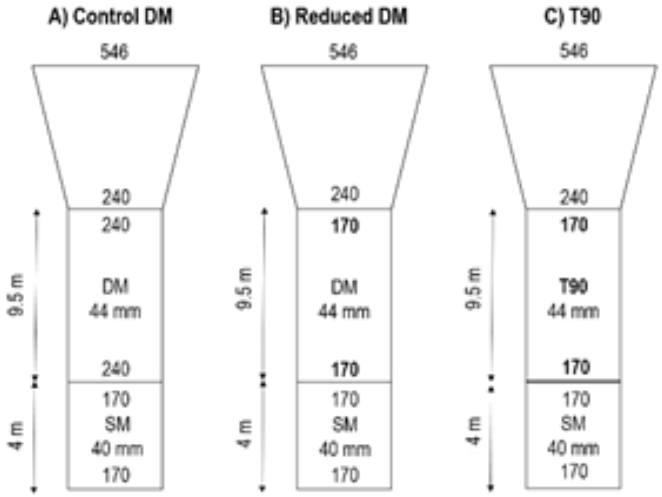
Total number of valid hauls: 8
Commercial net (Control DM): 4
T90: 4



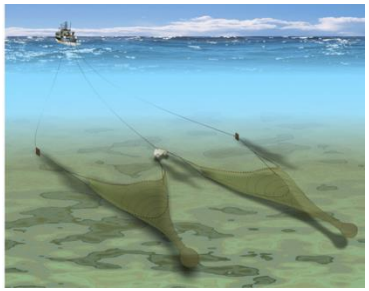
Case Study 4 – Eperimentation of T90 in Adriatic (Italian fleet).

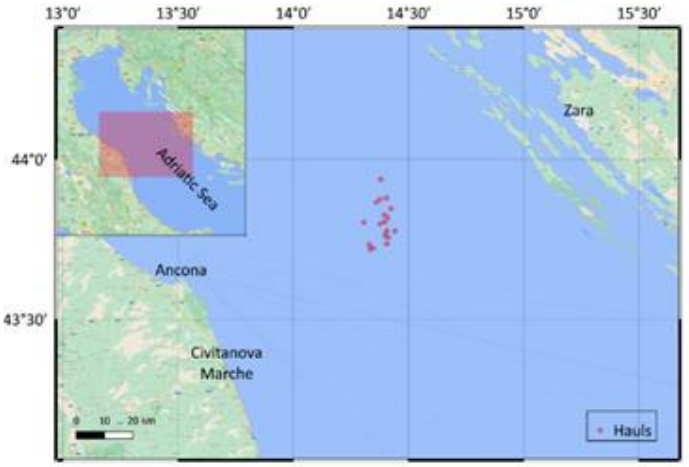
Period: from 22 to 25 February 2021.
Vessel: F/V Braveheart of Civitanova Marche (Marche)
Depth: 71-81 m

Total number of valid hauls: 36
Commercial net (Control DM): 12
Net with a reduced number of meshes in the extension piece: 12
T90: 12



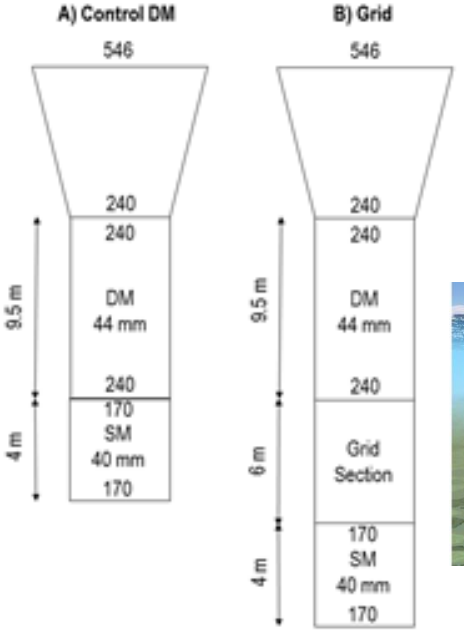
Scheme of the nets used during the experimentation. Extension piece and codend.

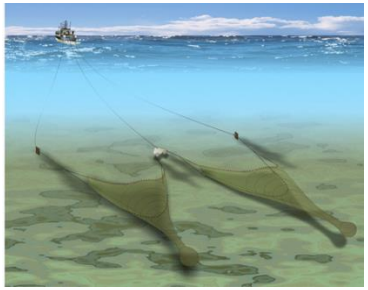




Case study 6 – Grid for Norway lobster in Adriatic (Italian fleet)

Period: 1-2 June 2021.
Vessel: F/V Braveheart di Civitanova Marche (Marche)
Depth: 190-251 m

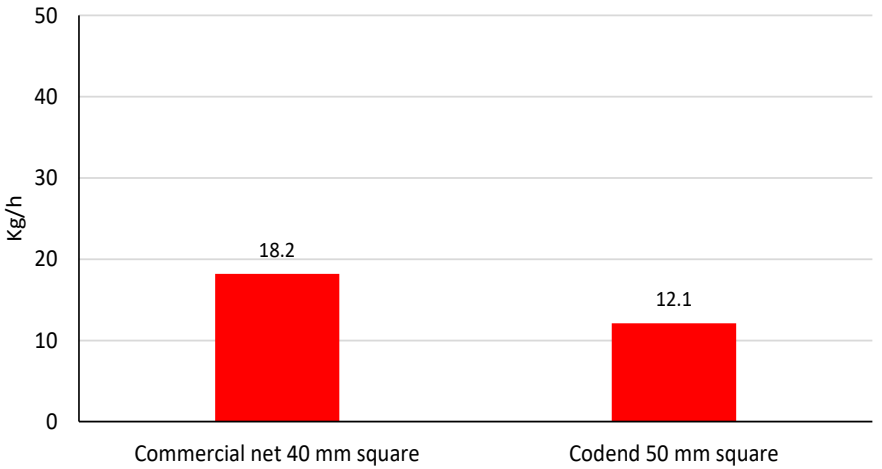




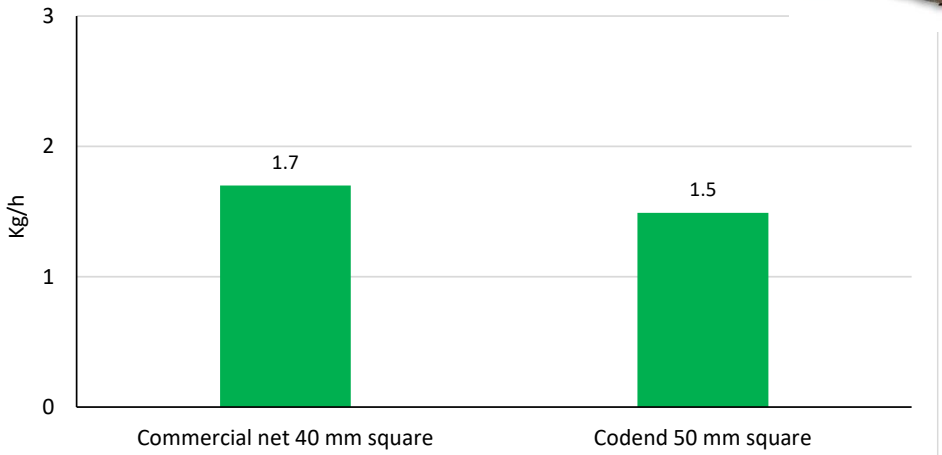
Scheme of the nets used during the experimentation. Extension piece and codend.

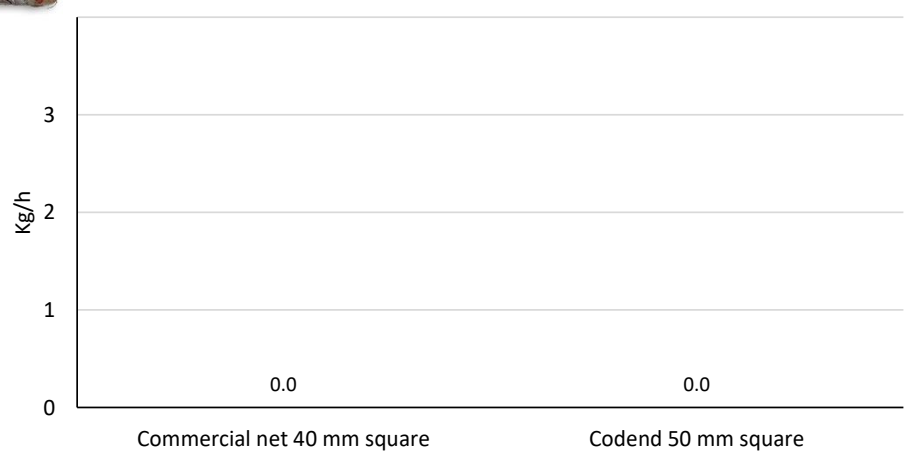
Total number of valid hauls: 24
Commercial net (Control DM): 12
Grid: 12

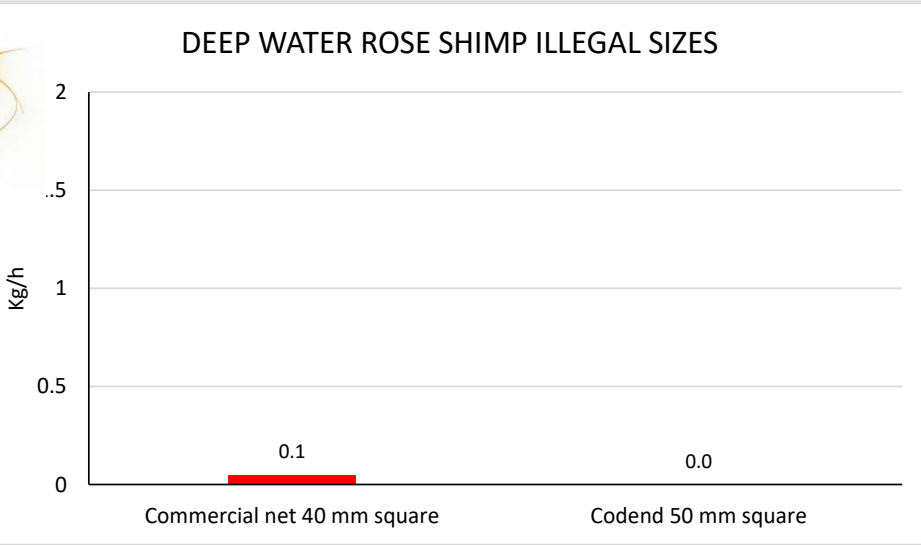
SPAIN (CATALUNA) - YIELD COMPARISON AMONG THE DIFFERENT NET CONFIGURATIONS



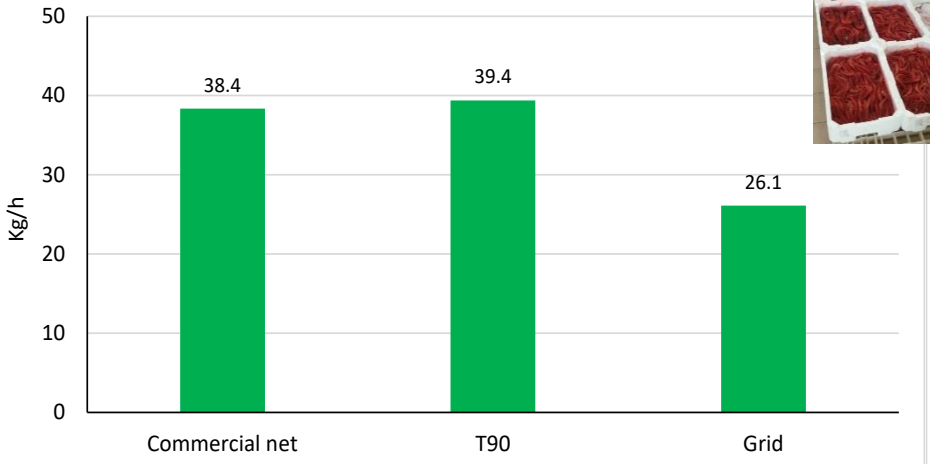
SPAIN (CATALUNA) - YIELD COMPARISON AMONG THE DIFFERENT NET CONFIGURATIONS

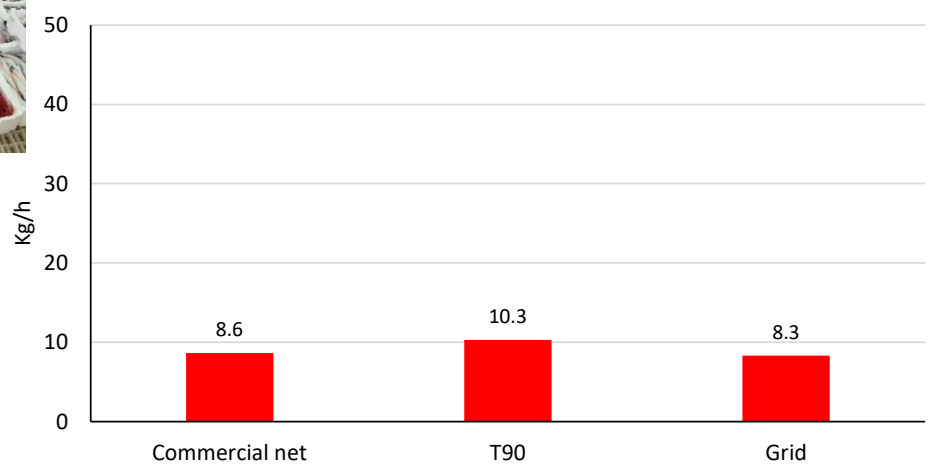


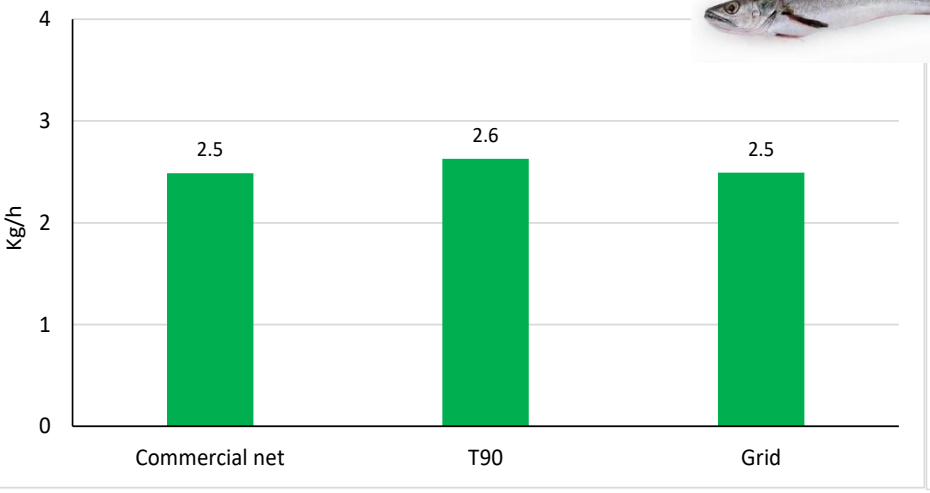


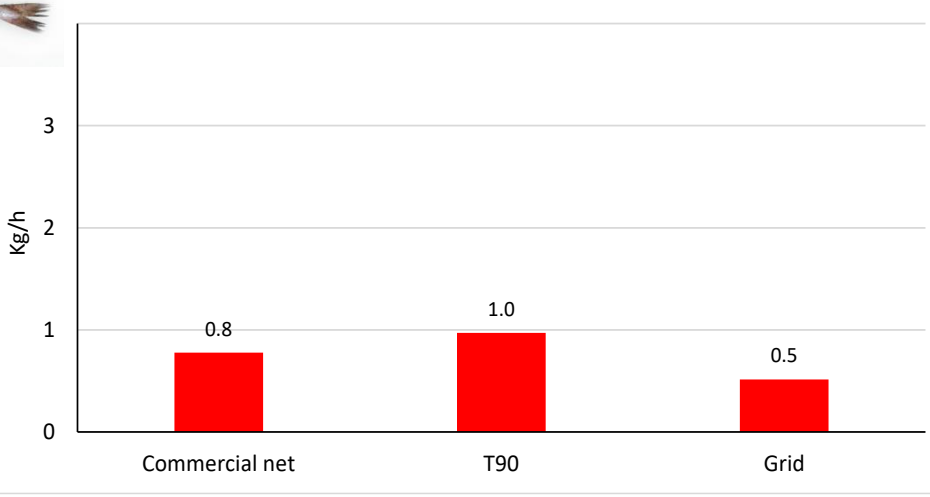


NORTHERN TIRRHENIAN SEA - YIELD COMPARISON AMONG THE DIFFERENT NET CONFIGURATIONS









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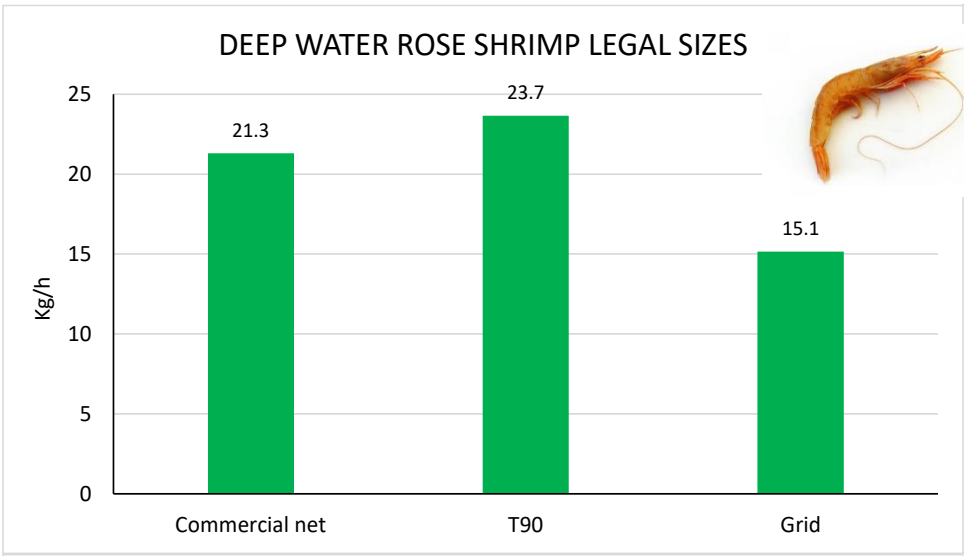
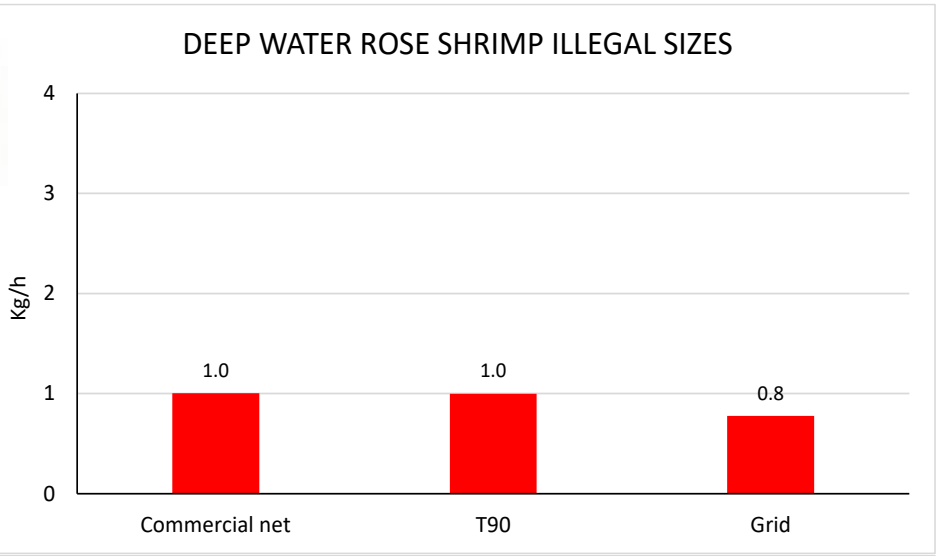
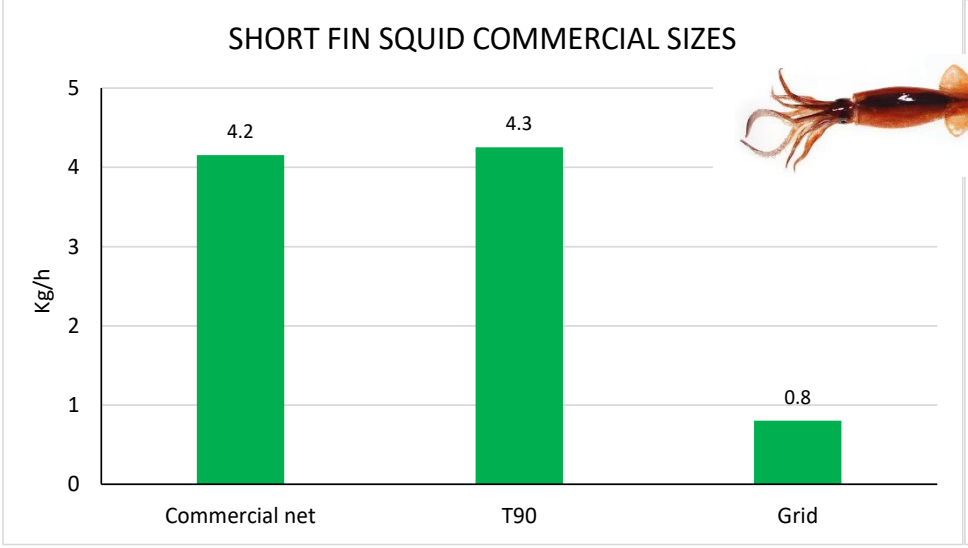
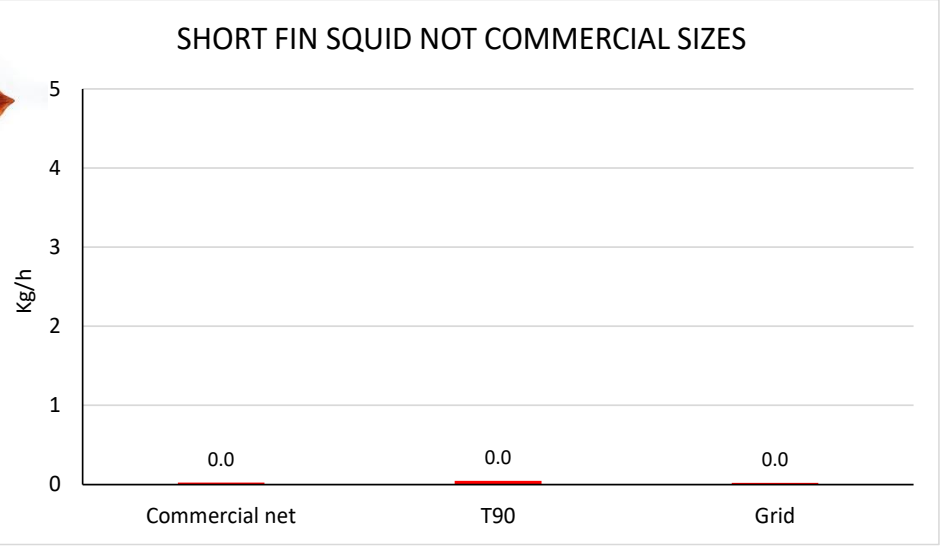


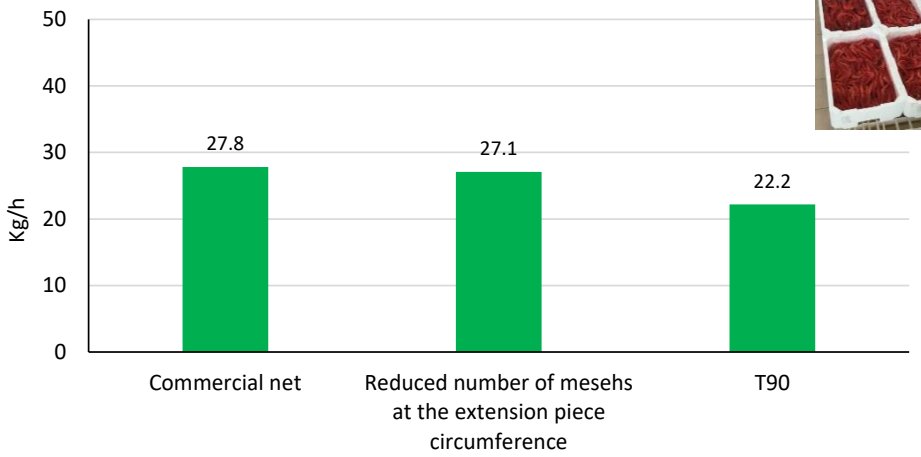




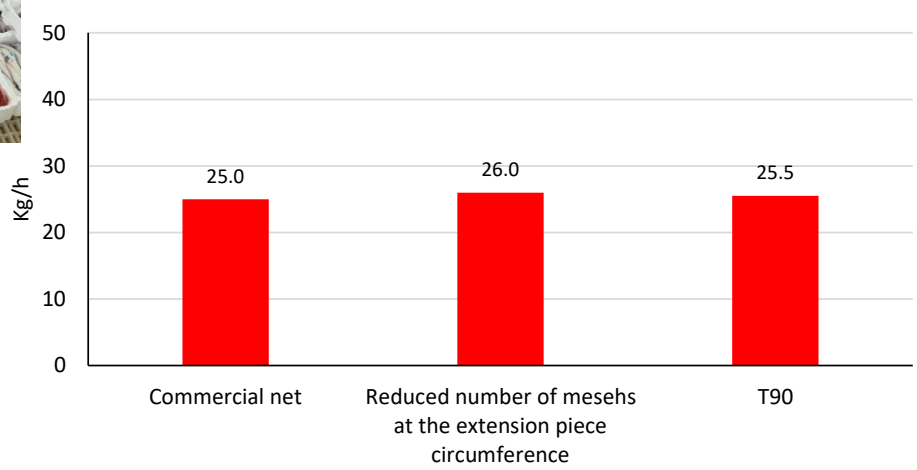


NORTH-CENTRAL ADRIATIC SEA - YIELD COMPARISON AMONG THE DIFFERENT NET CONFIGURATIONS

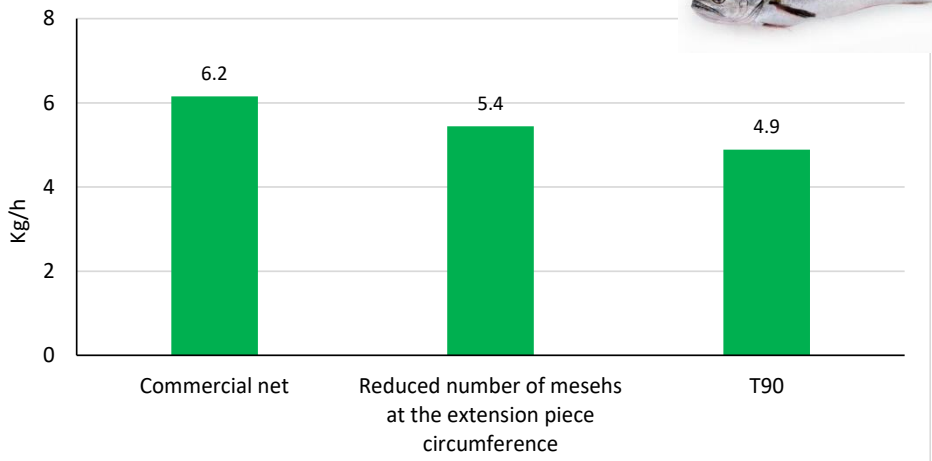
COMMERCIAL CATCH



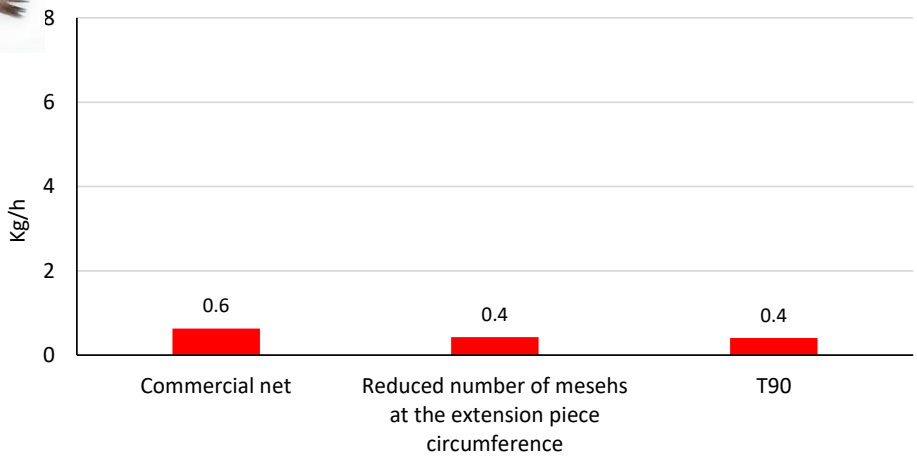
SPECIES & SIZES NOT COMMERCIAL



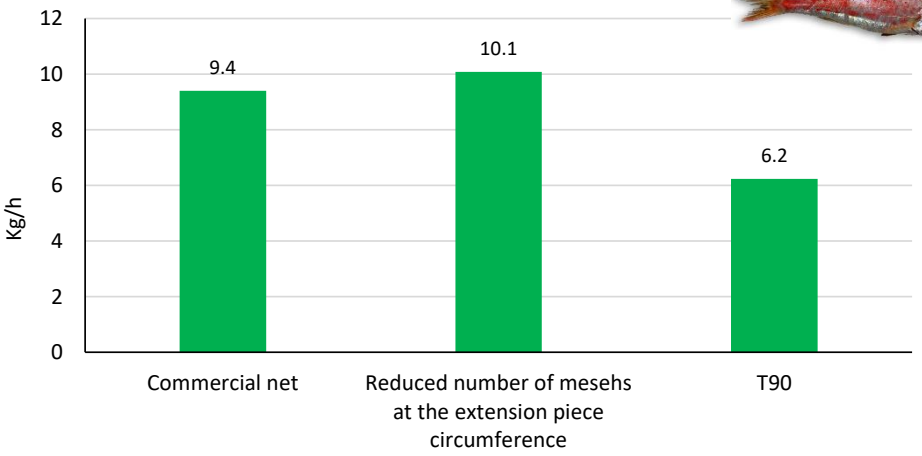
HAKE LEGAL SIZES

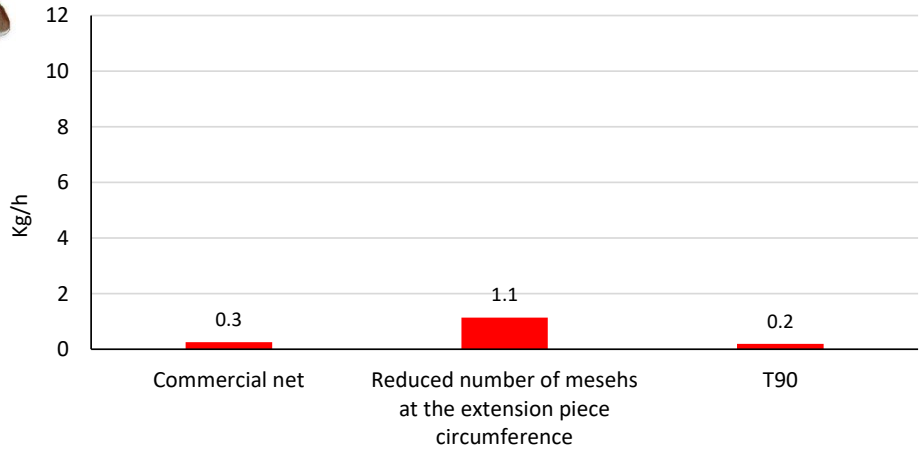


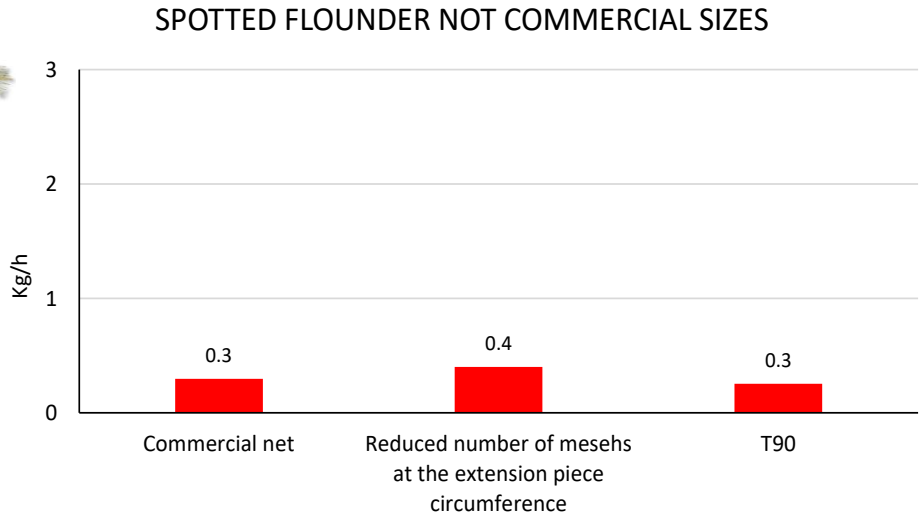
HAKE ILLEGAL SIZES



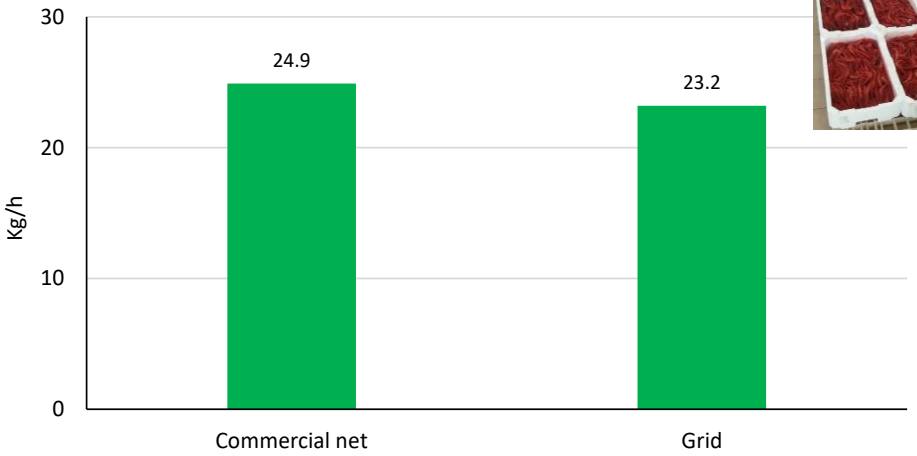
NORTH-CENTRAL ADRIATIC SEA - YIELD COMPARISON AMONG THE DIFFERENT NET CONFIGURATIONS

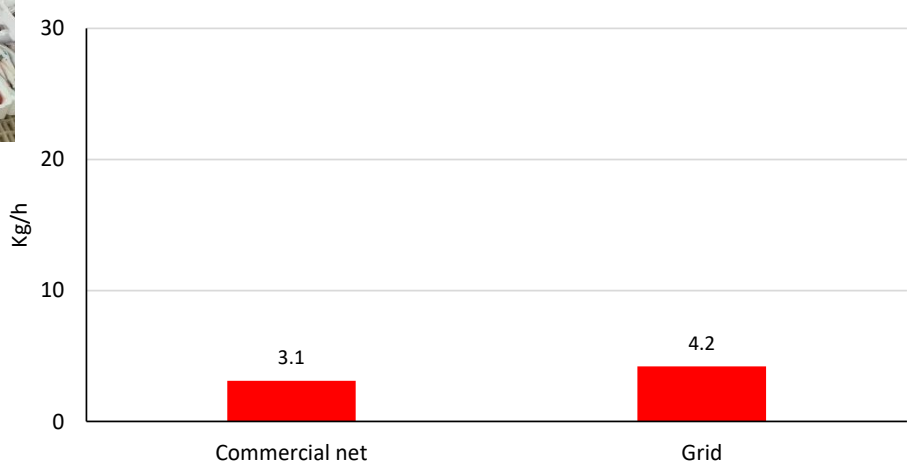


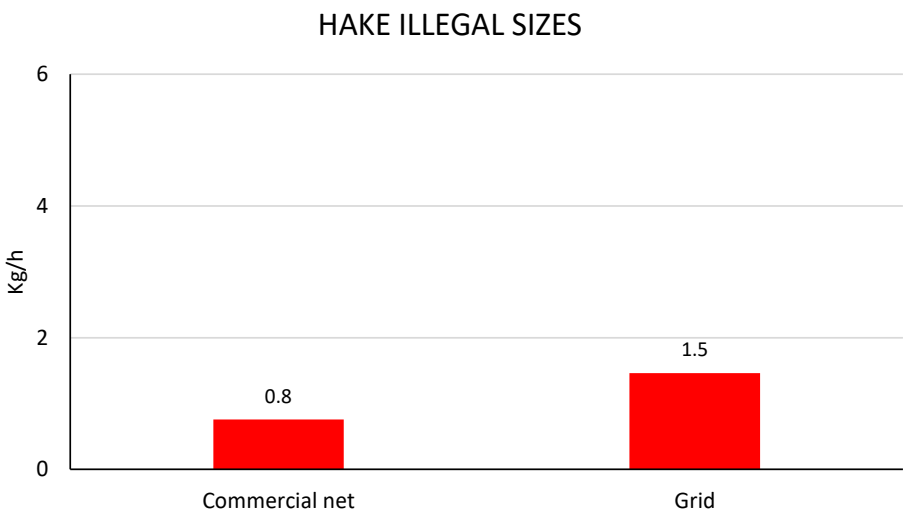




NORTH-CENTRAL ADRIATIC SEA - YIELD COMPARISON AMONG THE DIFFERENT NET CONFIGURATIONS







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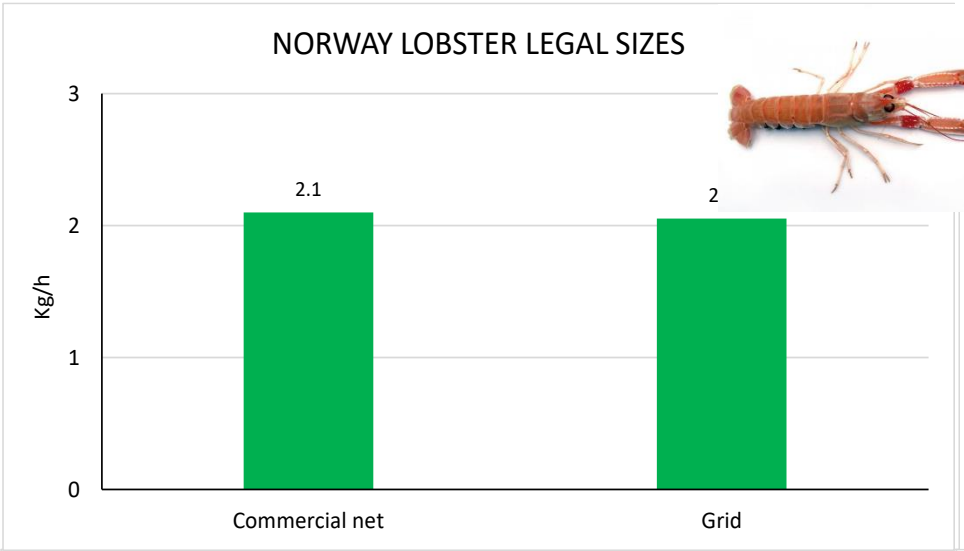
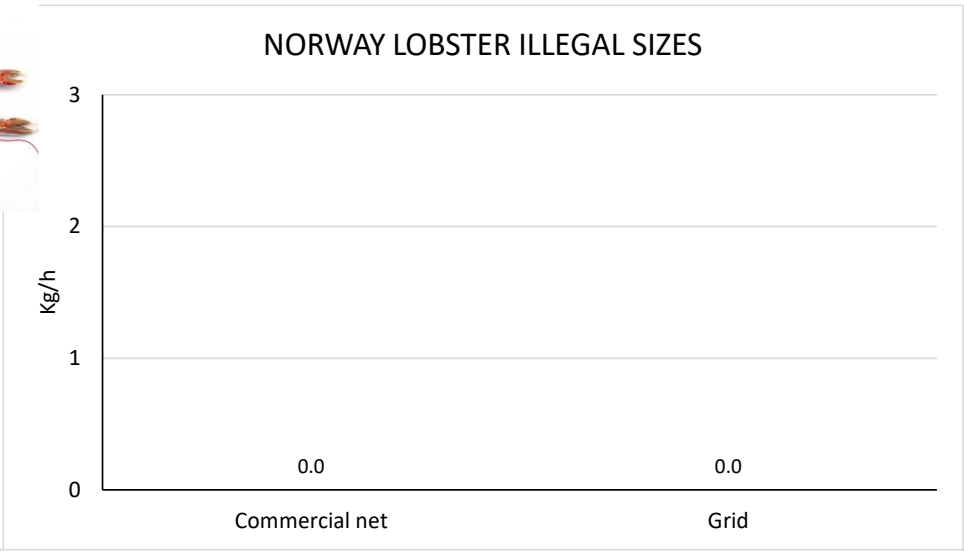
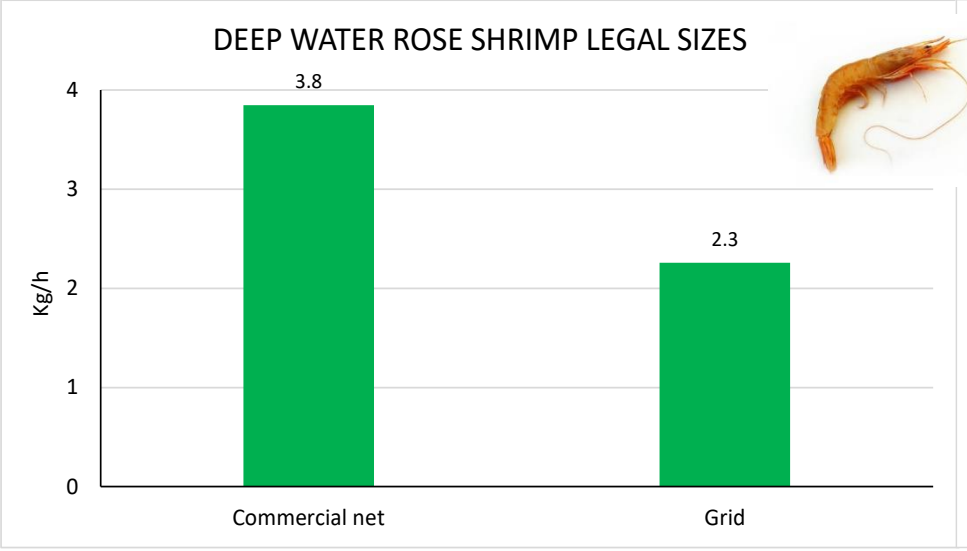
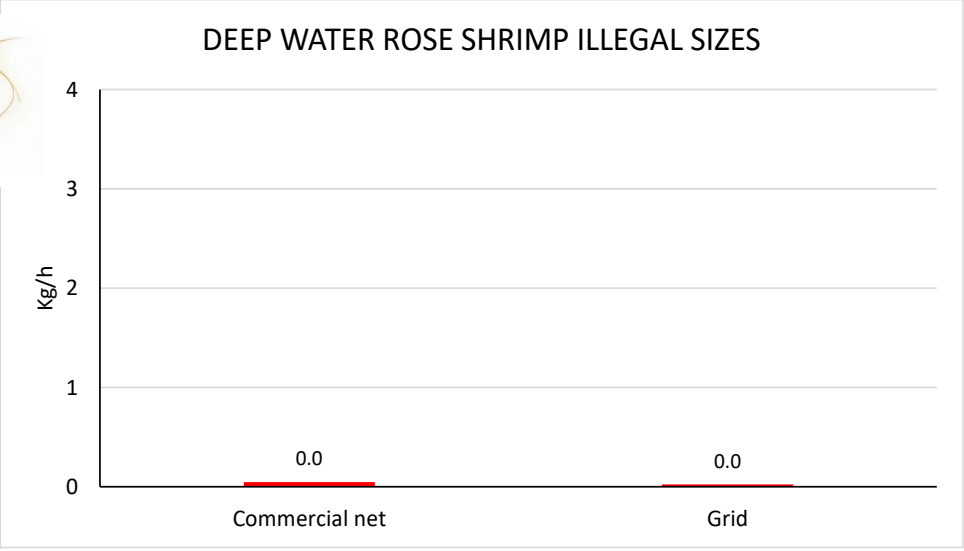








SOCIO-ECONOMIC IMPACT

The project included activities aimed at assessing the socio-economic impact of the implementation of the selection grid and the T90 in the extension piece and the 55mm square mesh in the codend.

Two methodological approaches were used:

- Cost-Benefit Analysis to measure the short-term impacts of the implementation of the selection grid and the T90 by a single boat.
- Estimation of short and long-term socio-economic performance by fleet segment by means of simulations produced with the BEMTOOL bio-economic model.

In the first case, it is assumed that there is no impact on the biomass as the device is implemented on a single boat.

In the second case, it is assumed that the technical device is implemented on a sufficient number of boats to determine a variation in the selectivity of the trawl fleet and therefore to have a positive impact on biomass.

COST-BENEFIT ANALYSIS

Generally, the Cost-Benefit Analysis has the objective of comparing different alternative design technical solutions in order to choose the one that has more benefits than costs.

In the IMPLEMED project, this analysis was performed in 3 geographical areas and for 2 different technical solutions:

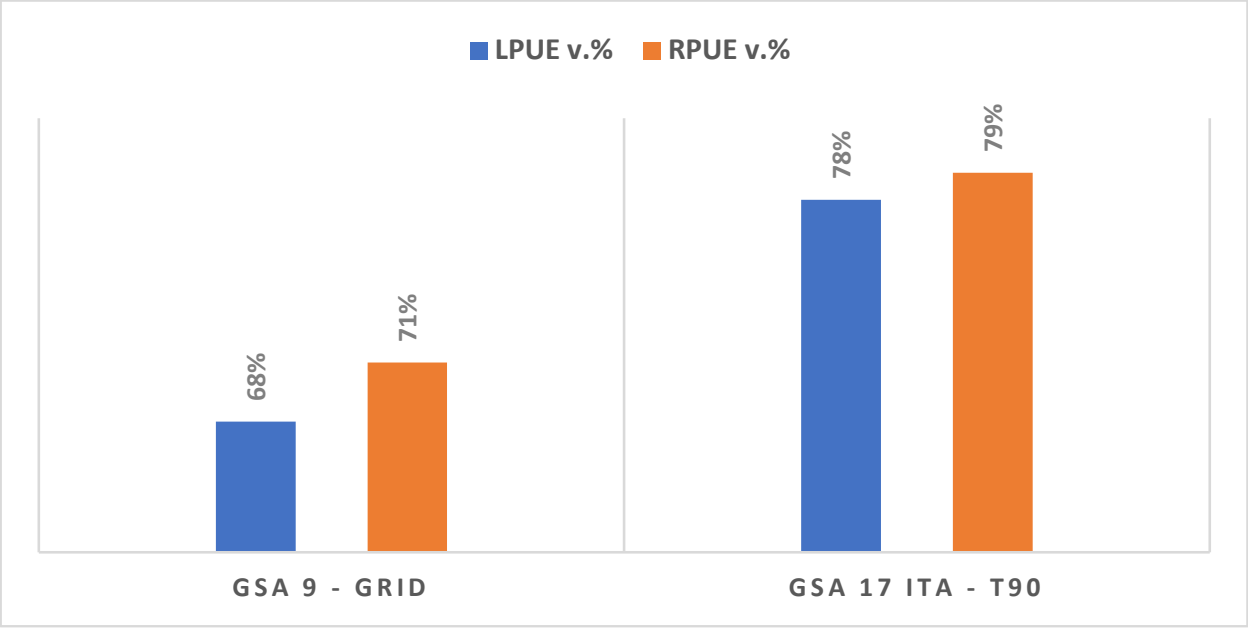
- GSA 9 (Northern Tyrrhenian Sea): selection grid;
- GSA 17 (Northern Adriatic Sea), Italian side and Croatian side: T90.

For each of the 3 case studies, the CBA was performed by estimating the impact that the implementation of the technical solution may have on the cost and revenue items of the income statement of the individual boat.

The impact of the T90 on the income statement items will be estimated through the experimental investigations provided for each case study.

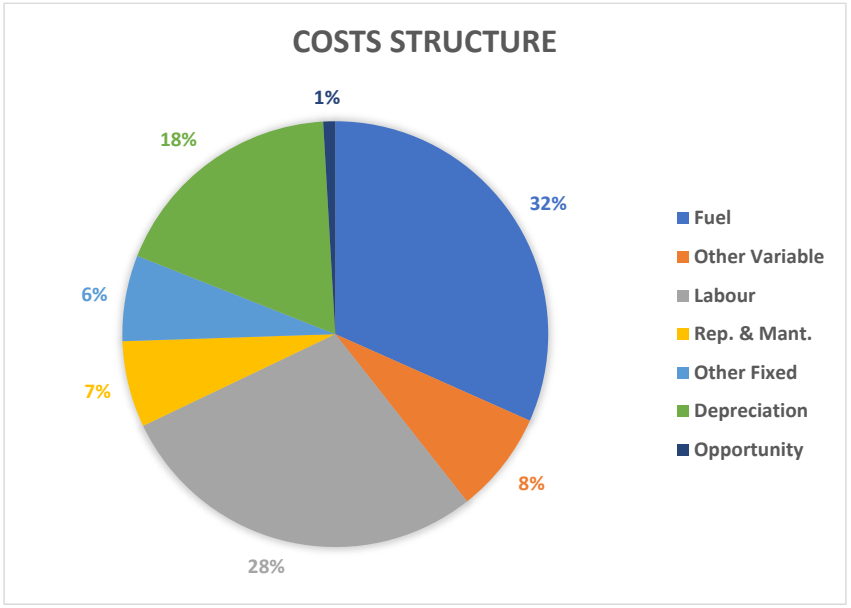
CHANGES IN PRODUCTIVITY

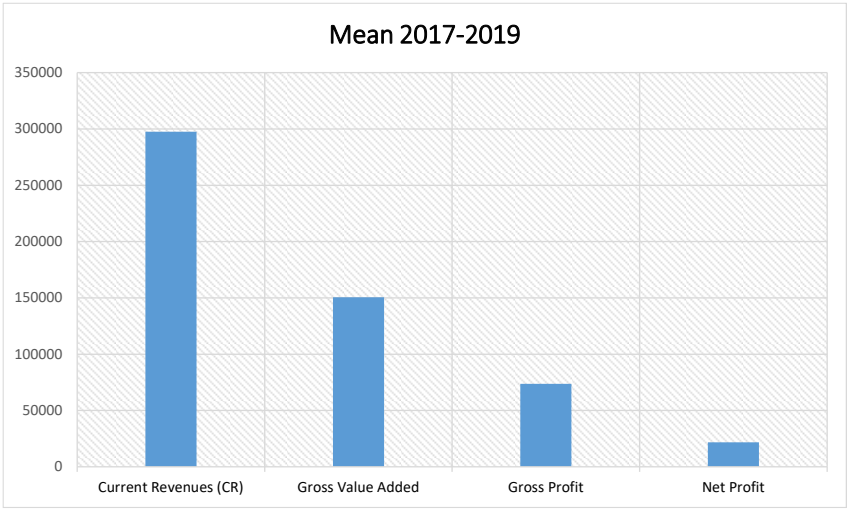
Estimated change in productivity by weight (CPUE) and value (RPUE) made 100 the value of the commercial net usually used by the fleet.



ECONOMIC DATA GSA9

Economic data for the trawl fleet segment from 18 to 40 meters.
The cost structure shows a prevalence of the cost of fuel (32%), followed by 28% of the cost of labor and 18% of depreciation.

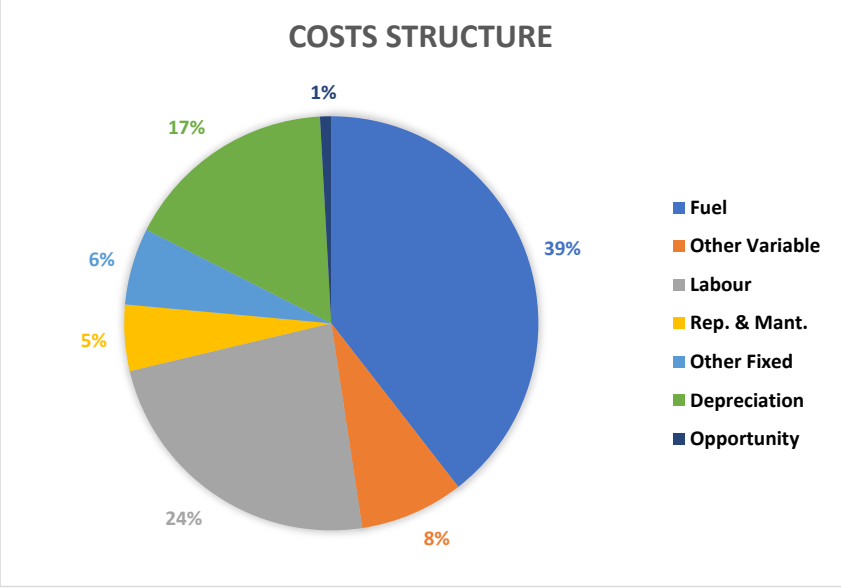


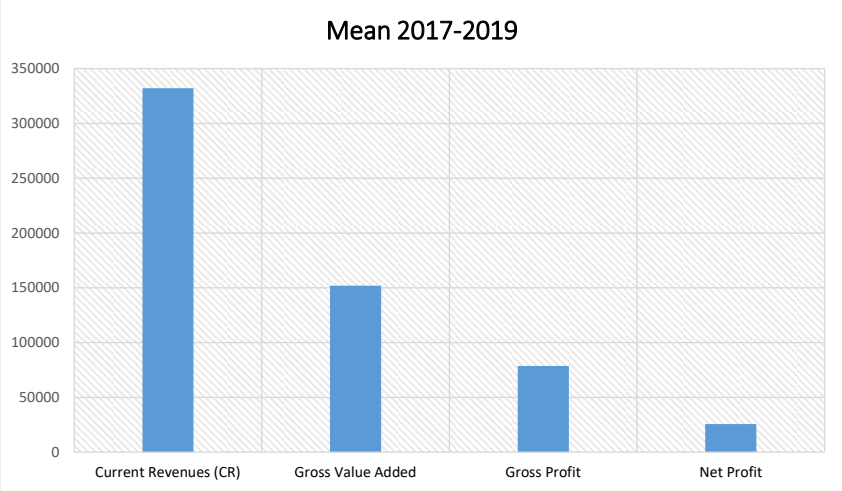


On average, the boats in this fleet recorded 297 thousand euros in revenues, 150 in value added, 74 in gross profit and 22 in net profit (7% of revenues).

ECONOMIC DATA GSA17

Economic data for the trawl fleet segment from 18 to 24 meters.
The cost structure shows a prevalence of the cost of fuel (39%), followed by 24% of the cost of labor and 17% of depreciation.

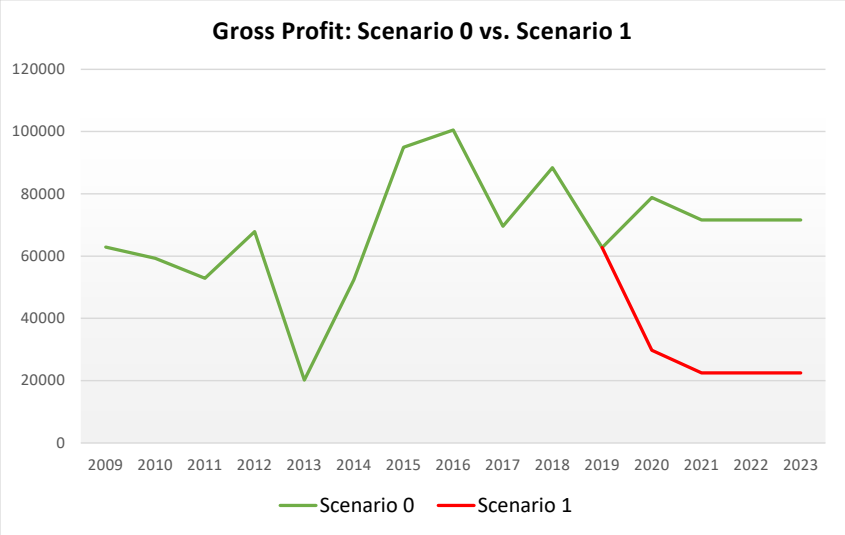


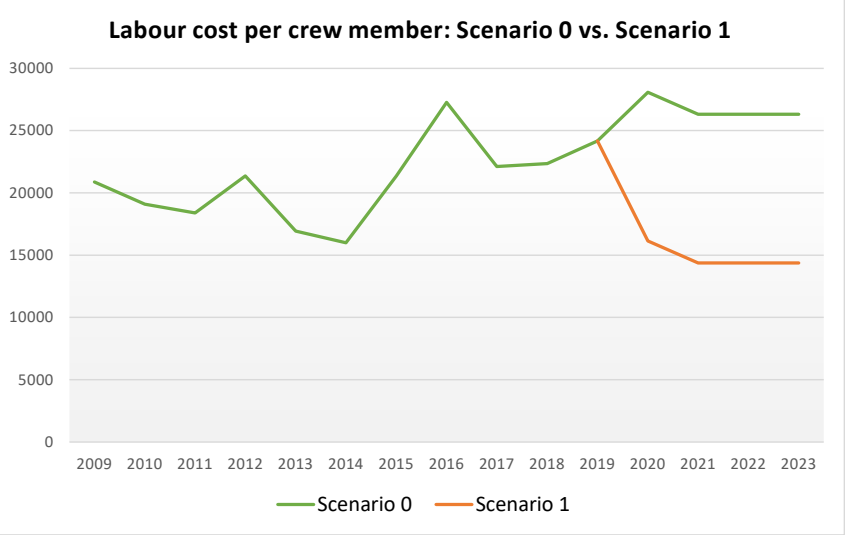


On average, the boats in this fleet recorded 332 thousand euros in revenues, 152 in value added, 79 in gross profit and 26 in net profit (8% of revenues).

RESULTS GSA9

In case of use of the selection grid (Scenario 1), a reduction of 62% in 2020 and 69% in subsequent years is expected for the gross profit.
Also in terms of labor costs per employee, the use of the selection grid would result in reductions of 43% in 2020 and 45% in subsequent years.

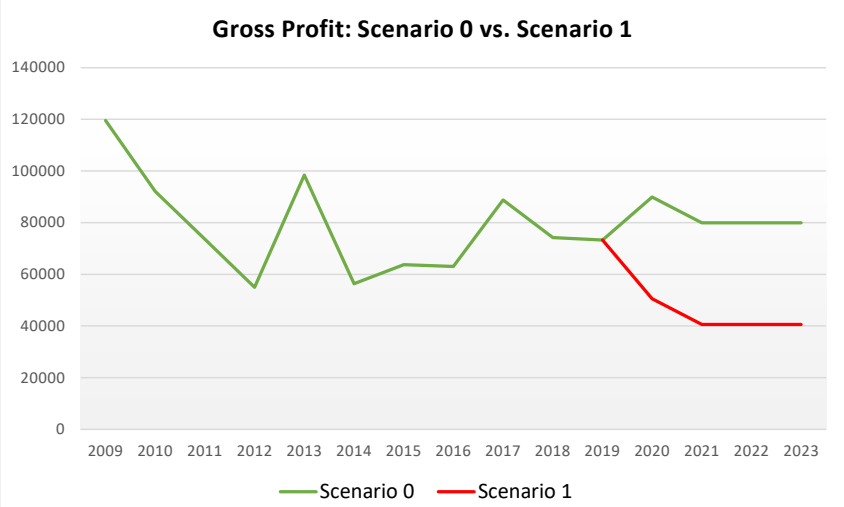


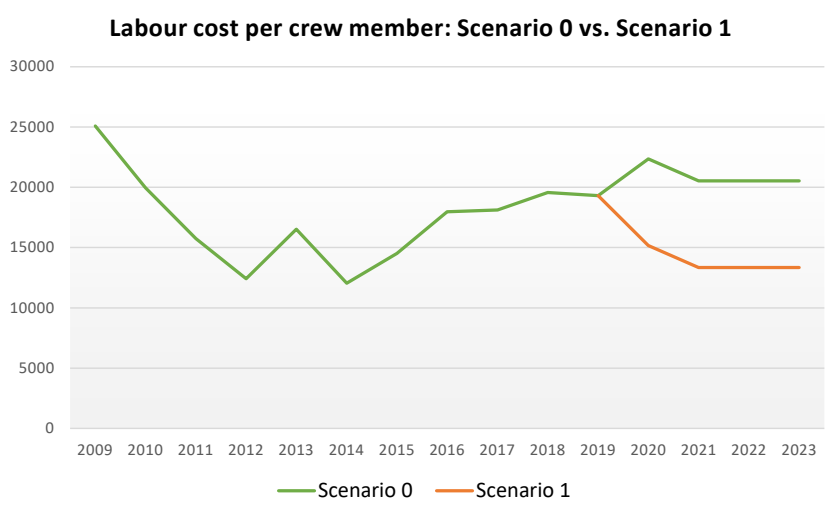


In absolute values, the gross profit is expected to decrease by about 49 thousand euros, while the average gross salary of about 12 thousand euros.

RESULTS GSA17

In case of use of the T90 (Scenario 1), the gross profit is expected to decrease by 44% in 2020 and 49% in the following years.
Also in terms of labor costs per employee, the use of the T90 would lead to reductions of 32% in 2020 and 35% in subsequent years.





In absolute values, the gross profit is expected to decrease by about 65 thousand euros, while the average gross salary is about 7 thousand euros.

CONCLUSIONS GRID IN GSA9

The transition from the traditional net to the net with a selection grid, with the same biomass, would produce a reduction in daily productivity:
32% in terms of weight of the total landing;
29% in terms of value of the total landing.

Reduced productivity causes economic losses:
between 62% and 69% in terms of gross profit;
between 43% and 45% in terms of remuneration of the crew;
between 52% and 56% in terms of added value.

Scenario	Indicator	2020	2021-2023
Status Quo (S0)	Gross Profit	78835	71581
	Labour Cost	92727	86900
	Gross Value Added	171562	158481
Selection grid (S1)	Gross Profit	29729	22475
	Labour Cost	53282	47455
	Gross Value Added	83011	69930
Difference S1 - S0	Gross Profit	-49106	-49106
	Labour Cost	-39445	-39445
	Gross Value Added	-88551	-88551
Difference % S1 - S0	Gross Profit	-62%	-69%
	Labour Cost	-43%	-45%
	Gross Value Added	-52%	-56%

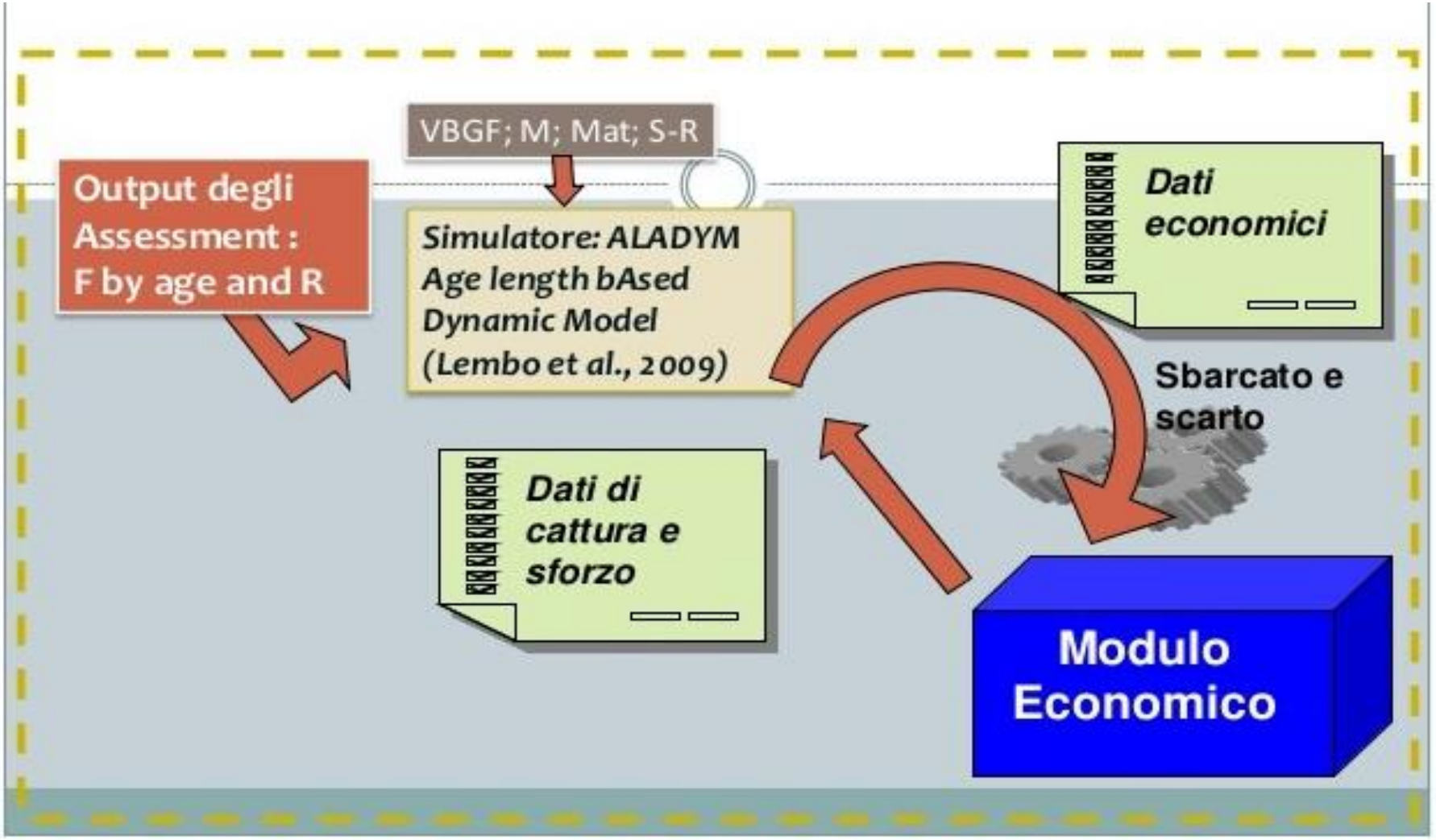
CONCLUSIONS T90 IN GSA17

The transition from the traditional net to the net with the T90, with the same biomass, would produce a reduction in daily productivity:
22% in terms of weight of the total landing;
21% in terms of value of the total landing.

Reduced productivity causes economic losses:
between 44% and 49% in terms of gross profit;
between 32% and 35% in terms of remuneration of the crew;
between 38% and 42% in terms of added value.

Scenario	Indicator	2020	2021-2023
Status Quo (S0)	Gross Profit	89907	79942
	Labour Cost	80602	74043
	Gross Value Added	170509	153985
T90 (S1)	Gross Profit	50571	40605
	Labour Cost	54714	48155
	Gross Value Added	105285	88761
Difference S1 - S0	Gross Profit	-39337	-39337
	Labour Cost	-25888	-25888
	Gross Value Added	-65224	-65224
Difference % S1 - S0	Gross Profit	-44%	-49%
	Labour Cost	-32%	-35%
	Gross Value Added	-38%	-42%

BEMTOOL BIO-ECONOMIC MODEL



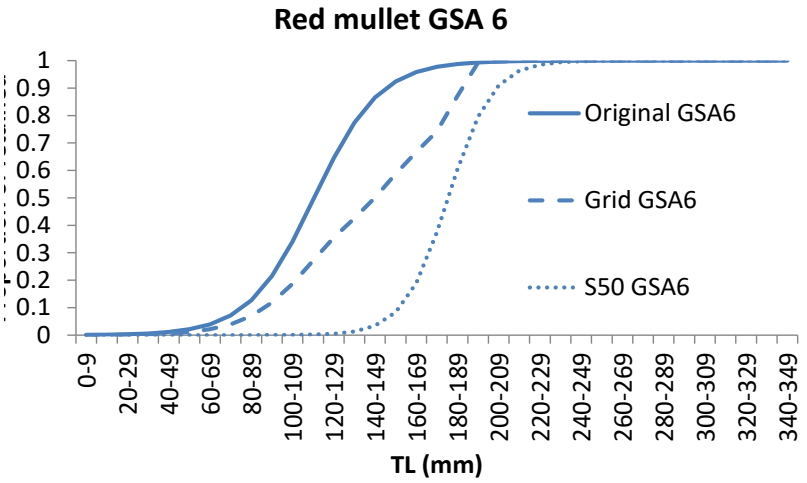
WHY A BIO-ECONOMIC MODEL?

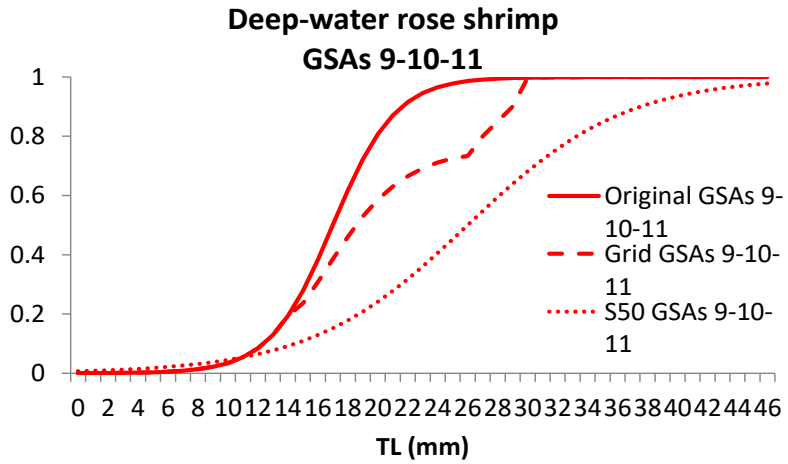
- To forecast the impact of management measures both on the stocks and on the fleet exploiting them, from a biological and socio-economic point of view respectively;
- To integrate the information from biological and socio-economic data collection;
- To take into account the status of the main marine resources, including the spawning potential in the medium and long term (stock assessment);
- To allow the inclusion of the results of the experimental sea trials on the different net configurations and the simulation of subsequent changes in catch composition and modification of economic performance;
- To consider the current economic situation of the fleet and could help in the definition of indemnities to support the fishery sector in the short term.

Processes integrated in the IMPLEMED case studies

- Reduction of smaller individuals in the catches;
- Decrease of the catches due to the implementation of the technical devices;
- Increase of the price per Kg corresponding to the increase in the mean size of the landing.

…for evaluating eventual processes allowing to compensate the losses in the landing in the short term

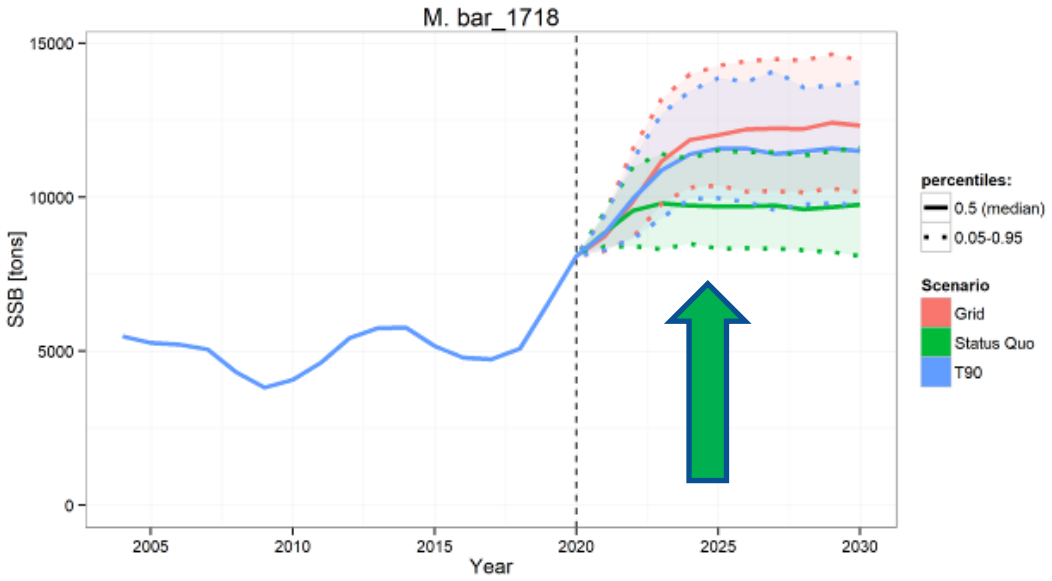




Impact on the stocks – GSA 17

2024

Stock	Baseline (SQ)	GRID change respect to SQ	T90change respect to SQ
E. hake	9731.067	+1%	+7%
Red mullet	6375.141	+22%	+17%



Impact on the landing- GSA 17 (Western side)

The model estimated a reduction of the catches of hake and red mullet for the sorting grid and the T90 in the short term.

This reduction is compensated in the medium and long term, when the change in the landing approaches the SQ values.

Anno	Status Quo	T90	Sorting grid
2020	3466	3466	3466
2022	8%	-6%	-6%
2024	14%	9%	10%
2028	15%	13%	13%

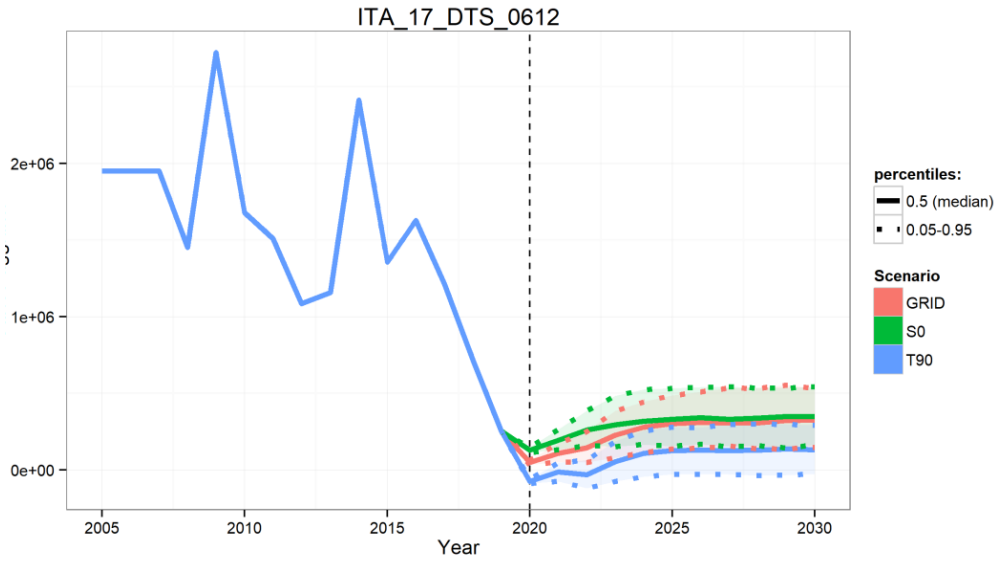
Revenues HKE-MUT(€)			
Fleet segment	Baseline (SQ)	Variation of GRID respect to SQ	Variation of T90 respect to SQ
ITA_17_DTS_0612	52076.13	4%	2%
ITA_17_DTS_1218	4861140	0%	-2%
ITA_17_DTS_1840	15383062	-1%	-3%
ITA_17_PGP_0012	57538.92	8%	-2%

Economic impact – GSA 17 (Western side)

When implementing the new configurations, the model predicts losses in the revenues of hake and red mullet that are less severe in the GRID scenario.

This losses are less marked in the log term.

Gross value added

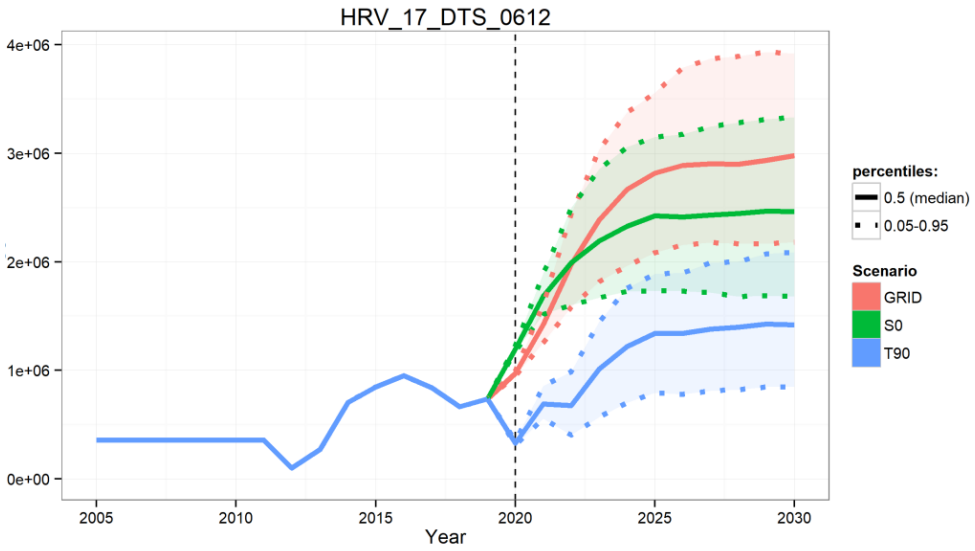


Revenues HKE-MUT(€)			
Fleet segment	Baseline (SQ)	Variation of GRID respect to SQ	Variation of T90 respect to SQ
HRV_17_DFN_0612	330061.2	4%	9%
HRV_17_DTS_0612	1616227	21%	2%
HRV_17_DTS_1218	3841420	22%	2%
HRV_17_DTS_1840	3099418	30%	1%

Gross value added

Economic impact – GSA 17 (Eastern side)

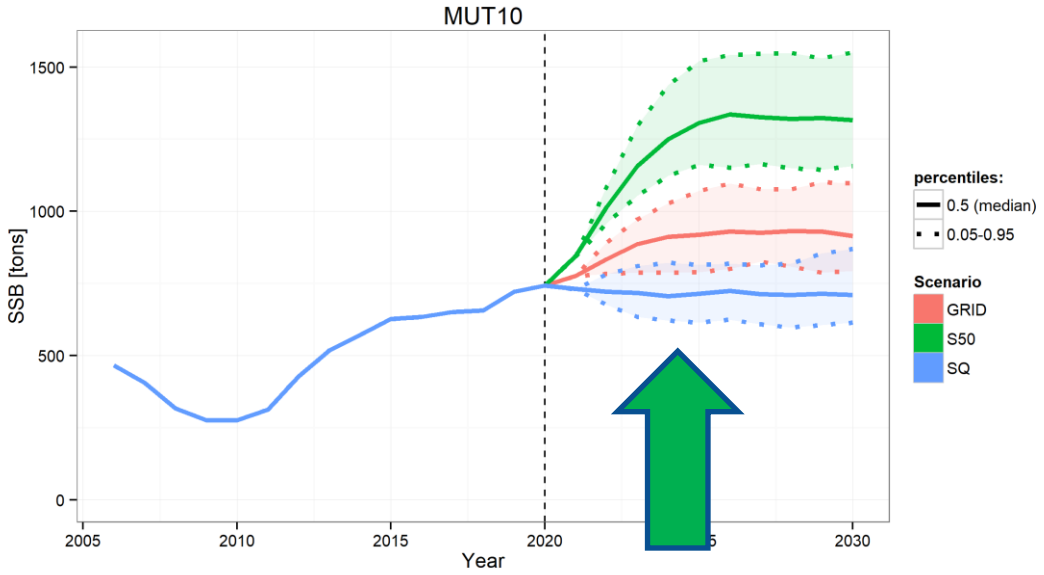
When implementing the new scenarios, the model predicts an increase in the revenues of hake and red mullet that are more marked in the GRID scenario.



Impact on the stocks – GSAs 9-10-11

2024

Stock	Baseline (SQ)	Variation of GRID respect to SQ	Variation of S50 respect to SQ
MUT10	0.44	25%	59%
MUT9	0.79	18%	49%
HKE	0.48	4%	11%
DPS	0.99	11%	30%



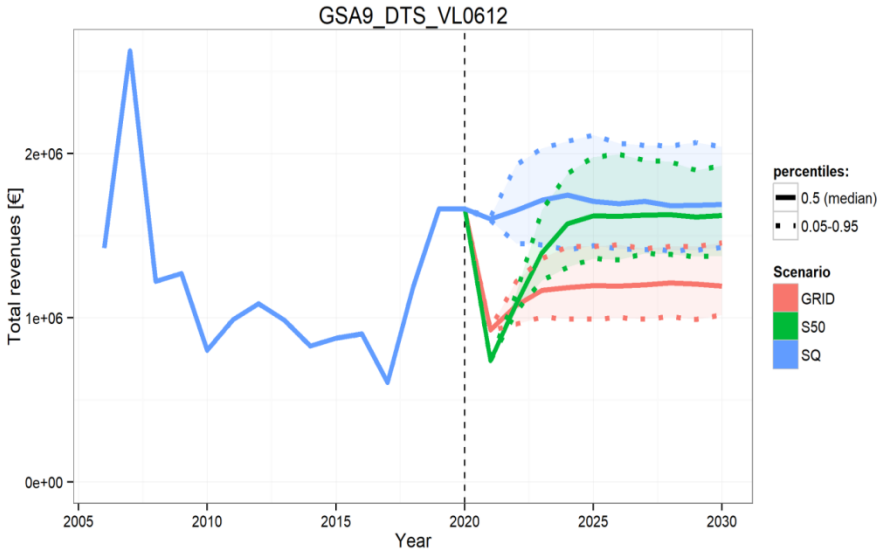
Impact on the landing and revenue - GSAs 9-10-11

2024

Stock	mean length (mm)			price (€)		
	Base line (SQ)	Variation of GRID respect to SQ	Variation of S50 respect to SQ	Baseline (SQ)	Variation of GRID respect to SQ	Variation of S50 respect to SQ
HKE	220	3%	31%	8	2.60%	13%
MUT10	106	7%	79%	5.2	4.00%	90%
MUT9	125	8%	52%	5.6	4.70%	42%
DPS	22	3%	11%	7.4	6.80%	25%

The change in the gear characteristics produces an increase in the mean length in the trawlers landings, corresponding to an increase in the price per kg.

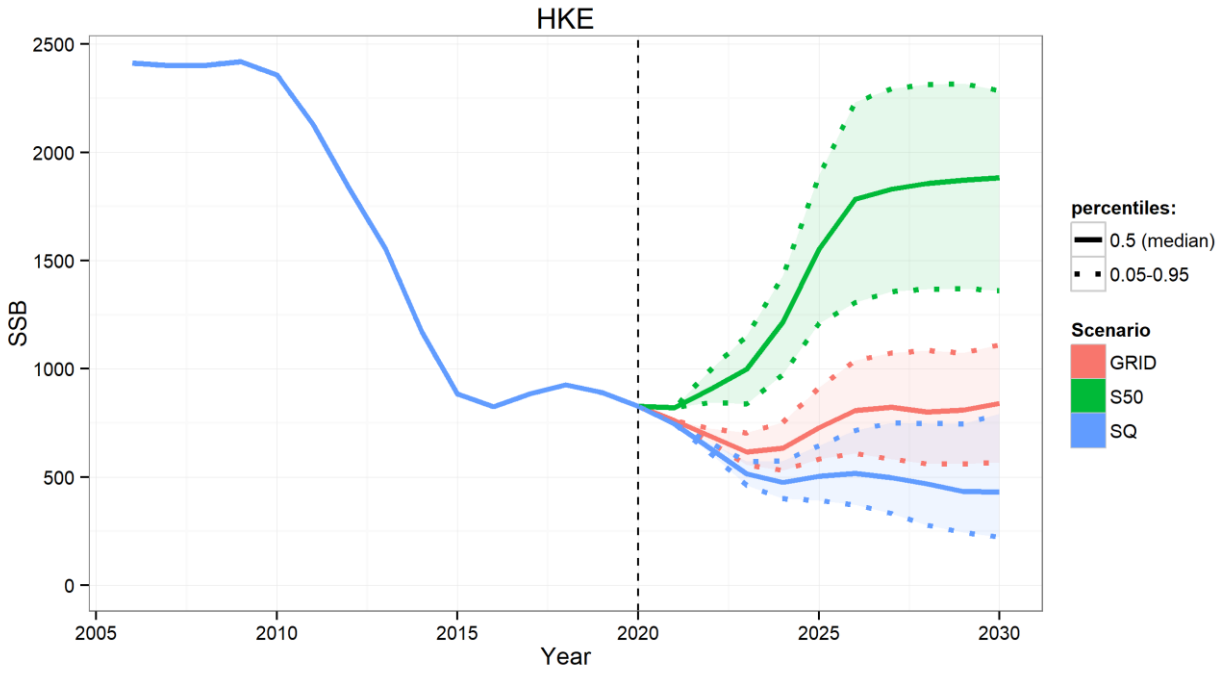
In terms of total revenues of the overall fleet, in the short term both alternative scenarios return a decrease and then an increase; S50 return values closer to SQ respect to GRID scenario in the medium term, but still below SQ



Impact on the stocks – GSA 6

2024

Stock	Baseline (SQ)	GRID	S50
HKE	1.35	-7%	-24%
MUT	1.24	-19%	-51%
DPS	1.55	-11%	-9%



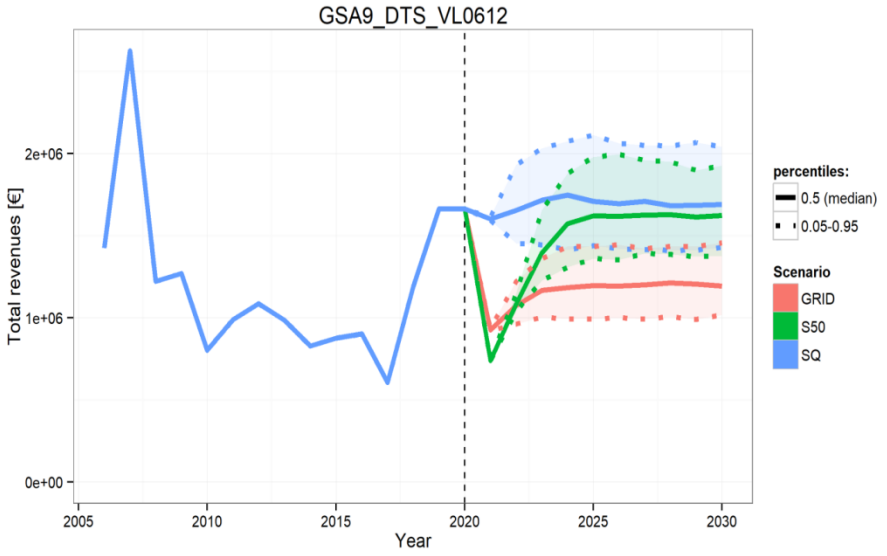
Impact on the landing and revenue – GSA 6

2024

Total revenues (€)			
DTS Fleet	Baseline (SQ)	GRID	S50
GSA6_DTS_VL0612	1125092	-23%	35%
GSA6_DTS_VL1218	18405088	-22%	39%
GSA6_DTS_VL1824	62760379	-23%	28%
GSA6_DTS_VL2440	36381731	-21%	47%
PGP and HOK Fleet	Baseline	GRID	S50
GSA6_HOK_VL0624	2635750	13%	73%
GSA6_PGP_VL0018	5284588	17%	78%

In terms of total revenues, in the short term both alternative scenarios return values lower than the SQ, while in the medium term the GRID scenario produces an average loss of 22% for trawlers and the S50 an increase of 37% in 2024.

Thus, only in S50 scenario the increase in mean length and in the corresponding price, has the effect to compensate the loss in total landing due to the change in the gear, returning values higher than SQ



IMPLEMED is based on a bottom-up multi-stakeholder participatory approach

- **Kick-off meetings at the beginning of the project**
- **Periodical technical meetings**
- **Final meeting at the end of the project**

The main recommendations gathered during the final meetings:

1) **• Work on financial tools to mitigate the socio-economic impact of improved selectivity, especially in the short term, while expecting economic recovery in the long term (as projected by the bio-economic model).**

2) **• Carefully evaluate the impact of selectivity on all the catch composition, when assessing the economic loss connected with the reduced catches.**

3) **• Make sure that diverse factors contributing to the depleted state of Mediterranean fish stocks are taken into account and tackled when proposing fisheries management measures.**

4) **• Consider that in some cases there seems to be no direct correlation between the increase in size and value of fish. On the contrary for some species the opposite could apply.**

5) **• It would be important to present selectivity as an opportunity for the fishing sector, rather than an additional burden as it is often perceived. Increased selectivity can be an important part of a toolkit to address the overfished state of most of the fish stocks in the Mediterranean.**

CONCLUSIONS

- ✓ The bio-economic model BEMTOOL allowed to investigate through simulations the consequences of changes in the exploitation pattern modifying key gear devices.
- ✓ For Western Mediterranean case studies the S50 scenario is expected to compensate the loss in total landing and in the total revenues due to the change in the gear, returning values in line or higher than SQ.
- ✓ For Northern and Central Adriatic case study, the GRID scenario would allow the revenues to approach the SQ for the Western side, while reaching higher values in the Eastern side.
- ✓ It should be also taken into consideration the presence of stocks that are currently exploited at or close to Fmsy and that, with the alternative measures explored, would remain underutilized, not fully contributing to a recovery of the revenues.
- ✓ In general, despite in the simulations the assumption of no change in the number of employees was made, a reduction in the employment in the short term could be expected, due to a decrease in the total revenues.