

SAC GFCM Sub-Committee on Stock Assessment

Date*

24	October	2011
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Code*

ARA0611Est

Authors*

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Affiliation*

Instituto Español de Oceanografía. Centro Oceanográfico de Murcia. c/ Varadero nº 1. San Pedro del Pinatar, Murcia. Spain

Species Scientific name* **1** *Aristeus antennatus* - **ARA**
Source: GFCM Priority Species

2
Source: -

3
Source: -

Geographical area*

Western Mediterranean (FAO 37.1.1)

Geographical Sub-Area (GSA)*

06- Northern Spain

Combination of GSAs

1	
2	
3	

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

Assessment form

Sheet #0

Basic data on the assessment

Code: ARA0611Est

Date*	24	Oct	2011	Authors*	Esteban, A. ↯ Fernandez, A.
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Species Scientific name*	Aristeus antennatus - ARA	Species common name*	Red shrimp, Crevette rouge, Gamba roja
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Data Source

GSA*	06- Northern Spain	Period of time*	1996-2010
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Description of the analysis

Type of data*	Monthly size distribution, and year-age classes. Daily landing bt vessel, and monthly port landing	Data source*	Fishery Department local authorities and DCR data sampling IEO programme.
Method of assessment*	LCA-Pseudocoohort and Y/R, VPA-Separable Virtual Analysis and XSA-Extended Survivor Analysis	Software used*	VIT (Leonart and Salat, 1997) VPA-XSA (Darby and Flatman, 1994)

Sheets filled out

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

Comments, bibliography, etc.

Leonart, J., and J. Salat. 1997. VIT: Software for fishery analysis--. User's manual FAO Computerized information Series (Fisheries) N° 11. Rome, FAO. 1997. 105 p.

Darby, C. and D. Flatman. 1994. Virtual Population Analysis: version 3.1. (Windows/Dos) user guide. Infor. Tech. Ser., MAFF Direct. Fish. Res., Lowestof (1):85 pp.

García-Rodríguez, M. La gamba roja (*Aristeus antennatus*): Distribución, Demografía, Crecimiento, Reproducción y Explotación en el Golfo de Alicante, Canal de Ibiza y Golfo de Vera. Tesis Doctoral. Universidad Complutense de Madrid.

García-Rodríguez, M & Esteban, A.-On the biology and fishery of *Aristeus antennatus* (Decapoda, Dendrobranchiata) in the Ibiza Channel (Balearic, Islands, Spain)

Comments, bibliography, etc.

The assessment was based on analysis of long-term data (landings, effort, CPUE, mean sizes in Aristeus catches in Santa Pola Bay and from models (LCA, Y/R, VPA and XSA). Dates were obtained from the Fishery Department of Autonomus Govern (landings and effort) and from the IEO own sampling programmes (IEO sampling programe from 1992 to 2003, and DCR sampling programmes from 2003 to 2009) for biological data (Size distribution, growth, maturity, sex-ratio, lenght-weight relationship, and natural mortality).

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Sheet B
Biology of the species

Code: ARA0611Est

Biology

Somatic magnitude measured (LH, LC, etc)*	CL	Units*	mm
Sex	Fem	Mal	Both
Maximum size observed	77	51	Unsexed
Size at first maturity	21.9	18.1	Reproduction season
Recruitment size	13-22	15-18	Reproduction areas
			Nursery areas
			GSA 6
			GSA 6

Parameters used (state units and information sources)

		Units	Sex			
			female	male	both	unsexed
Growth model	L ∞	mm	77	51	77	
	K	mm/month	0.38	0.36	0.38	
	t0		-0.0065	-0.52	-0.065	
	Data source	García-Rodríguez, M. 2003				
Length weight relationship	a		0.00231	0.0026	0.00237	
	b		2.50027	2.4668	2.496	

M		0.363	0.517	0.5	
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sex ratio (mal/fem)	30/70
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Comments

Aristeus present different growth and sexual maturity for females and males. The majority of landings are females dominated. The results of the assessment by sex are difficult to apply for management purposes.

A large empty rectangular box intended for handwritten or typed comments.

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Assessment form

Sheet P1

General information about the fishery

Code: ARA0611Est

Data source*	Govern Autonomus Cataluña and Valencia , Fishery Department	Year (s)*	1996-2010
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Data aggregation (by year, average figures between years, etc.)*	Annual agregation by year, and average of all years
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Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	ESP	06	E - Trawl (12-24 metres)	03 - Trawls	34 - Demersal slope species	ARA
Operational Unit 2						
Operational Unit 3						
Operational Unit 4						
Operational Unit 5						

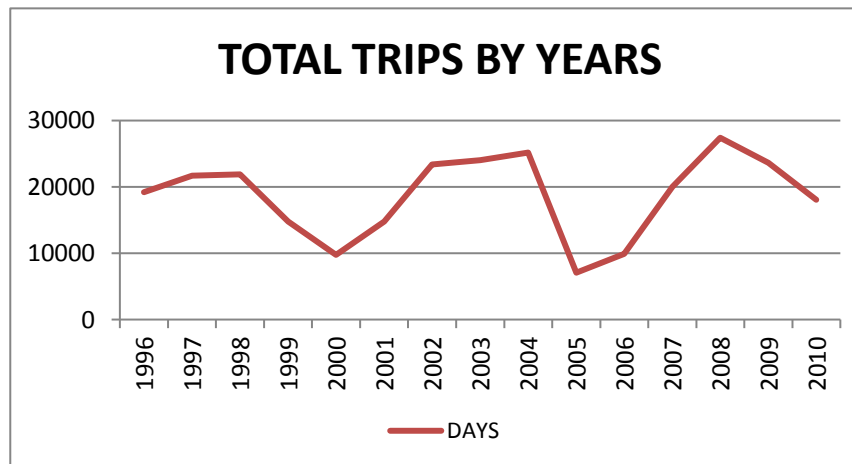
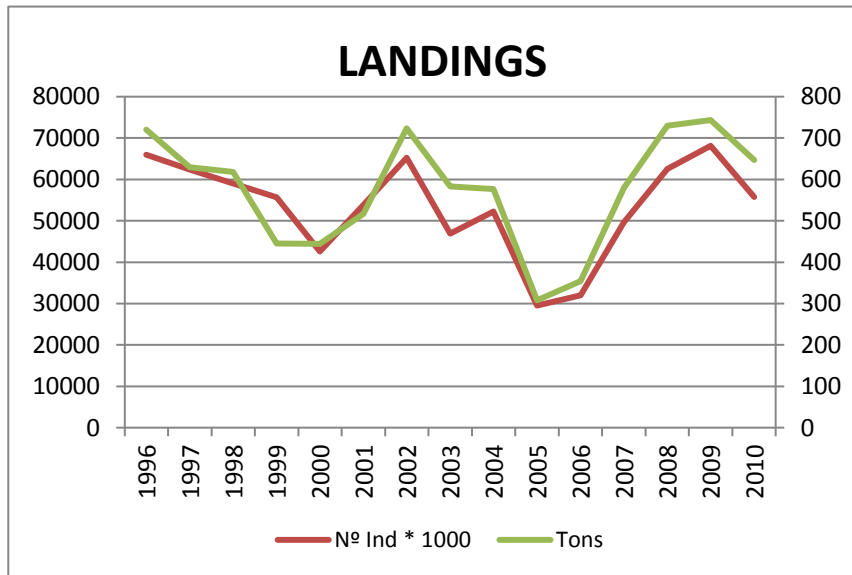
Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ESP 06 E 03 34 - ARA	130	Tons	647 t		NO	NO	Fishing-
Total	130		647t				

Legal minimum size	None
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Comments

Throughout the time series landings fluctuated between 300 and 700 tonnes, decreasing bellow 308 t in 2005. From 2005 landings increase untill 743 tonnes in 2009. Females predominate in the landings nearly 80% of the total. Discards of the red shrimp are null. The number of harbours with red shrimp fleets is 14 for the whole area. The estimated effort figures was made based on daily vessels sale sheets information obtained through the National Sampling Programme available for the Santa Pola fleet. The CPUEs fluctuated around long-term average of 33 Kg/day. Effort data indices (Landings/CPUE) remain fairly stable.

Comments





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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: ARA0611Est

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Data source*	Autonomus Govern. Fishing statistics	OpUnit 1*	ESP 06 E 03 34 - ARA
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Time series

Year*	1999	2000	2001	2002	2003	2004
Catch	445	444	517	723	583	577
Minimum size	12	15	17	16	15	14
Average size Lc	26.46	26.68	28.63	30.2	27.3	29.78
Maximum size	64	61	59	58	60	61
Fleet						

Year	2005	2006	2007	2008	2009	2010
Catch	308	354	579	730	743	647
Minimum size	14	14	15	16	16	16
Average size Lc	29.25	29.96	30.91	29.51	30.19	29.88
Maximum size	62	60	60	62	68	64
Fleet						

Selectivity

Remarks

L25	20.1	
L50	22.1	
L75	24.1	
Selection factor		
		

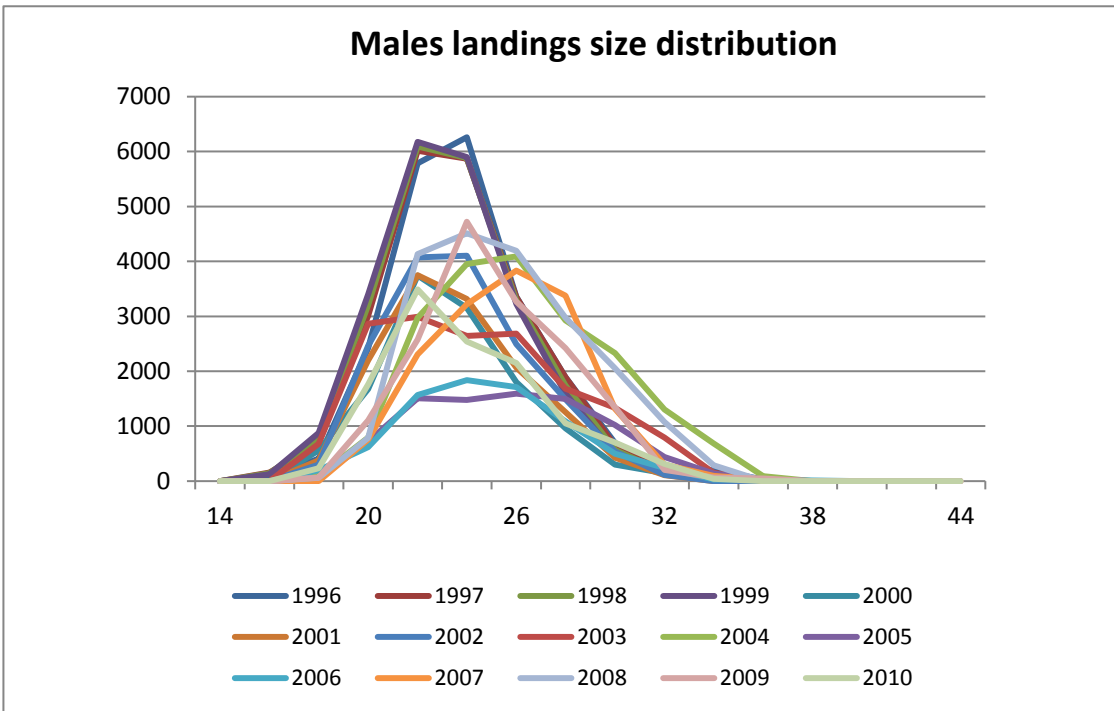
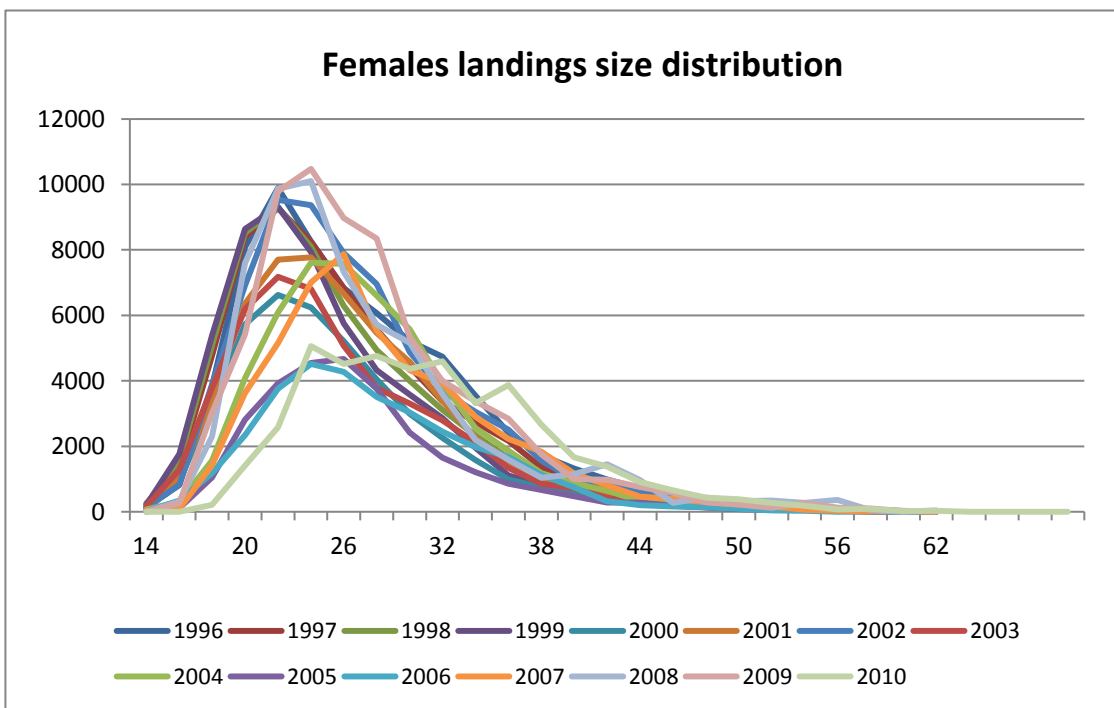
Structure by size or age

Size structure remain quite stable. The whole trawl fleet can potentially fishing in the slope, although the number of vessels fishing at the same time in the slope use be between 50 and 75% of the total fleet.

Summary of assessment carried out by the red shrimp in the GSA 6

	Females	Males	Sum of sex	Combined
LCA (Length	X	X	X	
VPA (Age				
XSA				
Y/R	X	X	X	

Structure by size or age



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Sheet P2b
Fishery by Operational Unit

Code: ARA0611Est

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Data source* BOE (Boletín Oficial del Estado) and personal observa OpUnit 1* ESP 06 E 03 34 - ARA

Regulations in force and degree of observance of regulations

Fishing license: fully observed
Engine power limited to 500 HP: not fully observed
Fishing forbidden at < 50 m depth: fully observed
Time at sea 5 days a week during 12 hours at sea: fully observed

EC Regulations:

The minimum mesh size of all bottom gear may not be less than 40 mm square mesh or 50 mm diamond. In addition trawling activity cannot be performed within 3 miles off the coast, where sea bed is less than 50 m depth.

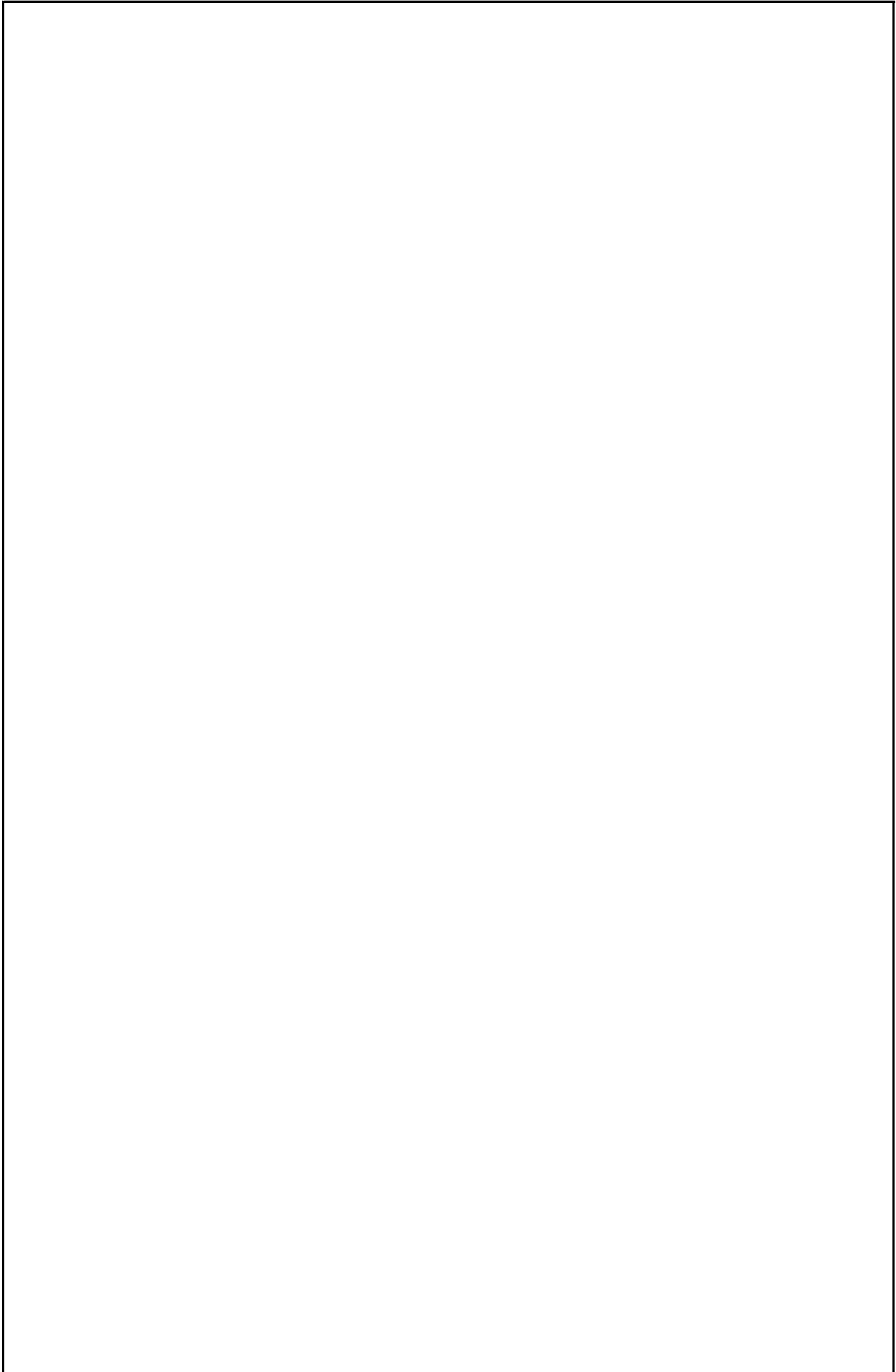
Minimum landings sizes have been established for the most important commercial species, although there is not a minimum landing size for the red shrimp according to EC Regulation 1967/2006, which has replaced the previous EC Regulation 1626/94.

The use of towed dredges and trawl nets is at depth beyond 1000 m prohibited (EC Regulation 1967/2006) ational Regulations:

Effort regulations (APA/254/200) authorised trawls fishing 5 days a week during 12 hours at sea.

Accompanying species

- Red Shrimp bottom trawl main accompanying species are listed below:
- European hake (*Merluccius merluccius*)
- Black mouth catshark (*Galeus melastomus*)
- Pandalid shrimps (*Plesionika spp . Pasiphaea*)
- Giant red shrimp (*Aristaeomorpha foliacea*)
- Crabs (*Macropipus tuberculatus*, *Geryon longipes*)
- Megrims (*Lepidorhombus spp .*)
- Seabreams (*Pagellus acarne*)
- Silver scabbard fish (*Lepidopus caudatus*)
- Anglerfish (*Lophius spp .*)
- Blue-whiting (*Micromesistius poutassou*)
- Greater forkbeard (*Phycis blennoides*)
- Rockfish (*Helicolenus dactylopterus*)
- Conger eel (*Conger conger*)



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Assessment form

Sheet A2
Indirect methods: data

Code: ARA0611Est

Sex*	Sex Combined	Gear*	TRAWL	Analysis # *	VPA, XSA
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Data source

Data

Quality of data and inputs: Length frequency data for landings are available on a monthly basis. It was run a single VPA of males and females combined, using VPA package. The male and female length distributions for year (1996-2010) were split using L2Age, slicing ICES package to ages. The catch-at-age for the two sexes were then summed to do a separable VPA and XSA for Sex_combined data. Effort in days represent effort by trip. Tuning data series was made using the Santa Pola harbour reference fleet. and MEDITS Surveys GSA 6.

PARAMETERS	Females	Males	Total
Linf	77	51	77
K	0.38	0.36	0.38
to	-0.065	-0.52	-0.065
a	0.00231	0.0026	0.00237
b	2.50273	2.46678	2.49607
L50	26	21	21
M	0.363	0.517	0.46

SEPARABLE VPA Setting used in the assessment

Ft = 0.4

St = 1.0

Initial sum of squared residuals was 83.194 and final sum of squared residuals is 5.126 after 31 iterations

XSA: Setting used in the assessment

GSA: Year range 1996-2109; Age range: 0-6; Classe plus 4+

TUNING FLEET: Santa Pola port; Year range: 1996-2010

TUNING SURVEY: MEDIT_GSA 6; Year range: 1996-2010

First age for normal catchability independ analysis: Age class 1

First age at which q is considered independent of age: Age class 1

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Assessment form

Sheet A3
Indirect methods: VPA results

Code: ARA0611Est

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Sex*	Both	Gear*	TRAWL	Analysis #*	XSA
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Population in figures

XSA	RECRUITS		
	Age 0	Year	Value
		2003	96164
1996	100048	2004	59918
1997	94371	2005	65756
1998	89315	2006	90030
1999	85664	2007	89324
2000	89917	2008	120584
2001	103534	2009	101384
2002	85592	2010	90996

Population in biomass

XSA	TOTALBIO			XSA	TOTSPBIO		
	Age 0	Year	Value		Age 0	Year	Value
		2003	1296			2003	324
1996	1382	2004	992	1996	300	2004	195
1997	1144	2005	733	1997	238	2005	162
1998	1114	2006	1017	1998	218	2006	275
1999	824	2007	1333	1999	176	2007	386
2000	1020	2008	1584	2000	254	2008	390
2001	1153	2009	1442	2001	280	2009	336
2002	1291	2010	1292	2002	268	2010	308

Fishing mortality rates

XSA	FBAR 0-3		
	Age 0	Year	Value
		2003	1.0768
1996	1.4563	2004	1.621
1997	1.5698	2005	1.2923
1998	1.658	2006	0.8802
1999	1.3583	2007	0.9611
2000	1.0194	2008	1.2822
2001	1.1085	2009	1.4192
2002	1.5978	2010	1.3016

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Assessment form

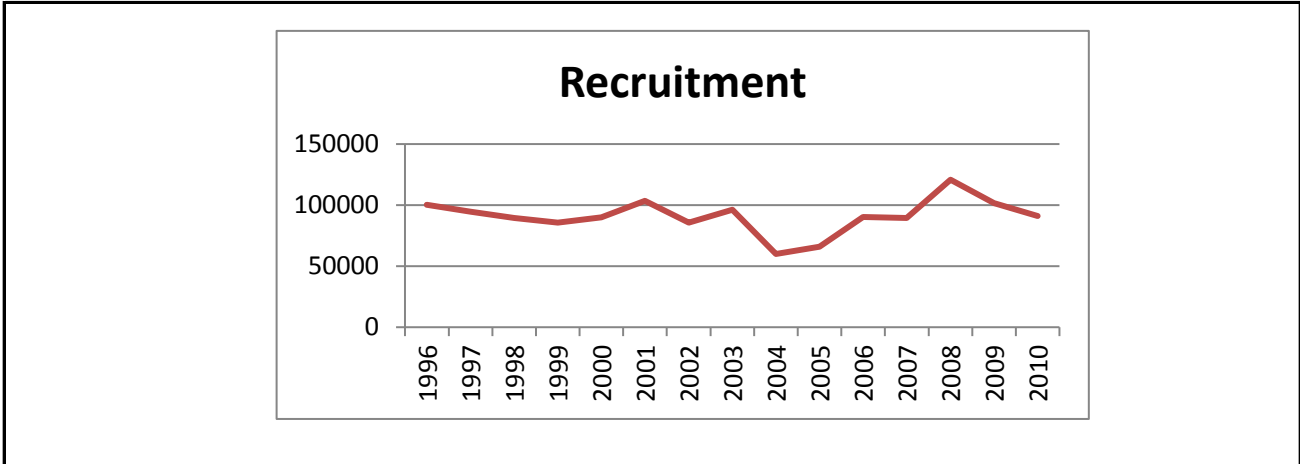
Sheet A3
Indirect methods: VPA results

Code: ARA0611Est

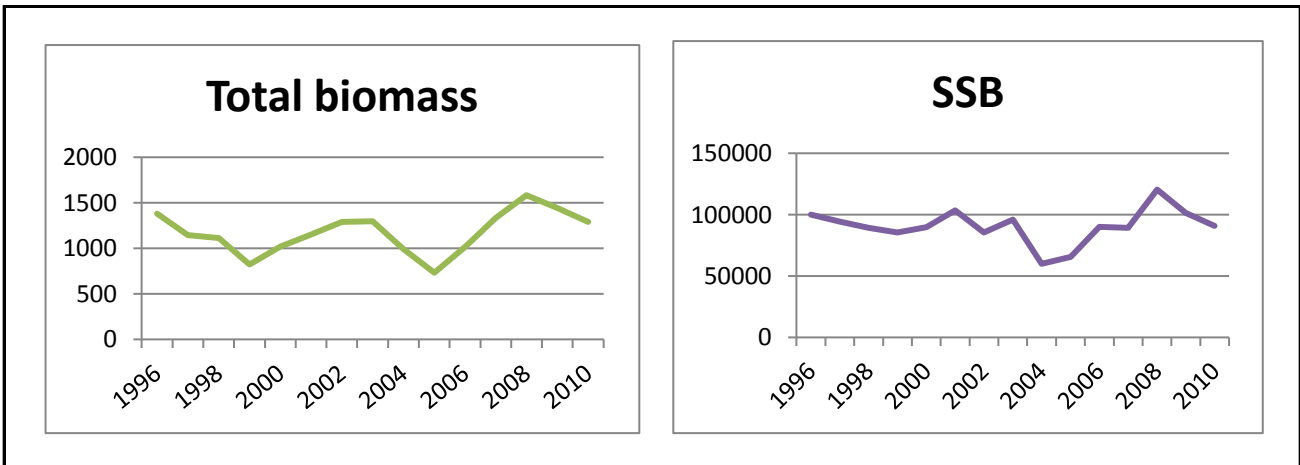
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Sex*	Both	Gear*	Trawl	Analysis #*	XSA
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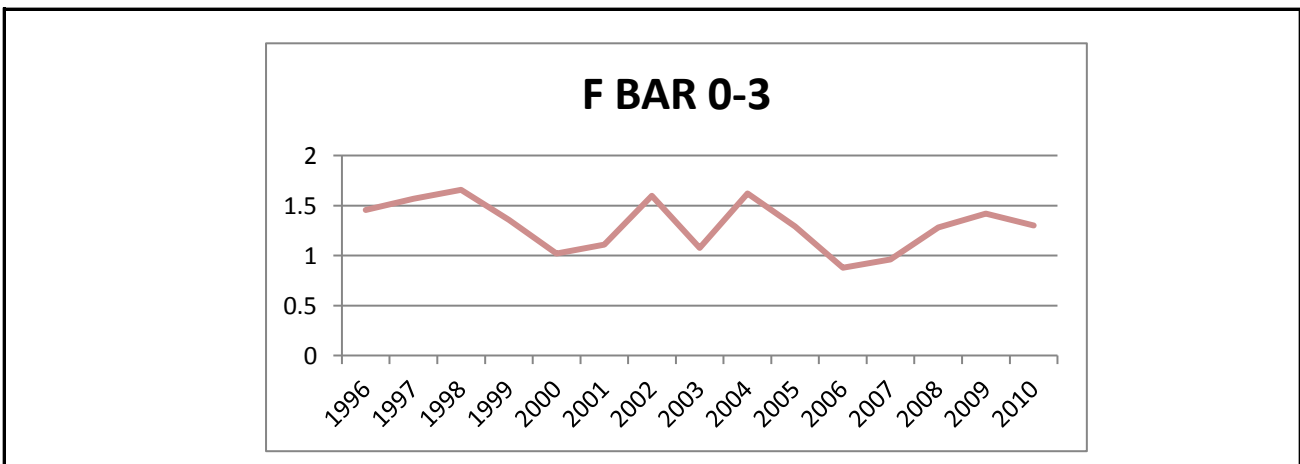
Population in figures



Population in biomass



Fishing mortality rates



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Assessment form

Sheet A3
Indirect methods: VPA results

Code: ARA0611Est

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Sex*	Both	Gear*	Trawl	Analysis #*	XSA
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Population in figures

Regression statistics :

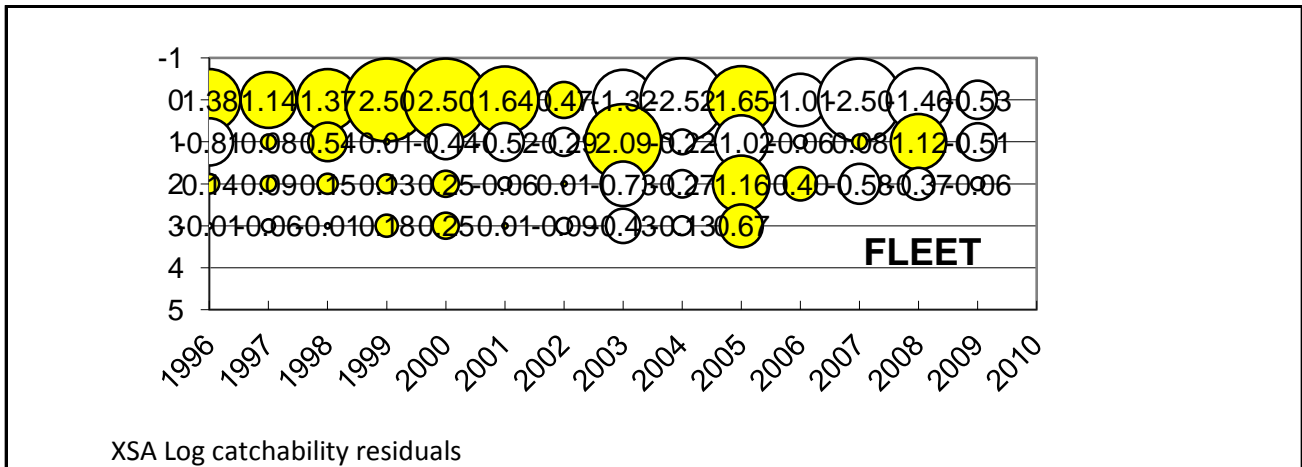
Ages with q dependent on year class strength

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Log q
0	5.97	-1.439	7.83	0.01	15	2.11	-10.8
1	-3.23	-3.815	15.08	0.08	15	0.87	-9.16

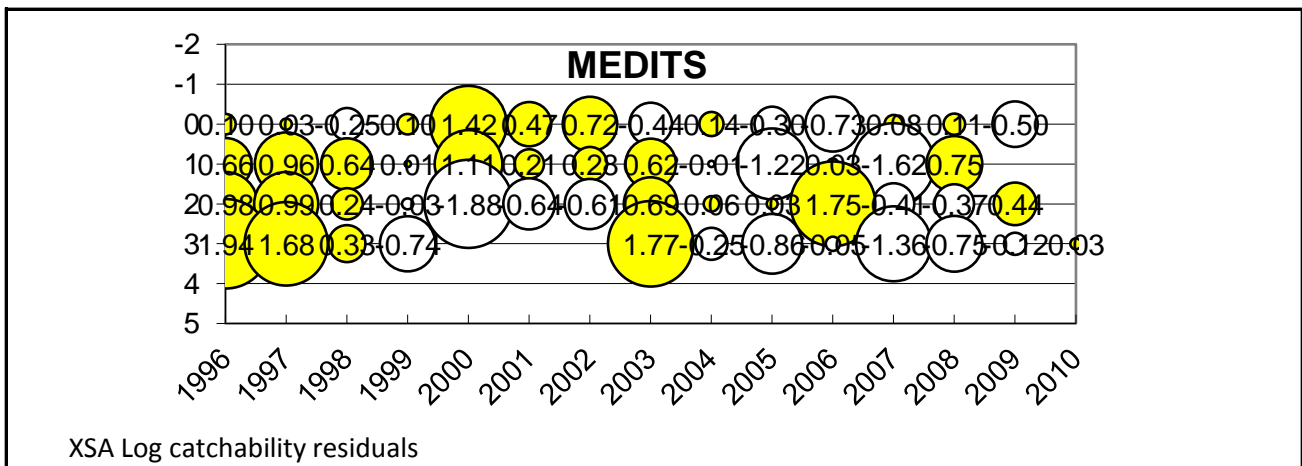
Ages with q independent of year class strength and constant w.r.t. time.

Age	Slope	t-value	Intercept	RSquare	No Pts	Reg s.e	Mean Q
2	4.94	-2.903	15.18	0.05	15	1.84	-9.53
3	1.25	-1.256	10.39	0.73	15	0.36	-9.57

Population in biomass



Fishing mortality rates



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Assessment form	Sheet Y Indirect methods: Y/R

Sex	Both
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Code: ARA0611Est	
Analysis #	Y/R

# of gears		Software	
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Parameters used

Vector F	From XSA analysis (Three last years)
Vector M	0.46
Vector N	

Model characteristics

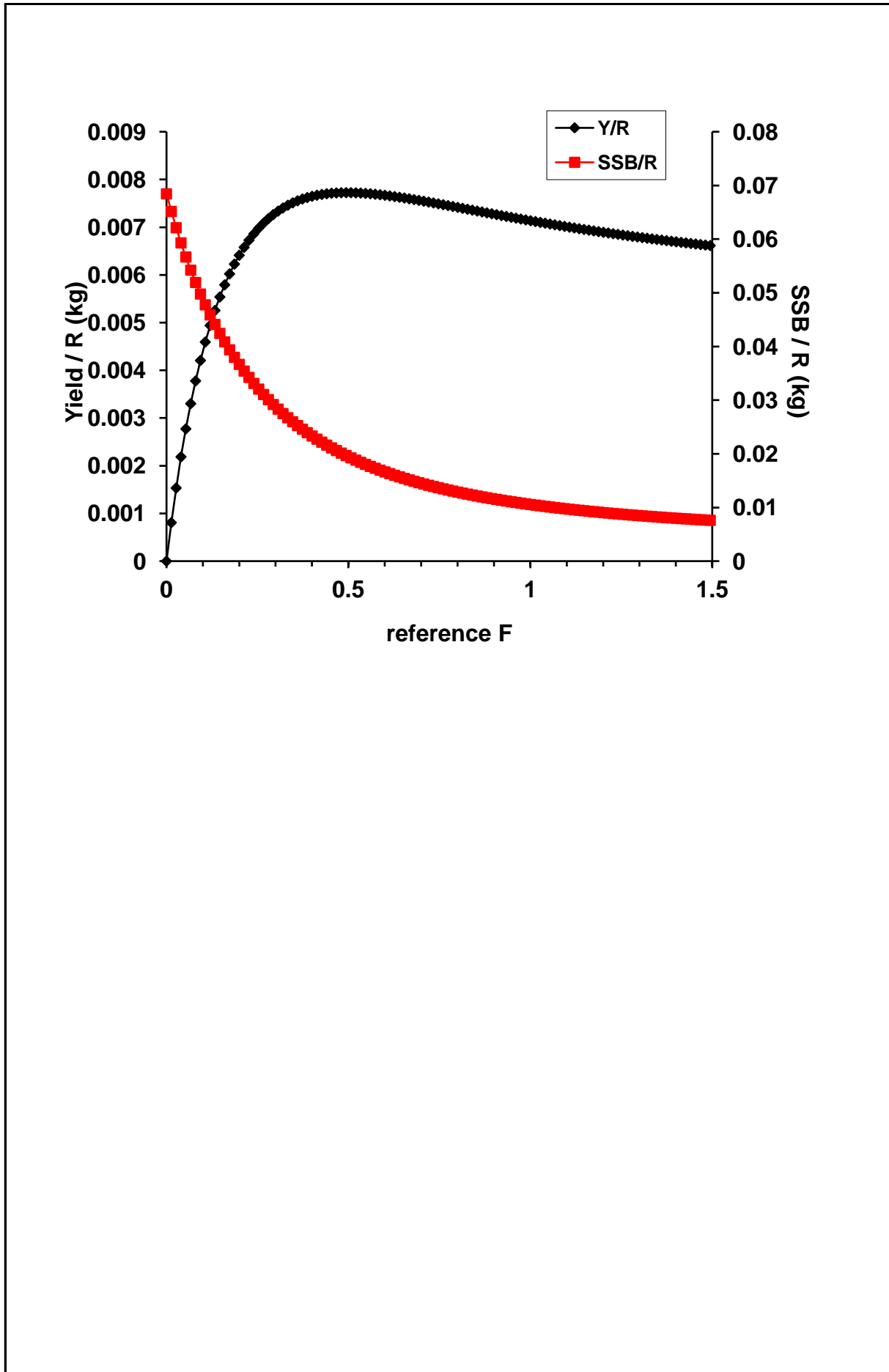
Yield per Recruit analysis were made for both sex ,and combined sex. Results indicate that the current exploitation is close to the maximum.

Results

	Total	Gear			
Current YR	0.641				
Maximum Y/R	0.761				
Y/R 0.1	0.759				
F _{max}	0.49				
F _{0.1}	0.28				
Current B/R	1.13				
Maximum B/R	2.01				
B/R 0.1	2.93				
F current	1.33				

Comments

Comments



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Assessment form

Sheet D
Diagnosis

Code: ARA0611Est

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	1292	Tons	1174	+	B mean as a reference point (B _{low} =733)
SSB	308	Tons	274	+	SSB mean as a reference point (SSB _{low} =162)
F	1.33		0.28	+	F 0.1 as a reference point
Y	647	Tons	574	+	Y mean as a reference point (Y _{low} =308)
CPUE	36	Kg/day	33	+	CPUE mean as a reference point (CPUE _{low} =23)

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 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 stock is in overfishing status.

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Assessment form

Sheet Z

Objectives and recommendations

Code: ARA0611Est

Management advice and recommendations*

To reduce fishing mortalities by 70% which can be achieved with reducing effort capacity and improving the selection pattern of the fishery.
Implementing area closures for fishing in the nursery areas during the recruitment period.

Advice for scientific research*

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Assessment form

Sheet C
Comments

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Comments*

XSA should be performed separately for males and females, joining the final results and comparing them with a XSA performed with sex combined.

Sensitivity analysis should be performed for both k and M simultaneously.

It is necessary to check the consistency between M and k: when parameters for both sexes are considered, k refers to females and M to males. In this sense, growth parameters should be reviewed.

It would be necessary to further explore the parameterisation of the model (the contribution of each tuning fleet in the model)

Abstract for SCSA reporting

Authors Esteban, A. → Fernandez, A. **Year** 2011

Species Scientific name Aristeus antennatus - ARA
Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area 06- Northern Spain

Fisheries (brief description of the fishery)*

Trawl fleets fishing effort of the Santa Pola's port were quite stable for the periods studied with small variations of the number of vessels in the recent years. Vessels length was between 12- 24 m. The gear used corresponded to a trawl net between 60 and 100 m longest rope. The vertical opening was between 1 and 3 m. The cod end mesh size used was a diamond 40 mm of mesh opening. The net was rigged with two doors between 500-800 kg. Trawl fleet in Santa Pola's port do daily trips with an unique haul directed to the red shrimp, with a duration between 5 and 7 hours.

Source of management advice*

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

Data source: Monthly size distribution, Daily landing by vessel, and monthly port landing from National on board sampling IEO programme and Fishery Department local authorities and DCR data sampling IEO programme.

Stock Status*

[Redacted]

Exploitation rate

High fishing mortality

Stock abundance

Low abundance

Comments

[Redacted]

Management advice and recommendations*

Use this section to provide any advice or recommendations that you consider appropriate for the client or the industry.

Use this section to provide any advice or recommendations that you consider appropriate for the client or the industry.

Advice for scientific research*

