

SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	Sheet #0 Basic data on the assessment

Code: ARS9911L

Date*	26 Oct 2011	Authors*	L. Knittweis1, F.Fiorentino2, R. Mifsud1, F. Gravino2, V. Gancitano2, G. Garofalo2, M. Gristina2
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Species Scientific name*	Aristaeomorpha foliacea - ARS	Species common name*	Giant red shrimp
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Data Source

GSA*	15 - Malta Island, 16 - South of Sicily	Period of time*	2006-2010
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Description of the analysis

Type of data*	LFD from commercial catches, commercial landings data, fisheries independent survey data	Data source*	EU data collection framework (DCF)
Method of assessment*	LCA, Y/R analysis	Software used*	Vit4Win, SURBA, Yield Package

Sheets filled out

B	P1	P2a	P2b	G	A1	A2	A3	Y	Other	D	Z	C
1	1	3	3	---	1	1	1	1	3	1	1	---

Comments, bibliography, etc.

<p>Branch T.A., Kirkwood G.P., Nicholson S.A., Lawlor B., Zara S.J. (2000) - Yield version 1.0, MRAG Ltd, London, U.K.</p> <p>Camilleri, M., Dimech, M., Drago, A., Fiorentino, F., Fortibuoni, T., Garofalo, G., Gristina, M., Schembri, P.J., Massa, F., Coppola, S., Bahri, T., Giacalone, V. 2008. Spatial distribution of demersal fishery resources, environmental factors and fishing activities in GSA 15 (Malta Island).</p> <p>GCP/RER/010/ITA/MSM-TD-13. MedSudMed Technical Documents, 13: 97 pp.</p> <p>CNR-IAMC, 2009 - Programma Nazionale Italiano per la raccolta di dati alieutici 2008. Modulo I - "Altri campionamenti biologici risorse demersali e piccoli pelagici" - GSA 16 (Stretto di Sicilia): relazione finale, IAMC-CNR, Mazara del Vallo (TP), Italia, 79 pp.</p> <p>Gancitano V., S. Cusumano, G. B. Giusto, G. Garofalo, G. Ingrande, E. Sabatella, S. Ragonese, F. Fiorentino (2008) Valutazione dello stato di sfruttamento del gambero rosso <i>Aristaeomorpha foliacea</i> (Risso, 1827) (Crustacea; Decapode) nello Stretto di Sicilia. Biol. Mar. Medit., 15(1): 326-327.</p>

Comments, bibliography, etc.

Garofalo G., G. B. Giusto, S. Cusumano, G. Ingrande, G. Sinacori, M. Gristina, F. Fiorentino (2007) Sulla cattura per unità di sforzo della pesca a gamberi rossi sui fondi batiali del mediterraneo orientale. *Biol. Mar. Medit.*, 14(2): 250-251.

Gayanilo F.C. Jr., P. Sparre, D. Pauly (2005) - Food And Agriculture Organization Of The United Nations – Fisat II (version 1.2.2) Roma, 2005.

Kirkwood G.P., Aukland R., ZaraS.J. (2001) – Length Frequency Distribution Analysis (LFDA), version 5.0. MRAG Ltd, London, U.K.

LleonartJ., SalatJ. (2000) - Vit4winVersion 1.1.www.faocopemed.org/es/activ/infodif.htm.

Ragonese S. (1995) - Geographical distribution of *Aristaeomorpha foliacea* (Crustacea-Aristeidae) in the Sicilian Channel (Mediterranean Sea). *ICES, Journal of marine Science Symposium*, 199: 183-188.

Ragonese S., Bianchini M. L. (1995) – Size at sexual maturity in red shrimp females *Aristaeomorpha foliacea*, from the Sicilian Channel (Mediterranean Sea). *Crustaceana* , 68 (1): 73-82.

Ragonese S., Andreoli M.G., Bono G., Giusto G.B., Rizzo P., Sinacori G., 2004. Overview of the available biological information on demersal resources of the Strait of Sicily. *MedSudMed Technical Documents 2*: 67-74.

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Assessment form

Sheet B
Biology of the species

Code: ARS9911L

Biology	Somatic magnitude measured (LH, LC, etc)*				CL	Units*	mm
	Sex	Fem	Mal	Both	Unsexed		
Maximum size observed						Reproduction season	summer peak
Size at first maturity	37.17		27.41			Reproduction areas	
Recruitment size						Nursery areas	

Parameters used (state units and information sources)

		Units	Sex			
			female	male	both	unsexed
Growth model	L ∞	mm	68.9	41.95		
	K		0.61	0.7		
	t0		-0.2	-0.18		
	Data source	STECF-EWG-11-12, CNR-IAMC (2009)				
Length weight relationship	a		0.0016	0.001		
	b		2.5884	2.7456		
	M		0.4			
	sex ratio (mal/fem)					

Comments

Although spawning in *A. foliacea* occurs from spring till autumn in the Strait of Sicily, maturity peaks in summer (Ragonese and Bianchini, 1995). According to Ragonese et al. (2004) the length at 50% of maturity was 42 mm CL in females and 30-33 mm CL in males. The most recent assessment of maturity ogive was given by CNR_IAMC (2009), being $L_{50\%}=37.17$ (es=0.108) mm CL and slope $g=0.541$ (es=0.028) in females and $L_{50\%}=27.41$ (es=0.037) mm CL and slope $g=0.988$ (es=0.031) in males.

A large, empty rectangular box with a thin black border, intended for entering comments.

SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	Sheet P1 General information about the fishery

Code: ARS9911L

Data source*	EU Data Collection Framework (DCF) data from GSA 15 & 16	Year (s)*	2006-2010
Data aggregation (by year, average figures between years, etc.)*	By year		

Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	MLT	99	E - Trawl (12-24 metres)	03 - Trawls	34 - Demersal slope species	ARS
Operational Unit 2	MLT	99	F - Trawl (>24 metres)	03 - Trawls	34 - Demersal slope species	ARS
Operational Unit 3	ITA	99	F - Trawl (>24 metres)	03 - Trawls	34 - Demersal slope species	ARS
Operational Unit 4						
Operational Unit 5						

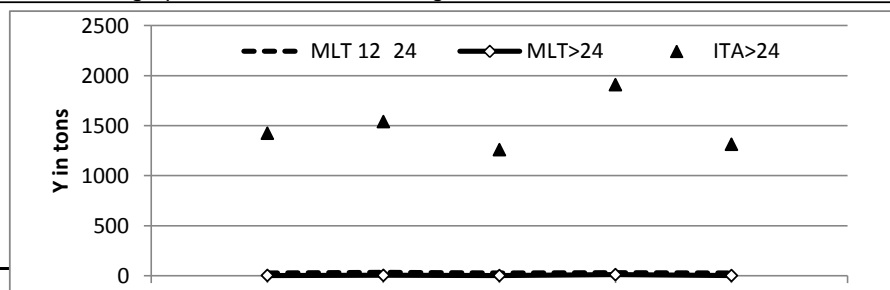
Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
MLT 99 E 03 34 - ARS	12	Tons	27				
MLT 99 F 03 34 - ARS	7	Tons	0.8				
ITA 99 F 03 34 - ARS	138	Tons	1314				
Total	157		1341.8				

Legal minimum size	n/a
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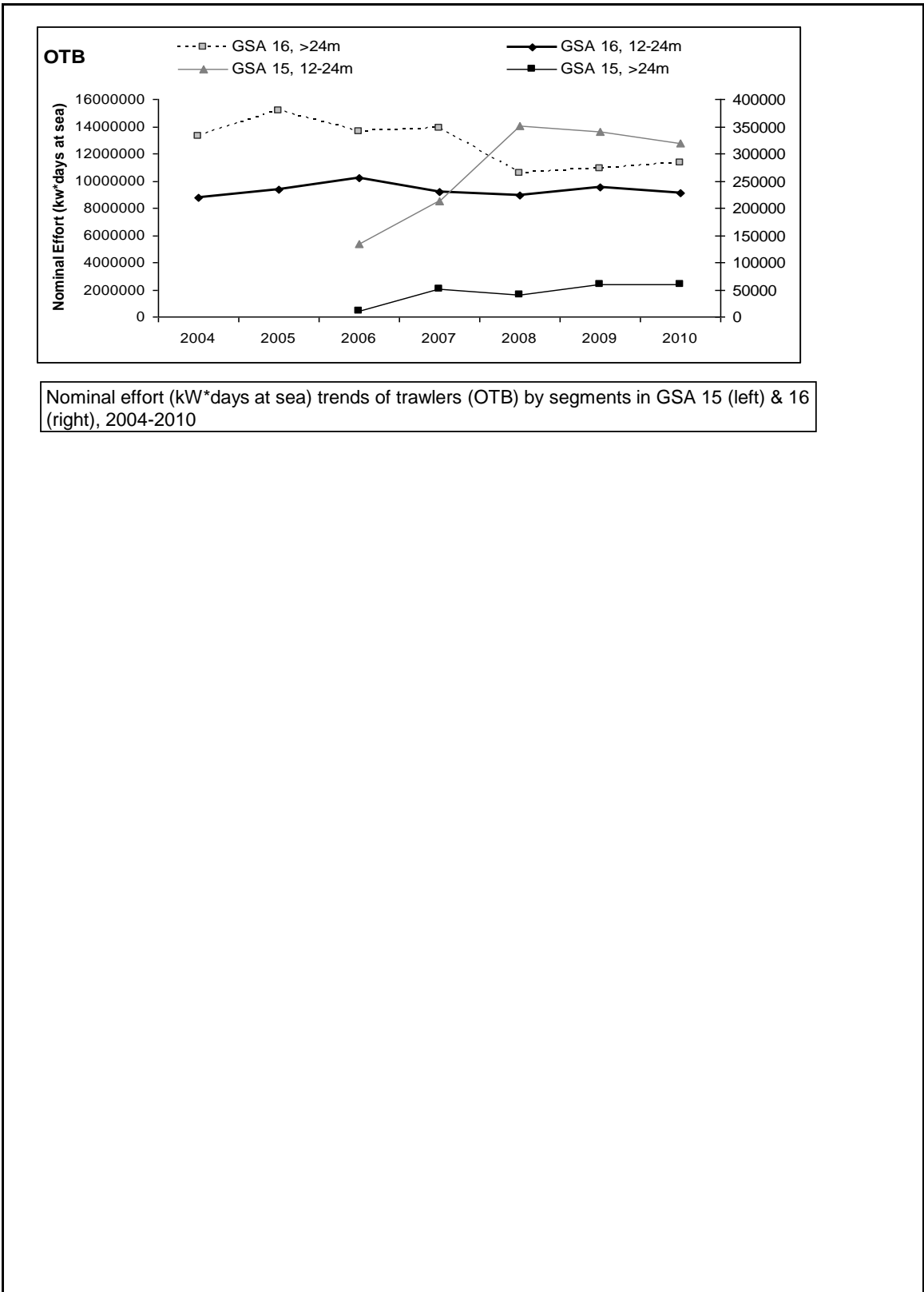
Comments

The giant red shrimps is a relevant target species of the Sicilian and Maltese trawlers and is caught on the slope ground during all year round, but landing peaks are observed in summer.

Trends in fishing effort by year and major gear type in terms of kw*day for the otter trawls are shown in the graph below, it is worth noting that Italian effort is 98-99% of the total one.



Comments



Code: ARS9911L
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Data source*	EU DCF, GSA 15	OpUnit 1*	MLT 99 E 03 34 - ARS
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Time series

Year*	2006	2007	2008	2009	2010	
Catch	27.4	31.3	26.3	29.2	26.6	
Minimum size				16	19	
Average size Lc						
Maximum size				64	66	
Fleet						

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity

Remarks

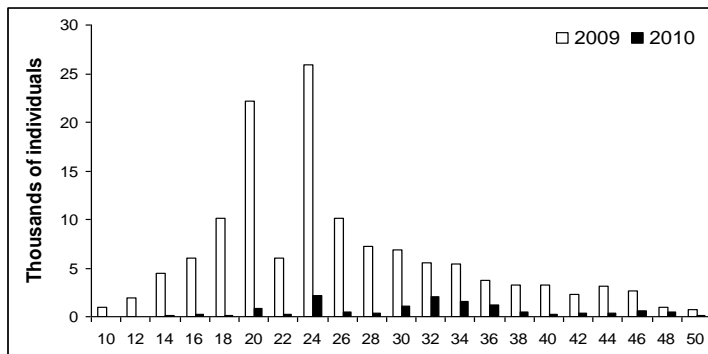
L25		
L50		
L75		
Selection factor		

Structure by size or age

CL (mm)	2009	2010
16	1169	0
17	816	0
18	4364	0
19	3641	864
20	1867	864
21	7762	0
22	4028	0
23	11274	0
24	9929	5187
25	13025	4322
26	13931	2583
27	22543	7311
28	21460	8551
29	30708	13308
30	36904	19050

Structure by size or age

31	43864	31893
32	112772	46863
33	163246	82088
34	170516	99044
35	150975	99576
36	84577	77796
37	69732	55482
38	64634	42839
39	61594	26406
40	52499	32727
41	67811	29597
42	59969	27126
43	80507	16720
44	73224	25420
45	59085	35069
46	63436	33931
47	74312	49935
48	42162	27382
49	41920	31654
50	24428	33539
51	16119	20418
52	16896	18997
53	25263	15108
54	12935	16010
55	16479	9858
56	13993	4754
57	10819	7706
58	7414	1700
59	16528	5849
60	10753	5832
61	11999	2543
62	9108	5525
63	2317	2158
64	2890	2964
65	0	2150
66	0	1705
Total	1918198	1090406



Yearly length structure of giant red shrimp discards in absolute numbers of Maltese trawlers fishing in the Strait of Sicily (GSA 15).

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Data source*	EU DCF, GSA 15	OpUnit 2*	MLT 99 F 03 34 - ARS
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Time series

Year*	2006	2007	2008	2009	2010	
Catch	2.3	3	0.8	10.2	0.8	
Minimum size						
Average size Lc						
Maximum size						
Fleet						

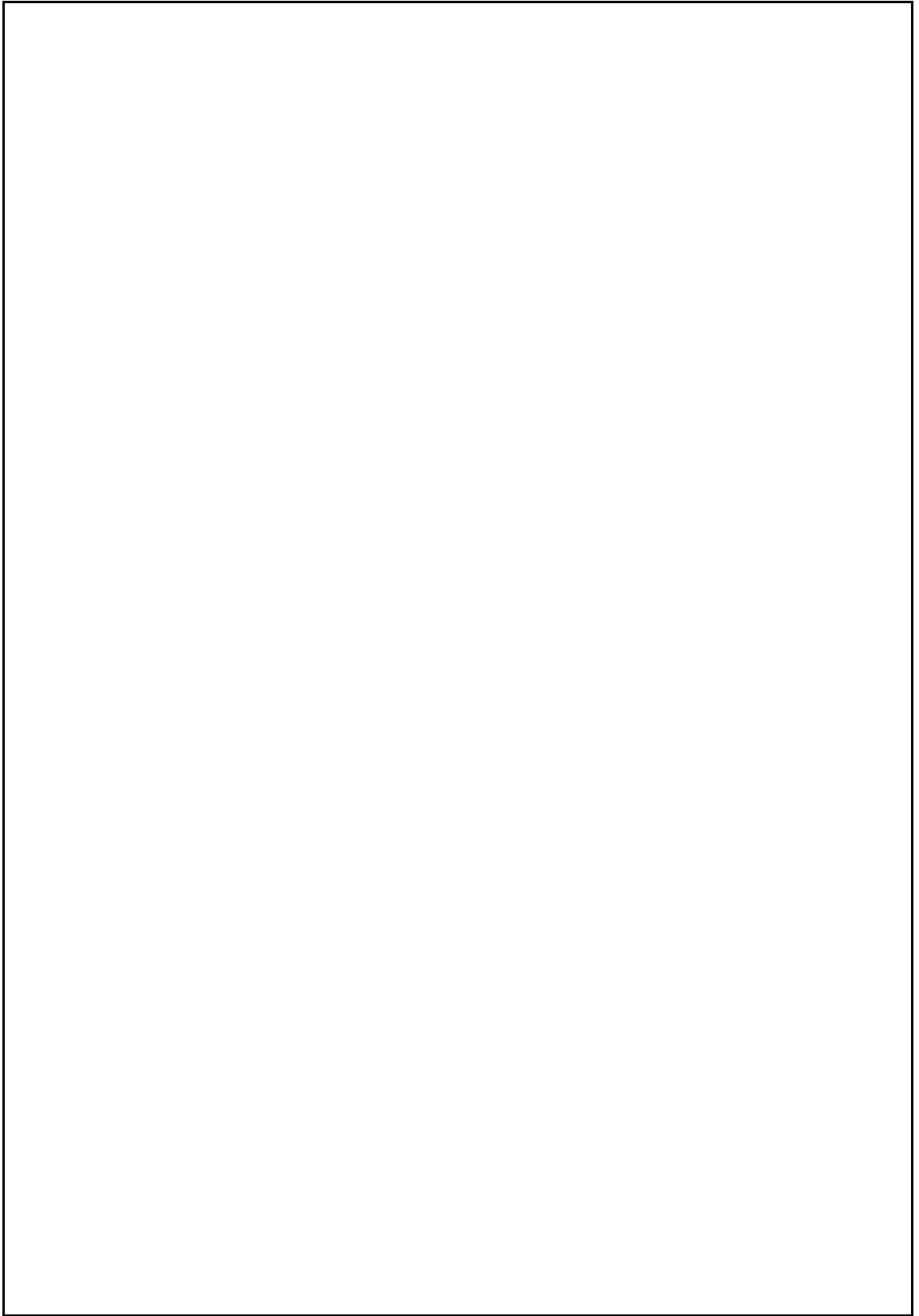
Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity

Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age



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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: ARS9911L

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Data source*	EU DCF, GSA 16	OpUnit 3*	ITA 99 F.03 34 - ARS
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Time series

Year*	2006	2007	2008	2009	2010	
Catch	1424.2	1540.5	1260.1	1909.8	1313.9	
Minimum size	22	18	20	22	22	
Average size Lc						
Maximum size	62	66	66	66	66	
Fleet	OTB	OTB	OTB	OTB	OTB	

Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity

Remarks

L25		
L50		
L75		
Selection factor		

Structure by size or age

CL (mm)	2006	2007	2008	2009	2010
18	0	1147718	0	0	0
20	0	2127058	100306.2	0	0
22	237775.4	1890491	100306.2	51574	127414
24	772770.1	3623935	305042.5	412592	359904
26	475550.8	3149727	215544.7	1388185	866497
28	118887.7	1318576	341744.8	1267871	1473459
30	127265.8	842285.6	256317.1	1018950	1697170
32	127265.8	532422.2	58257.5	1055220	1291634
34	31831.27	470658.9	41612.88	1052649	696676
36	31831.27	408893.2	145912.7	1047737	626244
38	379236	181203.5	243618.9	1156809	536708
40	1142386	711989.2	327243.4	2157004	1201883
42	3044008	3151277	2740826	4377946	2599471
44	5496558	4435267	3064312	7133900	4544630
46	6012676	4454301	6327786	6431671	5201250
48	4499250	4313914	5444355	5080945	4004438

50	4328759	2964016	1190867	3283812	2423721
52	3934095	3878326	1051074	2078437	2458156
54	2702964	4481193	1845097	2012452	1844386
56	2027310	2456743	1555172	1680363	1137034
58	904015.7	962710.1	1846294	1274067	607871
60	760427.9	761040.8	1128505	809822	379241
62	359591.3	574764.1	1515911	630901	334919
64	0	446162	712458	389640	164775
66	0	110052	101302.7	357679	81275
Total	37514455	49394723	30659868	46150230	34658755

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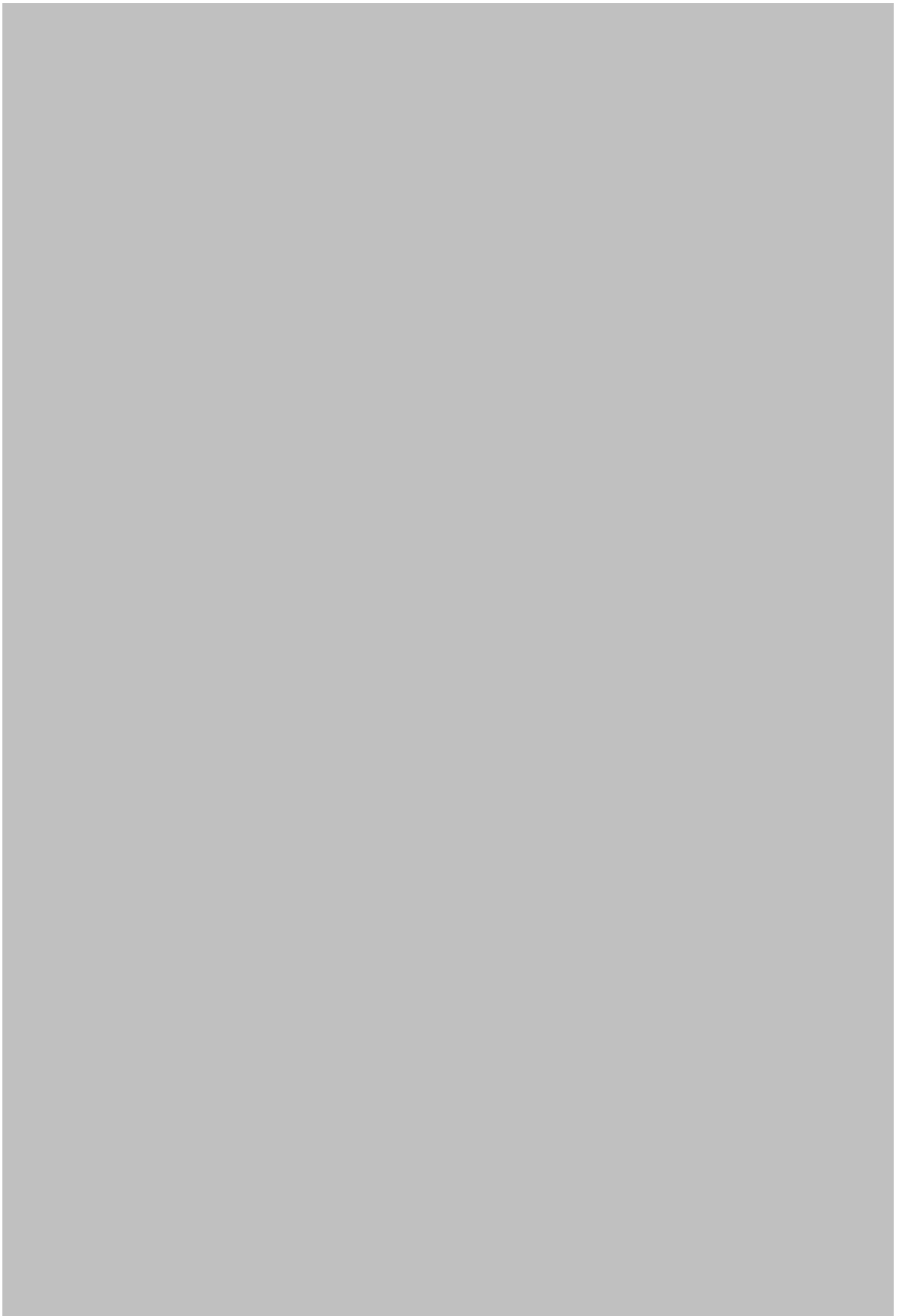
Assessment form

Sheet P2a
Fishery by Operational Unit

This sheet will be activated once the Operational Unit information (P1 section) will be successfully filled in

Code: ARS9911L





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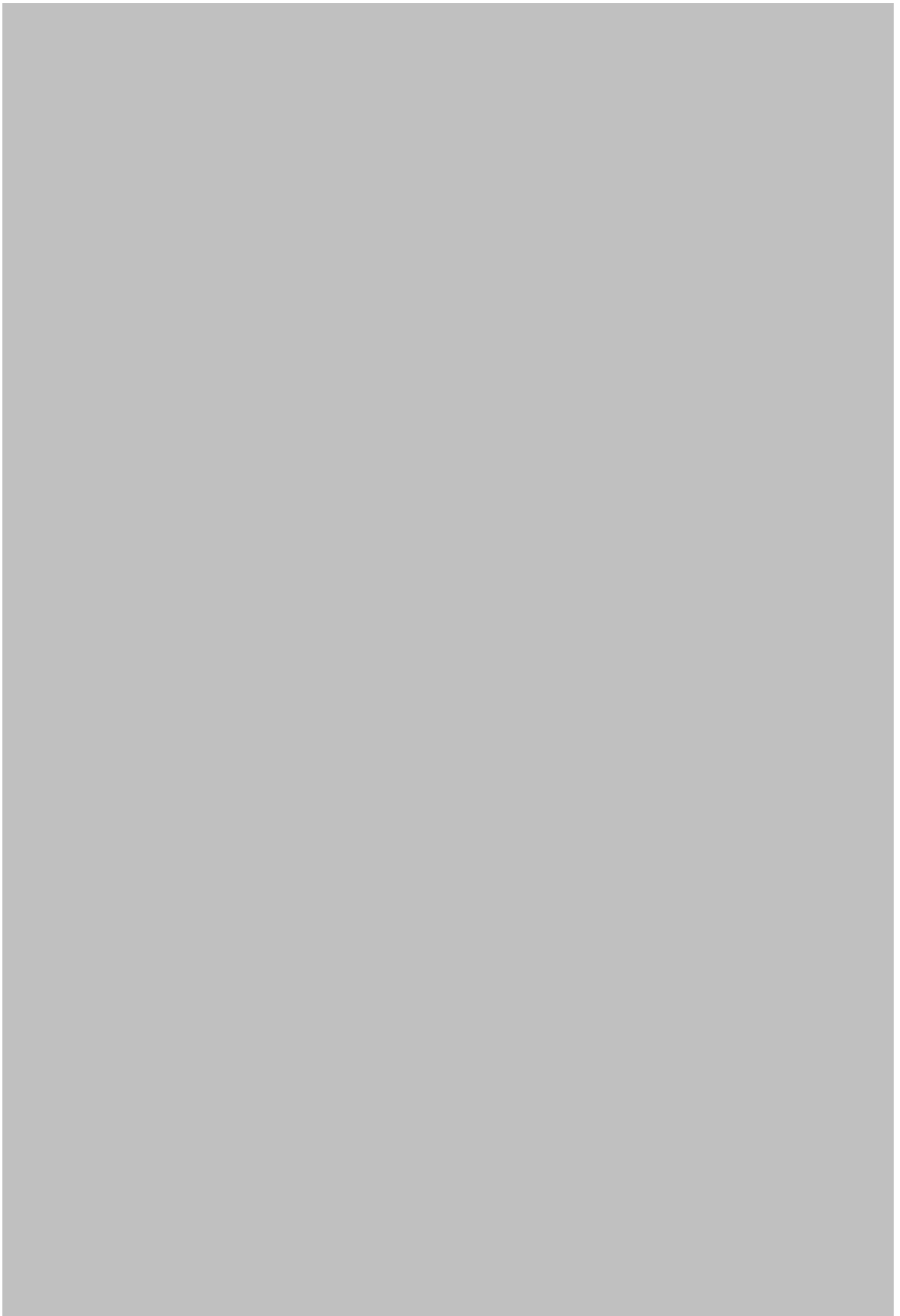
Assessment form

Sheet P2a
Fishery by Operational Unit

This sheet will be activated once the Operational Unit information (P1 section) will be successfully filled in

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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: ARS9911L

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Data source* EC 1967/2006

OpUnit 1*

MLT 99 E 03 34 - ARS

Regulations in force and degree of observance of regulations

At present there are no formal management objectives for giant red shrimp fisheries in the Strait of Sicily. As in other areas of the Mediterranean, the stock management is based on control of fishing capacity (licenses), fishing effort (fishing activity), technical measures (mesh size and area/season closures).

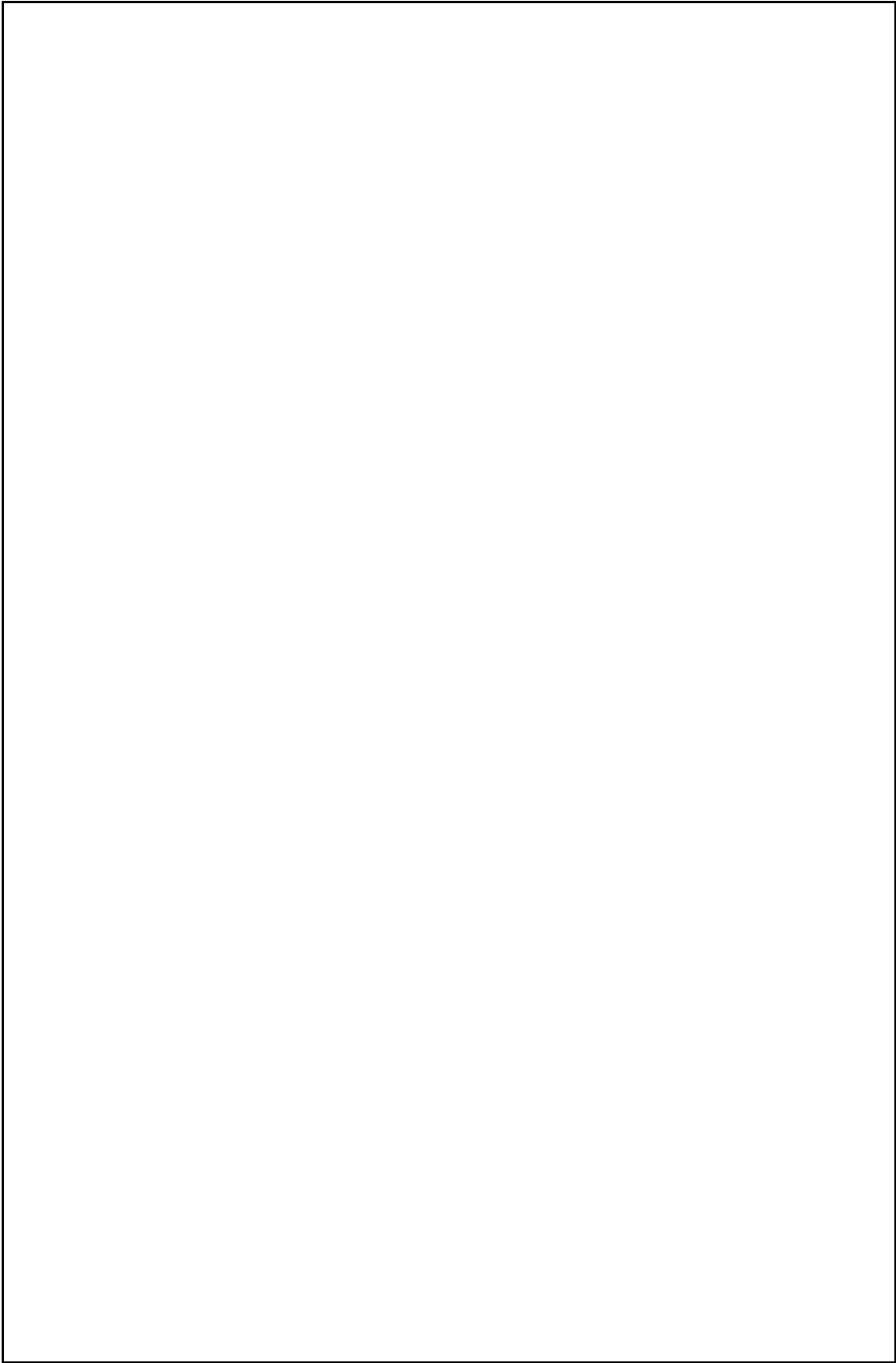
No minimum landing sizes is established for this species (EC 1967/06).

In order to limit the over-capacity of fishing fleet, Maltese fishing licenses have been fixed at a total of 16 trawlers since 2000. Eight new licences were however issued in 2008, a move made possible under EU law by the reduction of the capacities of other Maltese fishing fleets.

In terms of technical measures, the new regulation EC 1967 of 21 December 2006 fixed a minimum mesh size of 40 mm for bottom trawling of EU fishing vessels (Italian and Maltese trawlers). Mesh size had to be modified to square 40 mm or diamond 50 mm in July 2008, and derogations were only possible up to 2010.

Accompanying species

Giant red shrimps are frequently caught together with Norway lobster (*Nephrops norvegicus*), large sized deep water pink shrimp (*Parapenaeus longirostris*), the more rare violet shrimp (*Aristeus antennatus*) as well as large hake (*Merluccius merluccius*).



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Assessment form

Sheet P2b
Fishery by Operational Unit

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Data source*	EC 1967/2006	OpUnit 2*	MLT 99 F 03 34 - ARS
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Regulations in force and degree of observance of regulations

Moreover, the Maltese Islands are surrounded by a 25 nautical miles (nm) fisheries management zone, where fishing effort and capacity are being managed by limiting vessel sizes, as well as total vessel engine powers (EC 813/04; EC 1967/06). Trawling is allowed within this designated conservation area, however only by vessels not exceeding an overall length of 24m and only within designated areas. Such vessels fishing in the management zone hold a special fishing permit in accordance with Article 7 of Regulation (EC) No 1627/94, and are included in a list containing their external marking and vessel's Community fleet register number (CFR) to be provided to the Commission annually by the Member States concerned.

The overall capacity of the trawlers allowed to fish in the 25nm zone can not exceed 4 800 kW, and the total fishing effort of all vessels is not allowed to exceed an overall engine power and tonnage of 83 000 kW and 4 035 GT respectively. The fishing capacity of any single vessel with a license to operate at less than 200m depth can not exceed 185 kW.

The use of all trawl nets within 1.5nm of the coast is prohibited according to EC regulation 1967 / 2006, although again a transitional derogation is at present in place until 2010.

Accompanying species

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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: ARS9911L

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Data source*	EC 1967/2006	OpUnit 3*	ITA 99 F 03 34 - ARS
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Regulations in force and degree of observance of regulations

At present there are no formal management objectives for giant red shrimp fisheries in the Strait of Sicily. As in other areas of the Mediterranean, the stock management is based on control of fishing capacity (licenses), fishing effort (fishing activity), technical measures (mesh size and area/season closures).

No minimum landing sizes is established for this species (EC 1967/06).

The adoption of the trawling ban of 30-45 days per year by the Sicilian Government since late eighties have should contributed to reduce the fishing effort on demersal resources off the Sicilian coast. However this measure for many years had low efficacy for this species because the period of stopping trawling was not chosen to reduce fishing mortality on juveniles of giant red shrimps (in late spring-early summer).

In terms of technical measures, the new regulation EC 1967 of 21 December 2006 fixed a minimum mesh size of 40 mm for bottom trawling of EU fishing vessels (Italian and Maltese trawlers). Mesh size had to be modified to square 40 mm or diamond 50 mm in July 2008, and derogations were only possible up to 2010.

Accompanying species

Giant red shrimps are frequently caught together with Norway lobster (*Nephrops norvegicus*), large sized deep water pink shrimp (*Parapenaeus longirostris*), the more rare violet shrimp (*Aristeus antennatus*) as well as large hake (*Merluccius merluccius*).

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Assessment form

Sheet P2b
Fishery by Operational Unit

This sheet will be activated once the Operational Unit information (P1 section) will be successfully filled in

Code: ARS9911L.



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Assessment form

Sheet P2b
Fishery by Operational Unit

This sheet will be activated once the Operational Unit information (P1 section) will be successfully filled in

Code: ARS9911L.



SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	Sheet A1 Indirect methods: VPA, LCA

Sex*	F
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Code: ARS9911L.
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Time series

Analysis # *	LCA
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Data	Size	Age
(mark with X)	x	

Model	Cohorts	Pseudocohorts
(mark with X)		x

Equation used	VPA	Tunig method	none
# of gears	1	Software	Vit4Win
F _{terminal}	0.3		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment	median = 114	
Average			Average population		
Maximum			Virgin population		
Critical			Turnover		
			SSB		1370
				million	tonnes

Average mortality

	Total	Gear				
F ₁	0.73					
F ₂	1.07					
Z	0.99					

(F1 and F2 represent different possible calculations. Please state them)

Comments

F1 = Mean F over all ages (median 2006-2010)
 F2 = Mean F in age groups 1- 4 (median 2006-2010)
 Z = Mean Z over all ages (median 2006-2010)

Based on VIT analysis, there were 1070 t of spawning stock biomass in 2006, 1370 in 2007, 1300 in 2008, 1580 in 2009 and 1260 in 2010. SURBA analysis of GSA 16 data estimated highly fluctuating SSB indices from 1994 to 2001; from 2002 to 2010 spawning stock biomass remained stable at low levels.

The estimates of absolute recruitment in millions of individuals (age class 1) from VIT analysis in 2006-2010 were 98.1 in 2006, 114 in 2007, 83 in 2008, 118 in 2009 and 123 in 2010.

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Assessment form

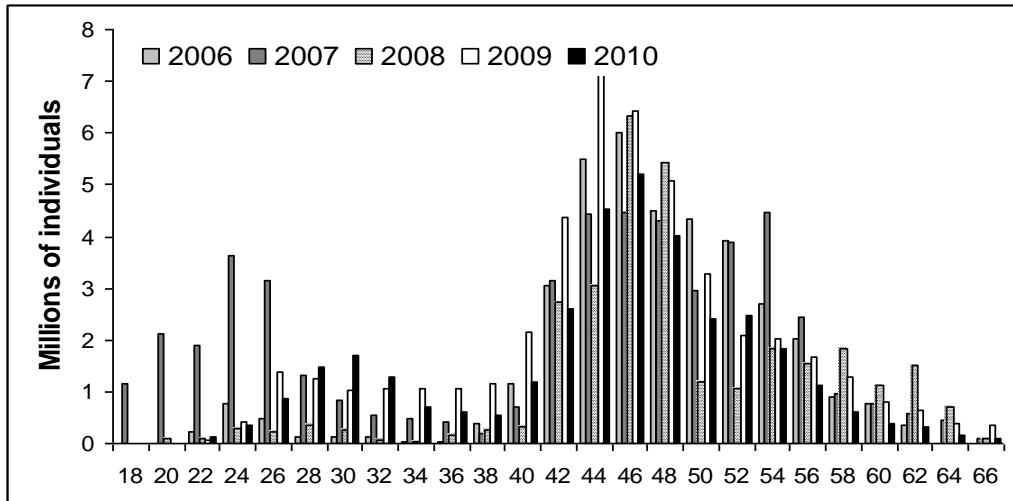
Sheet A2
Indirect methods: data

Code: ARS9911L

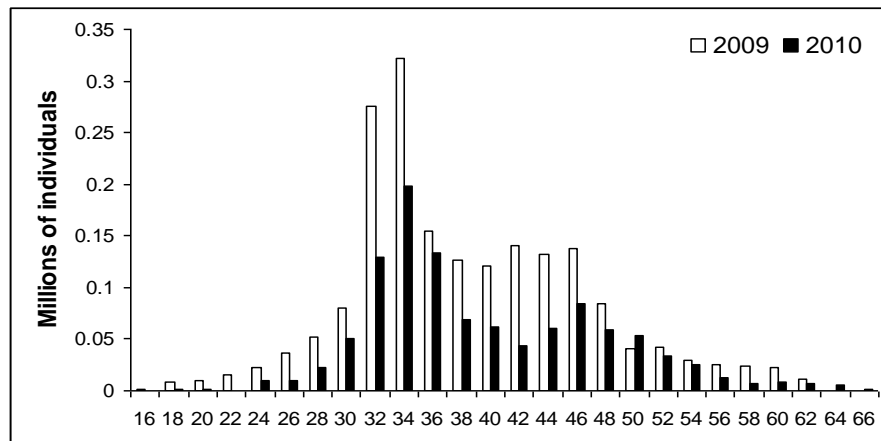
Sex*	F	Gear*	OTB	Analysis # *	LCA
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Data source	LFD, Sicilian and Maltese trawlers
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Data



Yearly length structure of giant red shrimp landings in absolute numbers of Sicilian trawlers fishing in the Strait of Sicily (GSA 12, 13, 14, 15 and 16).



Yearly length structure of giant red shrimp landings in absolute numbers of Maltese trawlers fishing in the Strait of Sicily (GSA 15).

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Assessment form

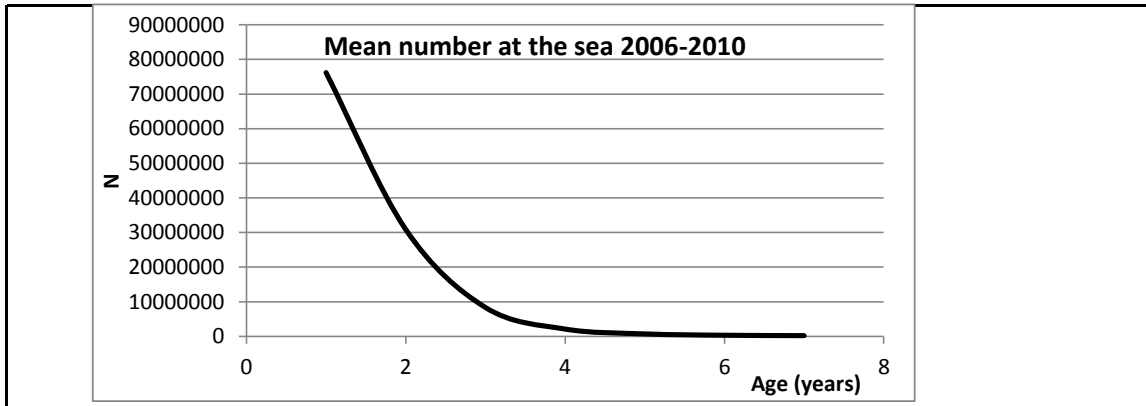
Sheet A3
Indirect methods: VPA results

Code: ARS9911L.

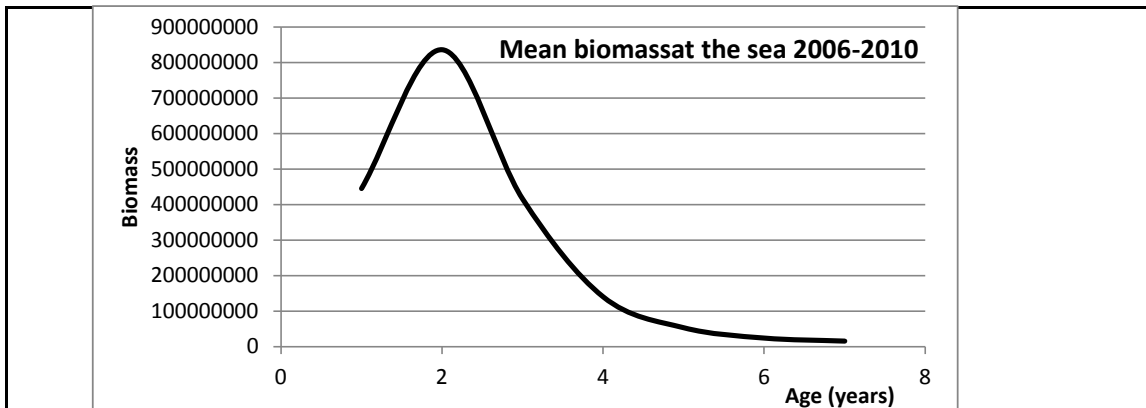
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Sex*	F	Gear*	OTB	Analysis #*	LCA
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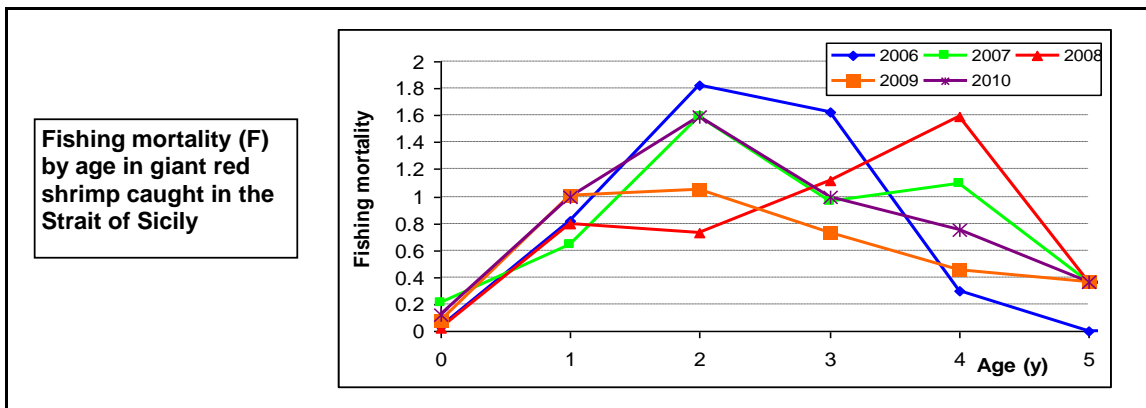
Population in figures



Population in biomass



Fishing mortality rates



SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	Sheet Y Indirect methods: Y/R

Sex	F	Code: ARS9911L
		Analysis # Y/R

# of gears	1	Software	Vit4Win
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Parameters used

Vector F	
Vector M	
Vector N	

Model characteristics

The VIT approach to Biomass and Yield per recruit analysis has been applied in order to analyse the stock production with increasing exploitation under equilibrium conditions.

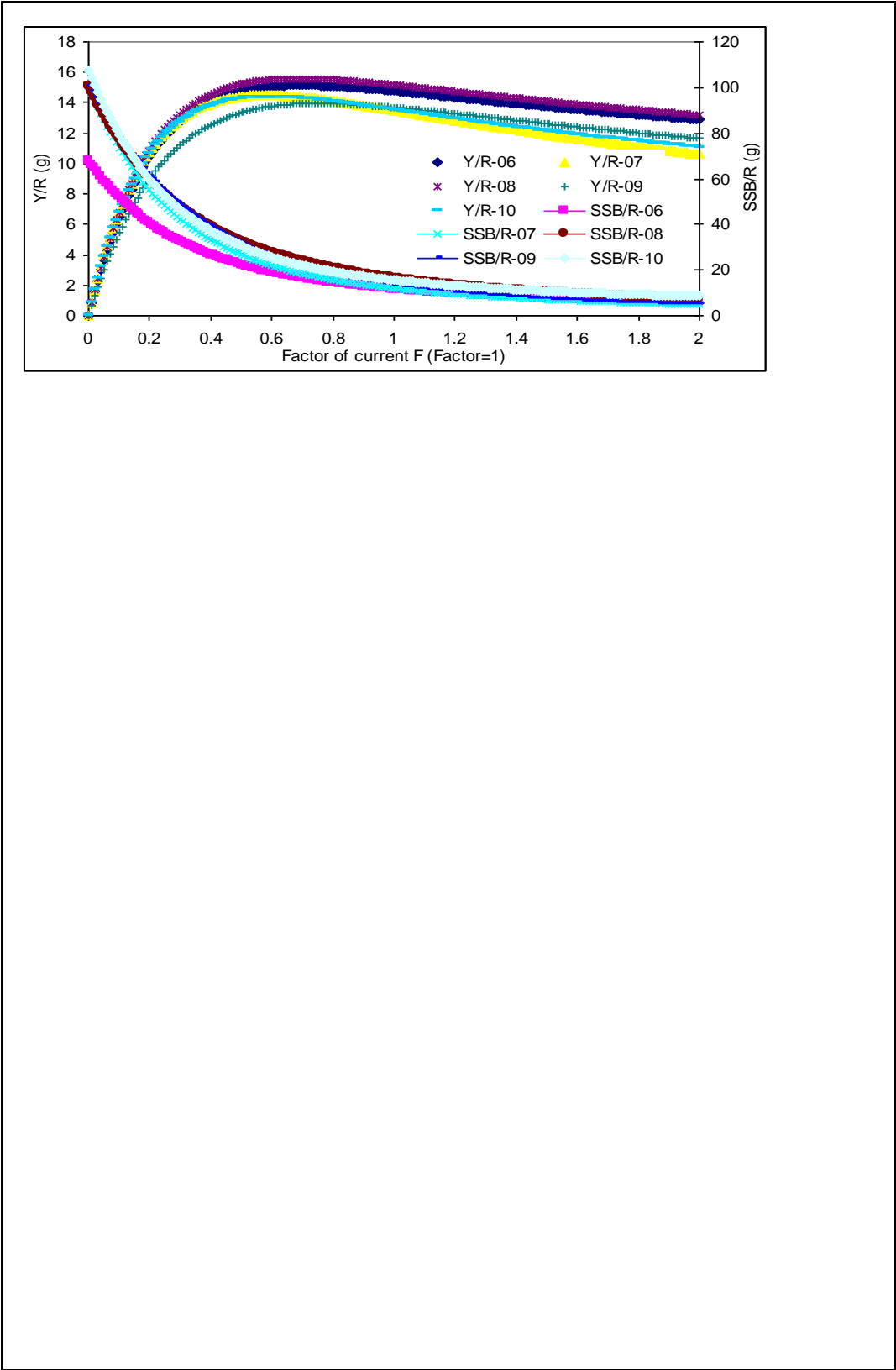
Results

	Total	Gear			
		2006	2007	2008	2009
Current YR	13.51	14.77	13.5	15.17	13.69
Maximum Y/R	14.36	15.15	14.5	15.59	13.96
Y/R 0.1	13.73	14.41	13.82	14.72	13.3
F_{max}	0.65	0.81	0.63	0.74	0.4
$F_{0.1}$	0.42	0.36	0.41	0.44	0.61
Current B/R	15.62				
Maximum B/R	26.15				
B/R 0.1	38.06				
	2010 variables				

Comments

Yield (Y/R) and Spawning stock biomass (SSB/R) per recruit varying current fishing mortality (F_c) by a multiplicative factor according to the VIT package. Analyses deal with pseudo-cohorts 2006, 2007, 2008, 2009 and 2010.

Comments



Other assessment methods

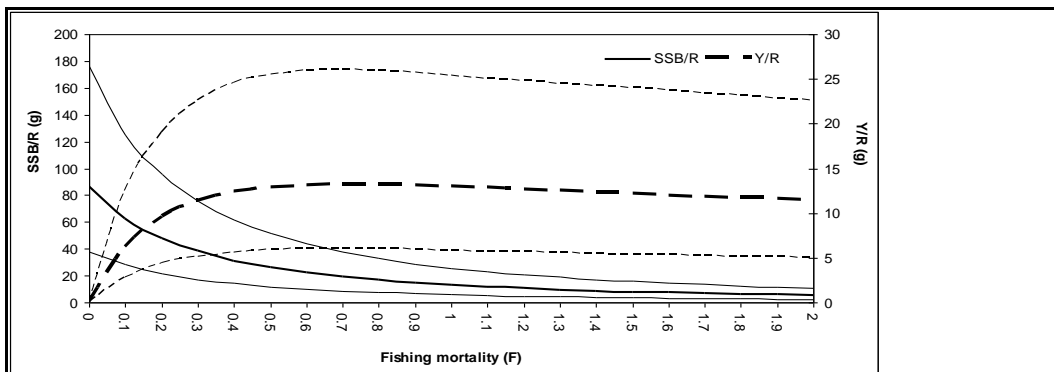
Availability of biological parameter and length at first capture allows to quantify by simulation the likely changes in Y, B and SSB per recruit in function of fishing mortality (F) with the Yield package (Branch et al., 2001). The package was also used to estimate a probability estimation of BRP (Fmax and F0.1).

Due to the constrains of the package, all parameters were converted from Carapace Length (CL) in mm to Total Length (TL) by using the relation given by Gancitano (Pers. Com.):

$$LT \text{ (mm)} = 2.678 \text{ CL (mm)} + 28.564.$$

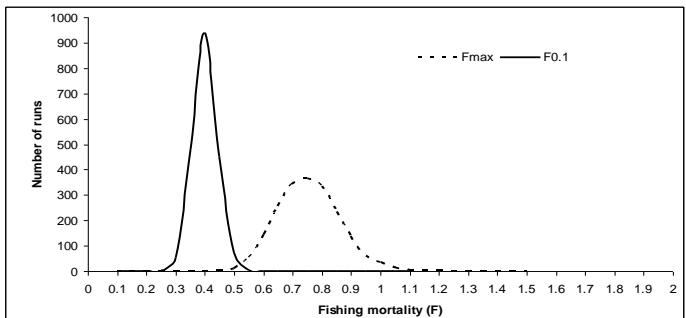
The new parameters were finally converted in terms of cm and g. A guess estimate of uncertainty in terms of coefficient of variation was added to each parameter. Due to the package constrains the natural mortality rate was assumed constant, being $M=0.40$ (Ragonese et al., 2004). Stock-recruitment relationship was not used. Recruitment was assumed constant with a random variability among years of $(CV=0.4)$.

Searching for biological reference points (BRP) through 2000 simulation produced the probability distribution of Fmax and F0.1



Median of yield and spawning stock biomass per recruit & corresponding uncertainty of

Probability distribution of Fmax and F0.1 according to Yield package:
 The F0.1 estimate is virtually equal to those given by VIT, whereas Fmax estimated in this manner is thus slightly higher.



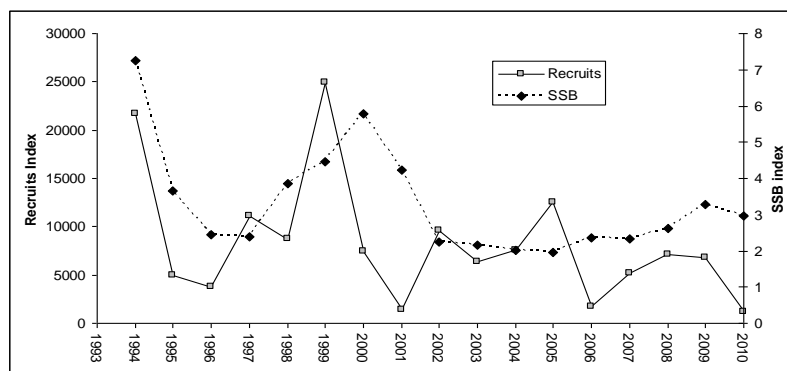
Other assessment methods

The availability of time series (2002-2010 for GSA 15 and 1994-2010 for GSA 16) of length frequency distribution (LFD) from trawl surveys data allows to reconstruct the evolution of main stock parameters (recruitment and spawning stock biomass indices and fishing mortality rates) of giant red shrimps in the GSA 15 and 16 by using the SURBA software package. Since females reach the largest size and they are more sensitive to fishery pressure, analysis were carried out only on females fraction, which represent about the 60% of the commercial catch (mean of period 2006-2009).

Firstly the LFD by sex from the MEDITS trawl surveys was corrected by including the data for the individuals with unidentified sexes. This was based on the sex ratio per size class. The corrected LFDs by sex for each GSA were then converted in numbers by age group using the subroutine "age slicing" as implemented in the software package LFDA (Kirkwood et al., 2001). Secondly we estimated the mean weight and maturity at age using VBGF and a vectorial natural mortality at age (PRODBIOM excel sheet as implemented by Abella in SGMED 01 09) for the SURBA software to run the analysis. Then the numbers at age were used to estimate time series of fishing mortality rates, and recruitment and SSB indices. Since the time series for GSA 15 is too short (from 2002 to 2010), SURBA analysis was done only considering the GSA 16 information (1994-2010).

Values by age used for Surba analyses for giant red shrimp (females) in GSA 16.

Age	0	1	2	3	4	5+
Natural mortality at age	0.62	0.30	0.23	0.19	0.17	0.16
Maturity at age	0.03	0.80	1.0	1.0	1.0	1.0
Weight at age	5.79	26.70	50.28	67.62	78.22	84.23
Catchability coefficient	0.4	0.8	1.0	1.0	1.0	1.0

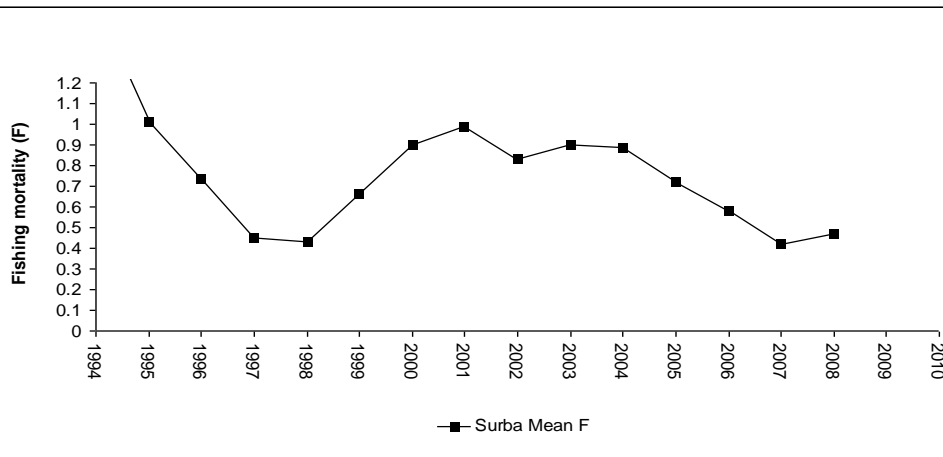


SSB in kg/km2 and recruits n/km2 (MEDITS survey), as median of SURBA bootstrapped values, in GSA 16:

In 1994 - 2001 recruitment / SSB indices fluctuate highly, with the lowest number of recruits recorded in 2001. From 2002- 2010 SSB remained stable on low level, whilst recruitment abundance recruits abundance reached the low levels recorded in 2001 in 2006/2010.

Other assessment methods

The values of F (age 1-3) in GSA 16 from 2000 to 2007 remains high, with values around 0.9. To avoid bias in F estimation due to unavailability of three cohorts for which F were averaged, the F estimate was only considered reliable up to 2008.



Development of fishing mortality (F1-3) (MEDITS survey), as median of SURBA bootstrapped values, in GSA 16. Due to the limit of the SURBA method, estimates are given up to 2008.

Code: ARS9911L

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	15.62	g	38.06		Biomass and yield values are per recruit
SSB	10.31	g	31.94		
F	1.09		0.4		(VIT analysis, F0.1 based on 2006-2010 results, Fc = 2010)
Y	13.51	g	13.73		
CPUE					

Stock Status* Use one (or both) of the following two systems for the stock assessment status description

Unidimensional	<input type="radio"/>	? - (or blank) Not known or uncertain . Not much information is available to make a judgment;
	<input type="radio"/>	U - Underexploited, undeveloped or new fishery . Believed to have a significant potential for expansion in total production;
	<input type="radio"/>	M - Moderately exploited , exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production;
	<input type="radio"/>	F - Fully exploited . The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;
	<input checked="" type="radio"/>	O - Overexploited . The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse;
	<input type="radio"/>	D - Depleted . Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
	<input type="radio"/>	R - Recovering . Catches are again increasing after having been depleted or a collapse from a previous;

Bidimensional	Exploitation rate		Stock abundance	
	<input type="radio"/>	No or low fishing	<input type="radio"/>	Virgin or high abundance
	<input type="radio"/>	Moderate fishing	<input type="radio"/>	Intermediate abundance
	<input checked="" type="radio"/>	High fishing mortality	<input checked="" type="radio"/>	Low abundance
	<input type="radio"/>	Uncertain / Not assessed	<input type="radio"/>	Depleted
			<input type="radio"/>	Uncertain / Not assessed

Comments

The giant red shrimp stock in the Strait of Sicily is considered overfished since the current fishing mortality is higher than both F_{max} and $F_{0.1}$. Considering the high consistency of results with different methods, $F_{max}=0.70$ were proposed as Limit Reference Points (LRP), and $F_{0.1}=0.40$ as the Target reference points (TRP).

SAC GFCM - Sub-Committee on Stock Assessment (SCSA)

Assessment form

Sheet Z

Objectives and recommendations

Code: ARS9911L

Management advice and recommendations*

Considering $F_{0.1}$ as target reference points, a reduction ranging between 50 and 60% of the current F in 2009 and 2010 is needed to reach a more sustainable fishery exploitation. To reach an exploitation below F_{max} a reduction of current F in the same years ranging between 20 and 40% should be pursued.

GFCM SCSA demersal WG was informed that the Italian government has adopted a management plan in which a reduction of trawler capacity of 25% of that existing in 2008 is planned within 2013. STECF EWG 11-12 recommends to continuously reduce current F through consistent effort reductions, and an improvement in current exploitation patterns.

Advice for scientific research*



Abstract for SCSA reporting

Authors

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Year

2011

Species Scientific name

Aristaeomorpha foliacea - ARS

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area

15 - Malta Island, 16 - South of Sicily

Fisheries (brief description of the fishery)*

The giant red shrimps is a relevant target species of the Sicilian and Maltese trawlers and is caught on the slope ground during all year round, but landing peaks are observed in summer. *A.foliacea* is fished exclusively by otter trawl, mainly in the central–eastern side of the Strait of Sicily, whereas in the western side it is substituted by the violet shrimp, *Aristeus antennatus*.

Due to reduction of catch rate since 2004 some distant trawlers based in Mazara del Vallo, which is the main fleet in the area, recently moved to the eastern Mediterranean (Aegean and Levant Sea) to fish red shrimps (Garofalo et al., 2007). A rough delimitation of the most important fishing grounds of red shrimps in the Strait of Sicily targetted by Sicilian vessels is reported in Ragonese (1995). In Maltese waters, trawlers targeting the giant red shrimp *A. foliacea* within the 25nm fisheries management zone trawl either to the north / north-west of the Island of Gozo, or to the west/south-west of Malta, at depths of about 600m. Detailed maps of the trawling grounds for Maltese Fisheries Management Zone (FMZ), including a wide part of GSA 15 are available (Camilleri et al., 2008).

Yield of both the Italian and Maltese trawlers peaked in 2009 with a total of 1951 t, compared to an average of 1400 t in 2005-2008. At 1340 t landings in 2010 were slightly below the 2005-2008 average. Maltese trawlers in 2005-2010 were responsible for only 2% of total landings of giant red shrimp in GSAs 12-16.

Source of management advice*

(brief description of material -data- and methods used for the assessment)

Five complete years (2006, 2007, 2008, 2009 and 2010) of length frequency distributions from GSA 16 commercial landings data (fished in GSA 15 as well as GSA 16) were available, as well as two years (2009 and 2010) from GSA 15, so an approach under steady state (pseudocohort) assumptions was used. Cohort (VPA equation) and Y/R analysis as implemented in the package VIT4win were thus used. Data were derived from DCF data call for GSA 15 and 16.

Stock Status*

O - Overexploited. The fishery is being exploited at above a level which is believed to be sustainable in the long term, with no potential room for further expansion and a higher risk of stock depletion/collapse;

Exploitation rate

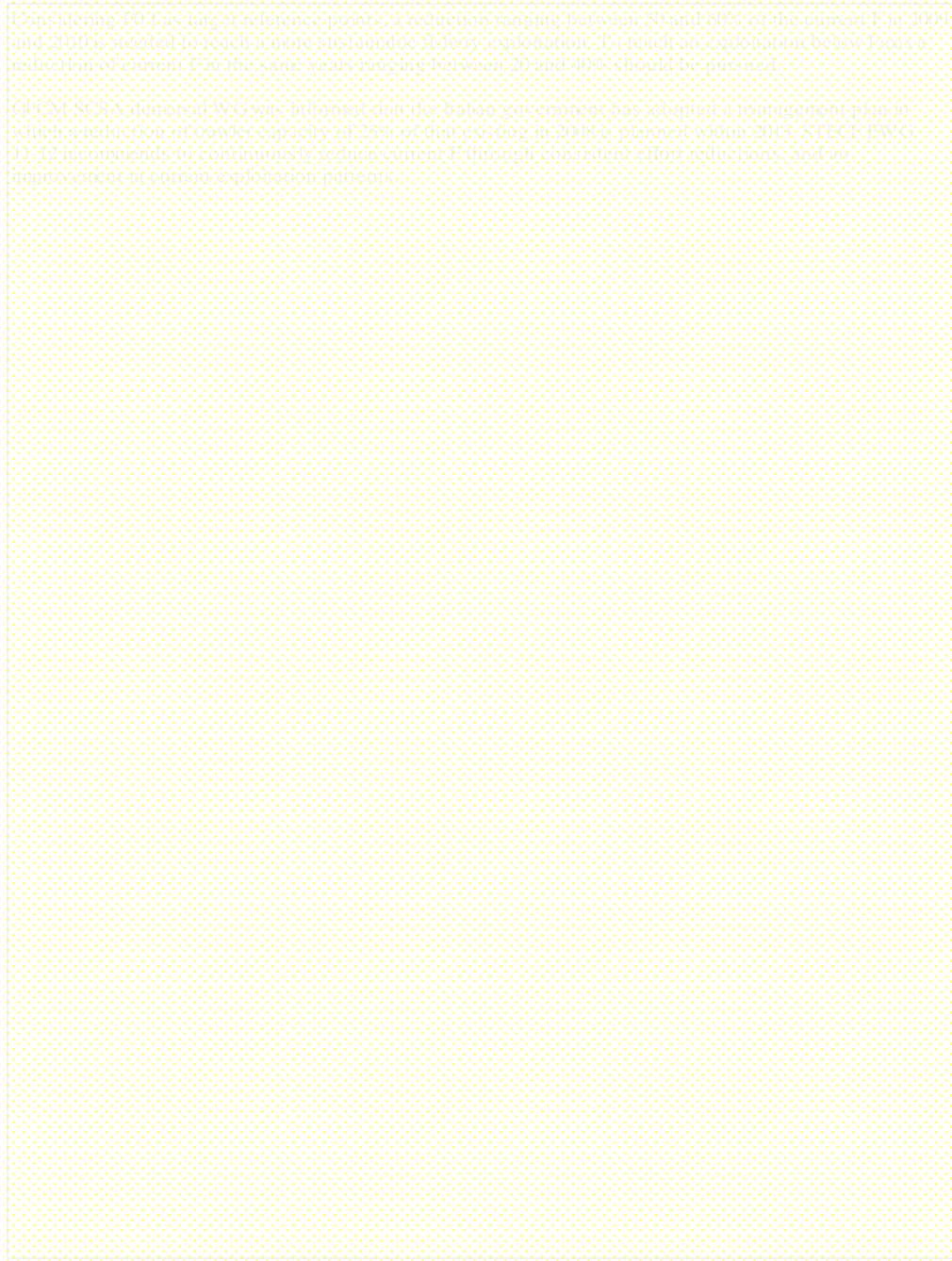
High fishing mortality

Stock abundance

Low abundance

Comments

Management advice and recommendations*



Advice for scientific research*

