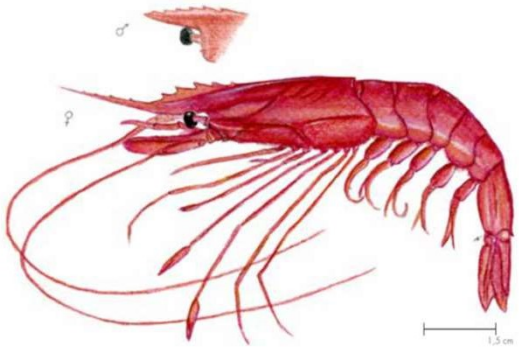
MEDAC - FG Strait of Sicily

Centro Congressi Cavour - Via Roma 50/a - Roma

27th February 2024

Deep Water Red Shrimps MCRS and its effects on fisheries in the Strait of Sicily. A biological point of view



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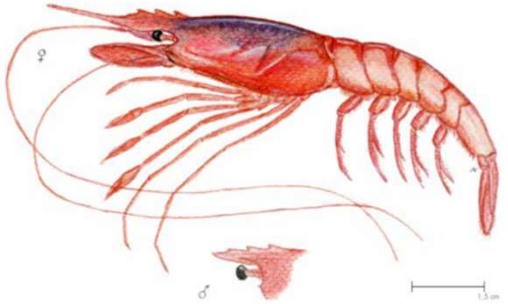


The recommendation GFCM/46/2023/2 establishes the minimum conservation reference size (MCRS) of 25 mm carapace length (LC) to protect juveniles of giant red shrimp (*Aristaeomorpha foliacea, ARS*) and blue and red shrimp (*Aristeus antennatus, ARA*), (Deep Water Red Shrimps, DWRS) in the Strait of Sicily (geographical subareas 12 to 16).

It is noteworthy that the ratio between the abundance of the two species (ARS /ARA) ranges from 0.90 to 0.95.

Recalling to the precautionary approach, this technical measure aims at strengthening the conservation measures of the multiannual management plan in the Strait of Sicily which is based on a list of authorized vessels and catch limits by country.

Sex Ratio in the Strait of Sicily ranges from 0.43 (Ragonese et al., 2004) to 0.52 (Maiorano et al., 2019)

GSA	Area	Sex	Mim. CL_m (mm)	CL_{50m} (mm)	$CL_{50sperm}$ (mm)	CL range (mm)	Source	Reference
15	Maltese islands	T		39		18-66	Survey	Dimech et al., 2012
16	South of Sicily	F		**39.7**		28-62	Commercial	Ragonese et al., 1994
16	South of Sicily	M		**31**			Commercial	Ragonese et al., 1994
16	South of Sicily	F		42	37	28-62	Survey	Ragonese & Bianchini, 1995
16	South of Sicily	F		**32.1**			Commercial	Casciaro et al, 2019
16	South of Sicily	M		**24.4**			Commercial	Casciaro et al, 2019
16	South of Sicily	T		34.3			Survey	Casciaro et al, 2019

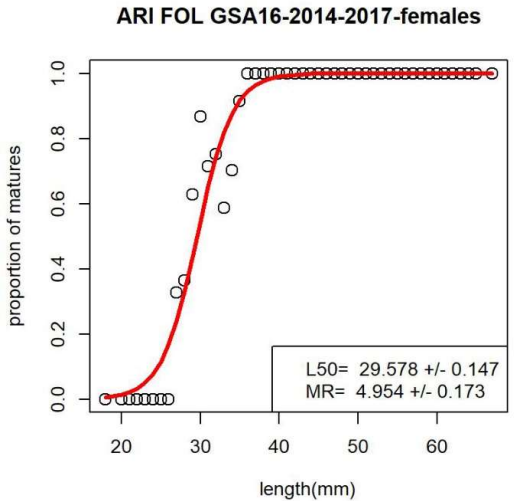
Size at maturity of ARS in the Strait of Sicily from literature

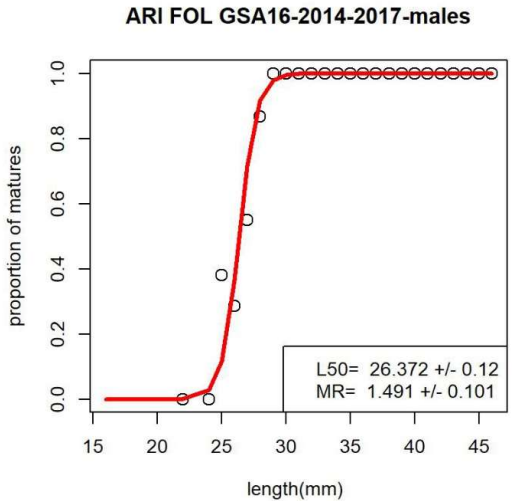
Sex Ratio in the Strait of Sicily ranges from 0.86 (Guijarro et al., 2019) to 0.93 (Gancitano et al., 2014)

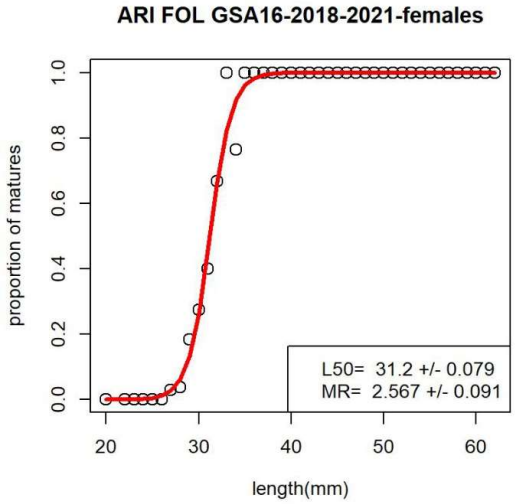
GSA	Area	Sex	Min. CL_m (mm)	CL_{50m} (mm)	$CL_{50sperm*}$ (mm)	CL range (mm)	Source	Reference
19	W. Ionian	F	22	**31.3**	25.2	12-62	survey	Carlucci et al., 2006
19	E. Ionian	F M		**24.1** **19.4**			commercial	Maiorano et al., 2022
20	E. Ionian	F M	26 20	29.5 19.4	26.0-	11-62 9-42	survey	Kapiris, 2004
24	Antalya Bay	F	24				survey	Deval & Kapiris, 2016
24	Antalya Bay	F M	23 18	26.2 **20.5**		13-58 15-30	survey	Aydın & Tıraşın, 2023b

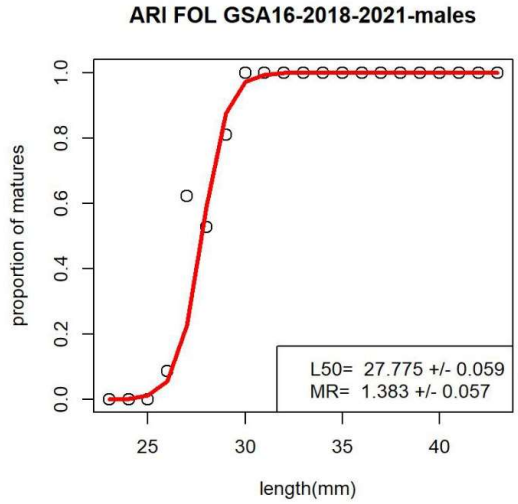
Size at maturity of ARA in the Central Mediterranean from literature

The most recent assessment of maturity ogive in the Strait of Sicily (GSA 12-16)

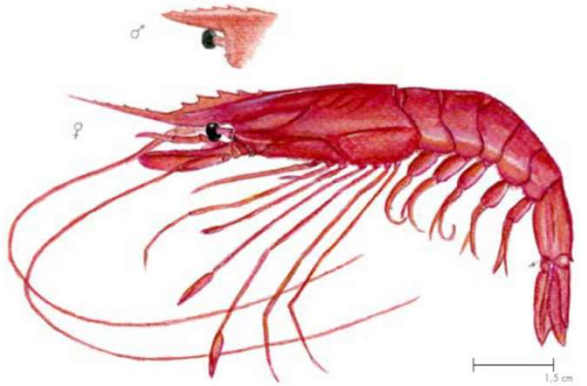






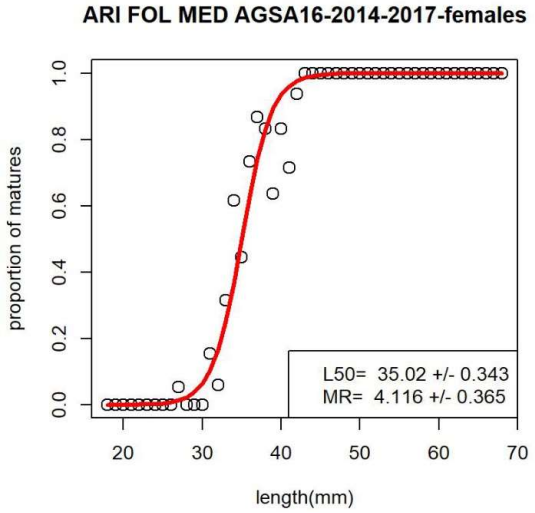


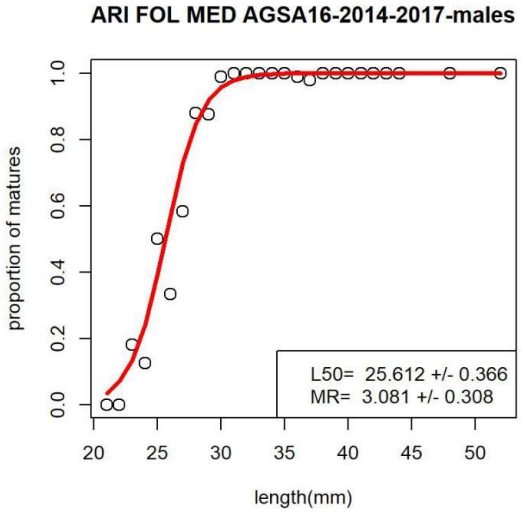
The length at 50% of maturity ranges between 29.5 and 31.2 mm CL in females and 26.3 and 27.8 in males

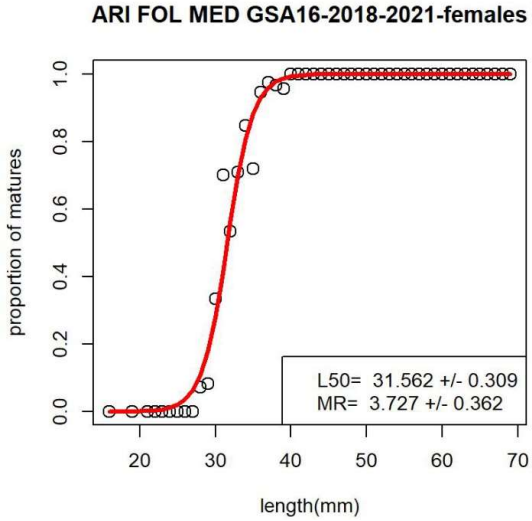


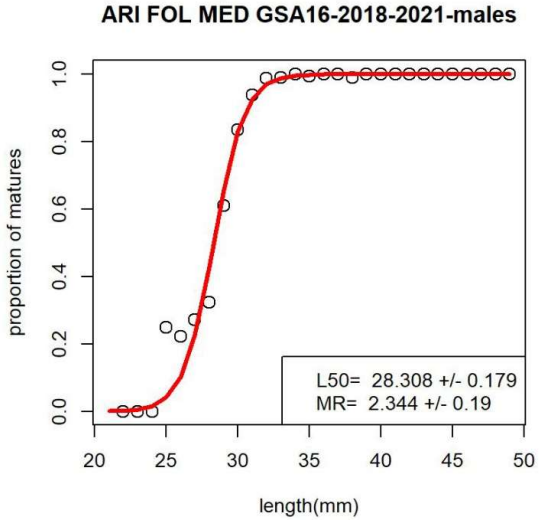
(Unpublished data)

The most recent assessment of maturity ogive in the Strait of Sicily (GSA 16)

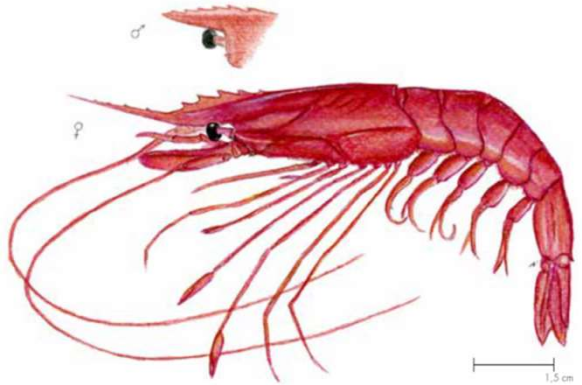








The length at 50% of maturity ranges between 31.6 and 35.0 mm CL in females and 25.6 and 28.3 in males



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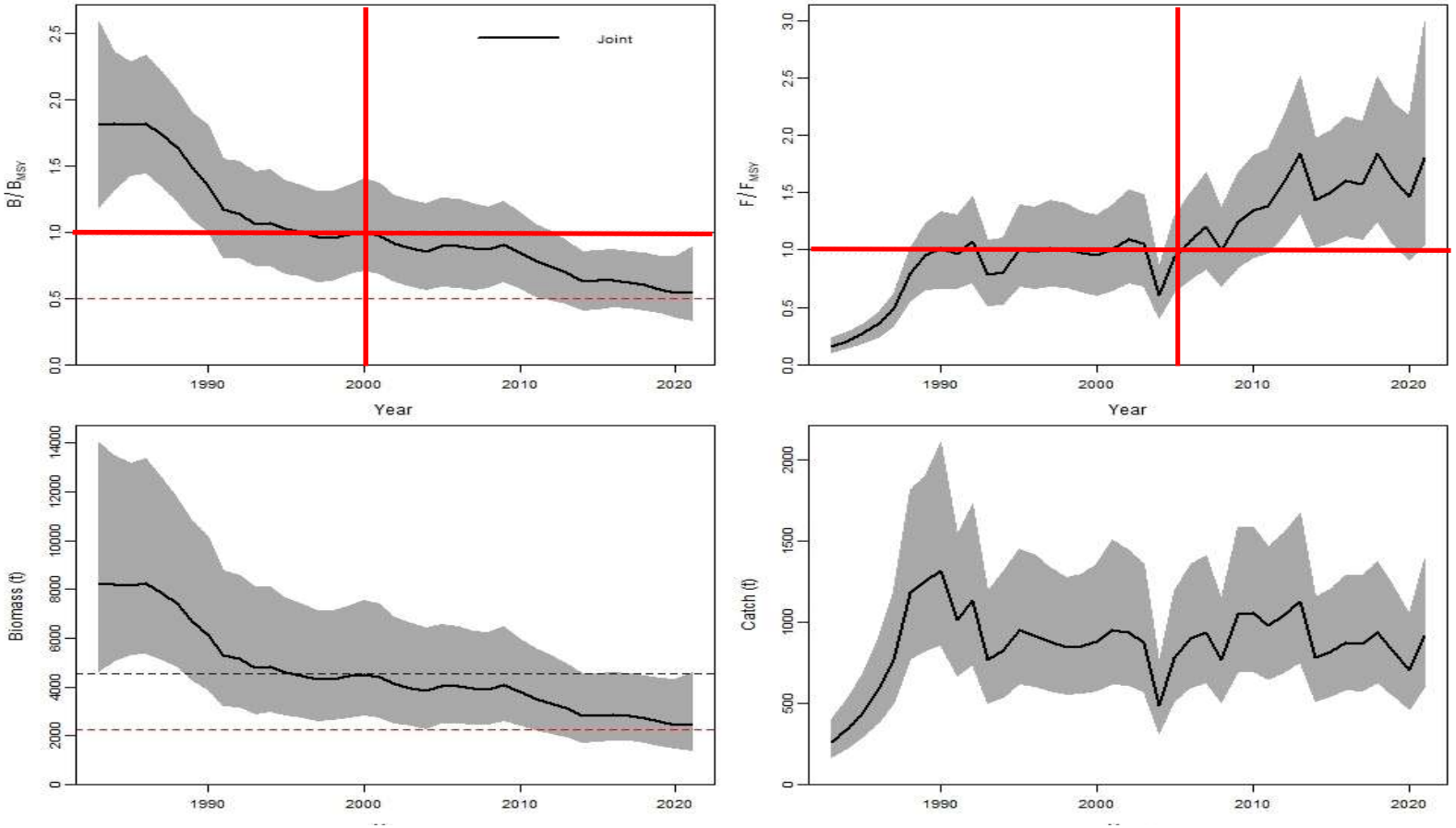
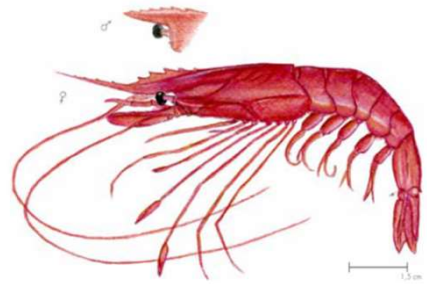
What is the status of the ARS in the Strait of Sicily



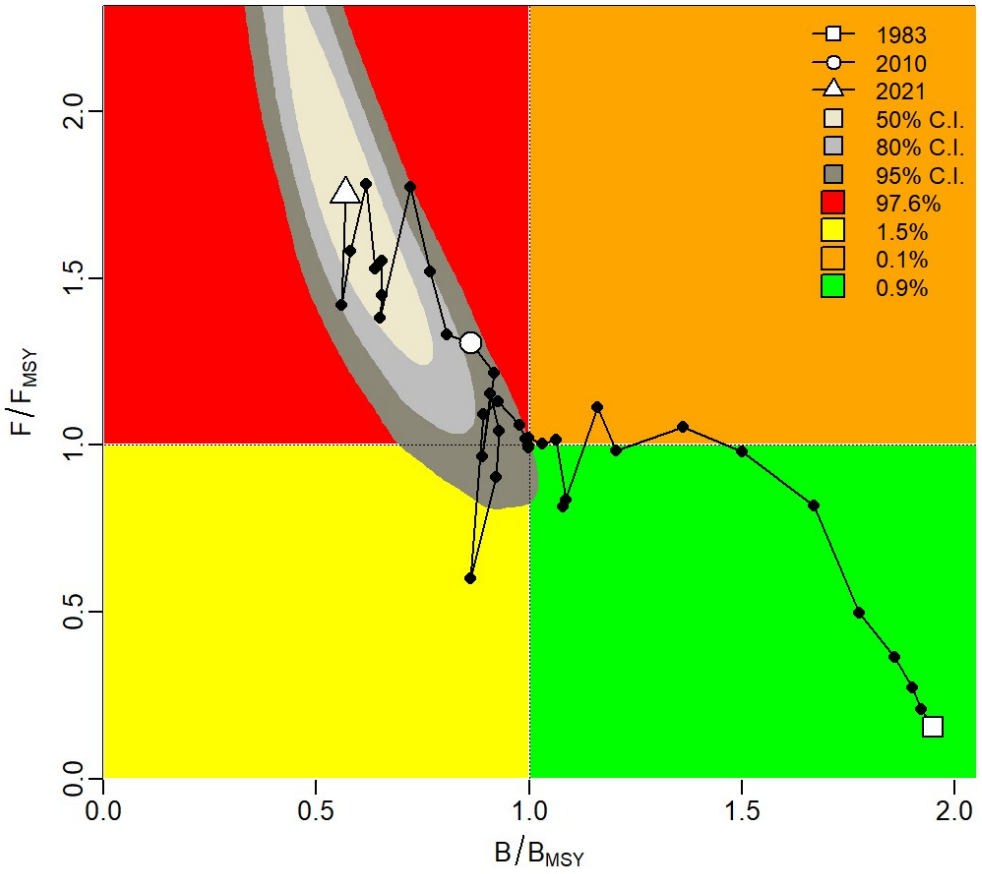


A progressive worsening of the stock status is evident both in increase of fishing pressure and in decrease of standing stock at sea

(by Scannella et al., 2022)

Kobe plot showing relative harvest rate (F/FMSY) on the Y-axis and relative Biomass (B/BMSY) on the X-axis.

- The orange area indicates healthy stock sizes that are about to be depleted by overfishing.
- The red area indicates ongoing overfishing while the stock is too small to produce maximum sustainable yields.
- The yellow area indicates reduced fishing pressure on stocks recovering from still too small biomass.
- The green area is the target area for management, indicating sustainable fishing pressure and healthy stock size capable of producing high yields close to MSY.



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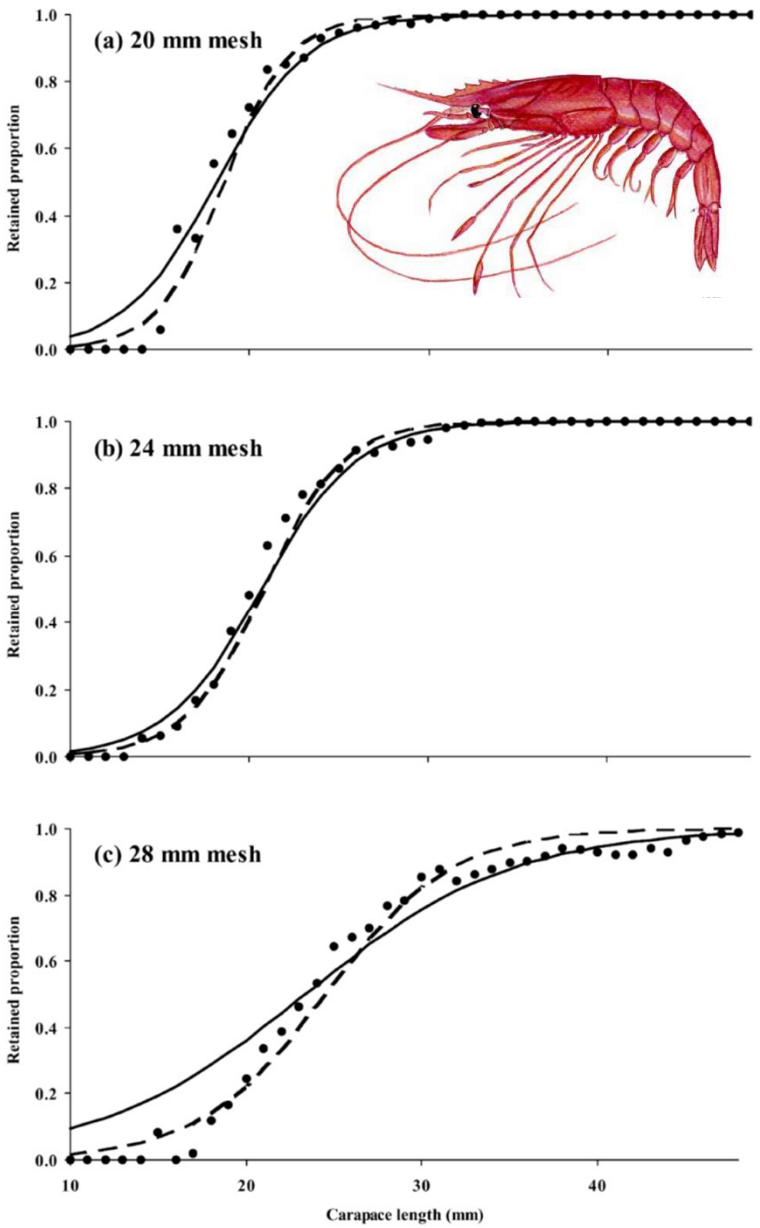
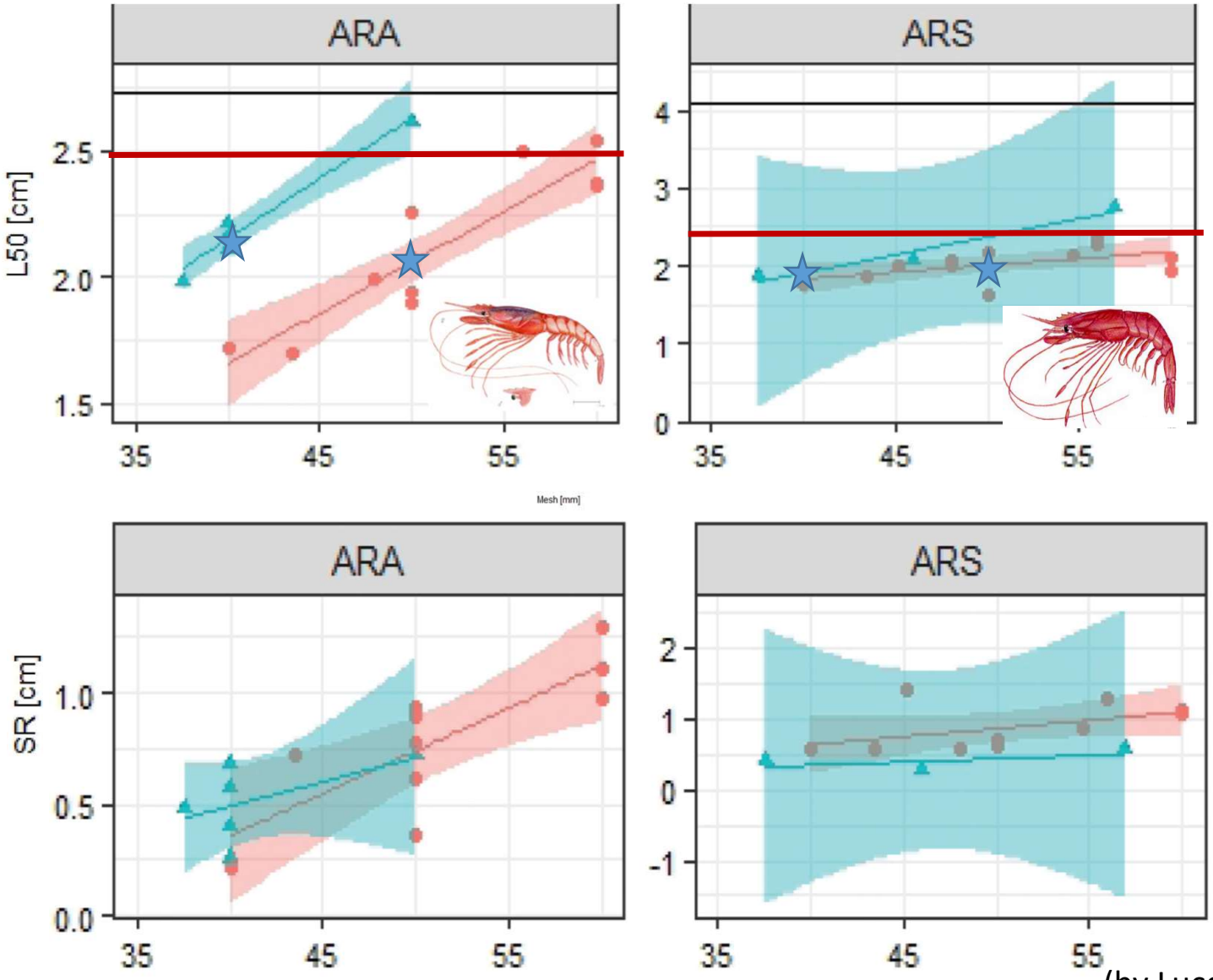


Ragonese et al. (2002) concluded, on the basis of selectivity experiments carried out in the Strait of Sicily with different diamond mesh sizes (40, 48 and 56 mm) in the codend, that neither the 40 nor the 48 mm mesh size allowed juveniles to escape.

Although the use of 56 mm mesh was recommended by Ragonese at al. (2002), as the L50 is lower than the LFM, additional measures should be taken to improve the exploitation pattern.

Gear configuration	All hauls	Spring	Summer
20/14			
CL_{50}	18.2	18.3	17.2
S.E.[a]	0.12	0.13	0.41
Rep[b]	0.19	0.28	0.14
24/14			
CL_{50}	20.7	20.9	19.4
S.E.	0.07	0.07	0.22
Rep	0.44	1.12	0.10
28/14			
CL_{50}	23.3	25.2	23.1
S.E.	0.14	0.26	0.15
Rep	0.55	0.67	0.12

Relationships between length at 50% capture (L50) and Selection Range (SR) in ARA and ARS with square and diamond mesh size



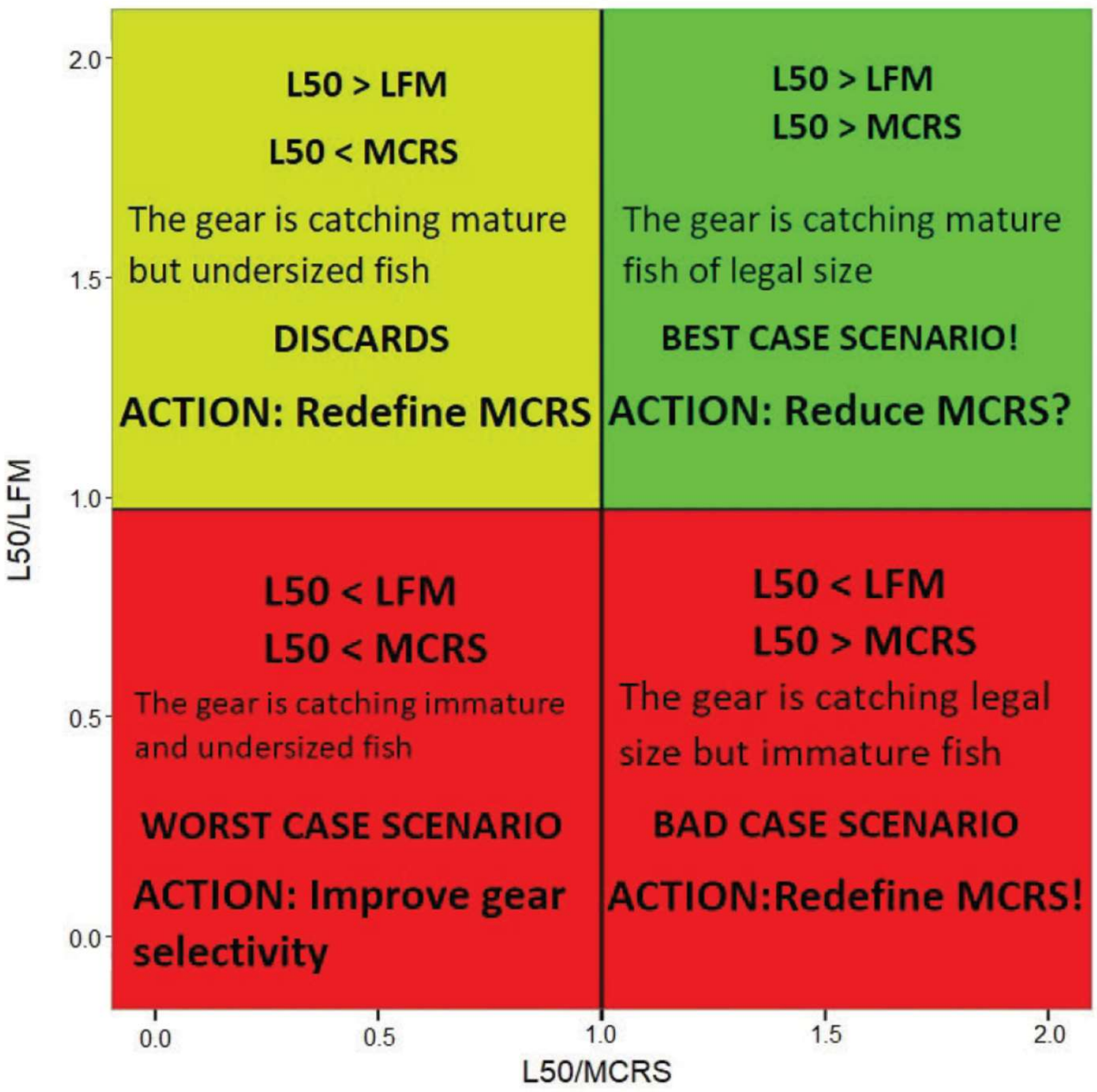
Green = Square
Red = Diamond

(by Lucchetti et al., 2021)

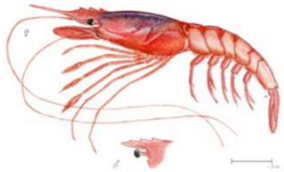
Density diagrams showing the relationships among the selectivity indicators.

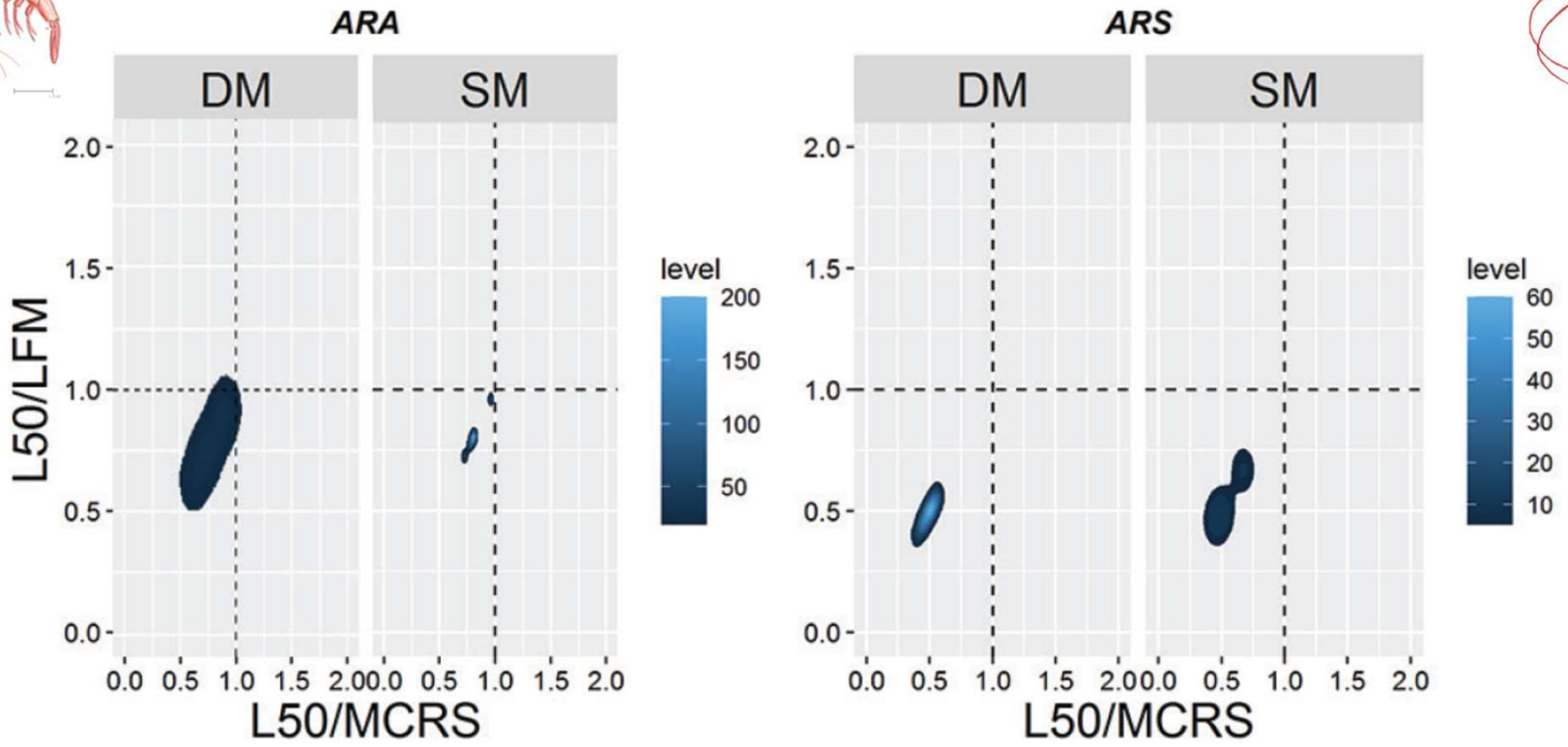
According to the available data in the case of ARS and ARA being **L50(20mm)<MCRS(25mm)<LFM (26-35mm)** the stock is badly exploited and improving the exploitation pattern of the DWRS fisheries is necessary to improve fishery productivity.

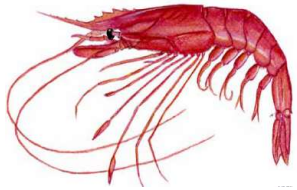
(by Lucchetti et al., 2021)



Diagrams showing the relationships among the selectivity indicator (L50), sustainability indicator (LFM) and management indicator (MCRS)







…in both species the proposed MRCS is below to the L50 of 40 square or 50 diamond and below the LFM suggesting the necessity to improve the exploitation pattern of DWRS fisheries

(by Lucchetti et al., 2021)

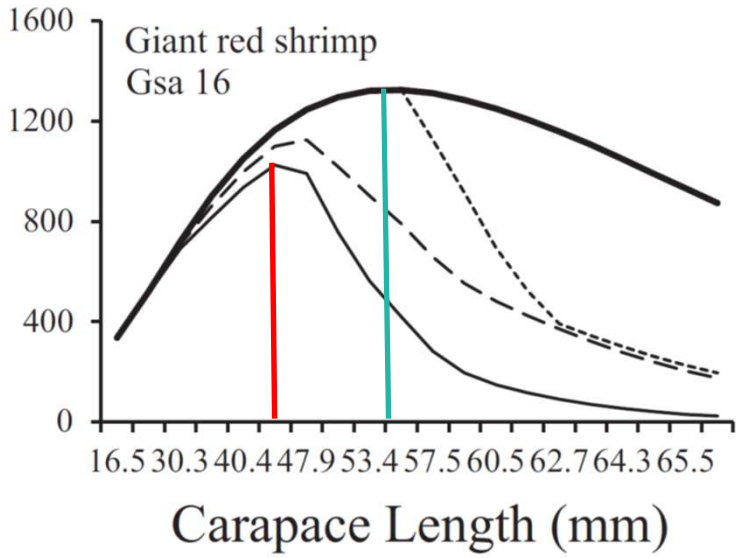
Shifting the size of first capture towards the size at which cohorts achieve their maximum biomass, the so-called optimal length, would produce more than 3 times higher economic yields and much higher biomass at sea for the ARS stock.

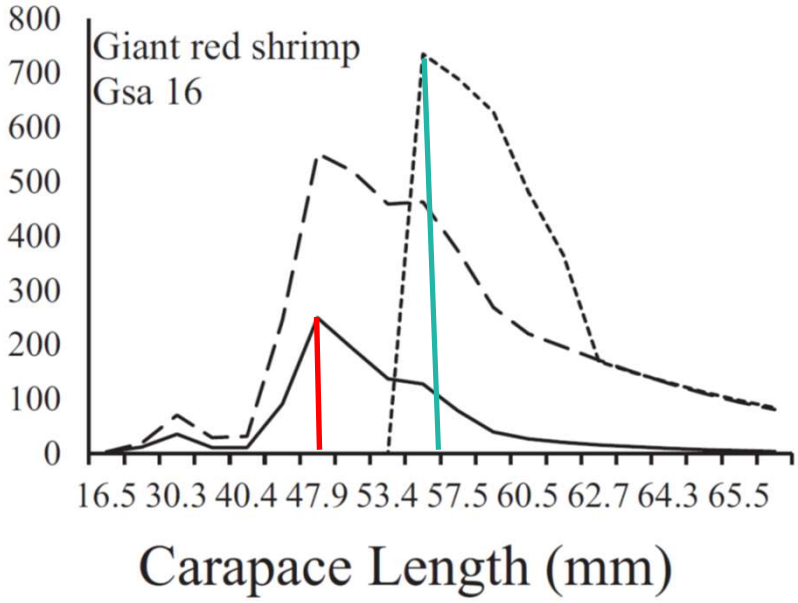
FISH and FISHERIES

FISH and FISHERIES

Rebuilding Mediterranean fisheries: a new paradigm for ecological sustainability

Francesco Colloca[1], Massimiliano Cardinale[2], Francesc Maynou[3], Marianna Giannoulaki[4], Giuseppe Scarcella[5], Klavdija Jenko[6], José Maria Bellido[7,8] & Fabio Fiorentino[9]





Cohort Biomass (right) and **yield (left)** against length, with **no-exploitation (bold line)**, exploitation at maximum sustainable yield (MSY) **(FMSY, dashed line),** exploitation at optimal length **(FLopt, dotted line)** and current exploitation pattern **(Fcur, thin line)** for ARS in the Strait of Sicily in middle 2000s.

Some points for discussion

In view of the **likely discrepancy between the legal mesh size and the MCRS of DWRS** in the Strait of Sicily, and taking into account that Recommendation GFCM/46/2023/2 states that DWRS specimens smaller than the MCRS may not be caught, retained on board, transhipped, transferred, landed, stored, sold, displayed or offered for sale by professional fishermen, it is advisable **to adopt additional measures** to allow for an increase in the size of the catch.

Based on existing information, some solutions could be explored. Among them:

- Test the performance of **50 mm square mesh or other more selective net** configurations in different seasons and fishing areas;
- Evaluate the effects of a **mandatory fishing ban** when high concentrations of ARS juveniles occur;
- Identify **nursery areas** if and where ARS juveniles aggregate to protect them from trawling;
- Investigate the variability in the **amount and size composition of the catch during the day and at night and the effects of using light on the net**
- …..

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