SAC GFCM
Sub-Committee on Stock Assessment

Date*	**18**	**October**	**2010**	**Code***	**GME0910A.A**

Authors*

A.Abella4, F. Colloca[1], P. Sartor[2], A. Ligas[2], , M. Sbrana[2], A.Mannini[3],

Affiliation*

[1]Dep. Environmental Biology, University of Rome "La Sapienza", Italy
[2]Centro Interuniversitario di Biologia Marina, Livorno, Italy
[3]Dip.Te.Ris., Università di Genova, Italy
[4]ARPAT, Area Mare, RIBM, Livorno, Italy

Species Scientific name*

1

Source: -

2

Source: -

3

Source: -

Geographical area*

Northwestern Mediterranean

Geographical Sub-Area (GSA)*

09 - Ligurian and North Tirrenian Sea

Combination of GSAs 1

2

3

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

Code: GME0910A.A

Date*	18	Oct	2010	Authors*	A.Abella4, F. Colloca1, P. Sartor2, A. Ligas2, , M. Sbrana2, A.Mannini3,

Species Scientific name*	Galeus melastomus- GME , ,	Species common name*	Blackmouth catshark

Data Source

GSA*	09 - Ligurian and North Tirrenian Sea	Period of time*	1994-2011

Description of the analysis

Type of data*	commercial catches, size structure of the catch by gear, trawl surveys size	Data source*	catch assessment surveys
Method of assessment*	Length cohort analysis; Yield forecasting	Software used*	

Sheets filled out

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

Comments, bibliography, etc.

Au, D.W. & Smith, S.E. 1997. A demographic method with population density compensation for estimating productivity and yield per recruit of the leopard shark (Triakis semifasciata). Canadian Journal of Fisheries and Aquatic Sciences, 54: 415–420
Caswell, H. 1989. Matrix population models: construction, analysis and interpretation. Sinauer, Sunderland, Massachusetts
Goodyear, C. P. 1995. Red snapper stocks in U.S. waters of the Gulf of Mexico. National Marine Fisheries Service, Southeast Fisheries Centre, Miami Laboratory, CRD 95/96-05, Miami, FL, 125 pp
Krebs, C. J. 1985. Ecology: the experimental analysis of distribution and abundance, 3rd ed. Harper and Row, New York
Simpfendorfer, C. A. 1999. Demographic analysis of the dusky shark fishery in Southwestern Australia, p. 149-160. In: Life in the slow lane. Ecology and conservation of long-lived marine animals.J. A. Musick (ed.). American Fisheries Society Symposium 23, Bethesda, Maryland

Lleonart, J., Salat J (1997) VIT: Software for fishery analysis. User's manual. FAO Computerized Information Series (Fisheries), 11, Rome, FAO. 105 pp.

Needle C. L. (2003) - Survey-based assessments with SURBA. Working Document to the ICES Working Group on Methods of Fish Stock Assessment, Copenhagen, 29 January to 5 February 2003

Comments, bibliography, etc.

Abella A., Serena F., Ria M., 2005. Distributional response to variations in abundance over spatial and temporal scales for juveniles of European hake (Merluccius merluccius) in the Western Mediterranean Sea. Fisheries Research, 71: 295–310.

Abella A.J., Serena F., 1998. Selettività e vulnerabilità del nasello nella pesca a strascico. Biol. Mar. Medit., 5 (2): 496-504.

Bartolino V., Colloca F., Sartor P., Ardizzone G., 2008b. Modelling recruitment dynamics of hake, Merluccius merluccius, in the central Mediterranean in relation to key environmental variables. Fisheries Research, 92: 277-288.

Bartolino V., Ottavi A., Colloca F., Ardizzone G.D., Stefánsson G. 2008a. Bathymetric preferences of juvenile European hake (Merluccius merluccius). ICES J. Mar. Sci. 65: 963-969.

Belcari P., Ligas A., Viva C., 2006. Age determination and growth of juveniles of the European hake, Merluccius merluccius (L., 1758), in the northern Tyrrhenian Sea (NW Mediterranean). Fisheries Research., 78: 211-217

Biagi F., Cesarini A., Sbrana M., Viva C., 1995. Reproductive biology and fecundity of Merluccius merluccius (Linnaeus, 1758) in the Northern Tyrrhenian Sea. Rapp. Comm. int. Mer Médit., 34: 23.

Carpentieri P., Colloca F., Ardizzone G.D., 2008. Daily ration and feeding activity of juvenile hake in the central Mediterranean Sea. J. Mar. Biol. Ass. U.K., 88 (7): 1493-1501.

Carpentieri P., Colloca F., Cardinale M., Belluscio A., Ardizzone G.D., 2005. Feeding habits of European hake (Merluccius merluccius) in the central Mediterranean Sea. Fisheries Bulletin US, 103 (2): 411-416.

Colloca F., Belluscio A., Ardizzone G.D., 2000. Sforzo di pesca, catture e gestione dello stock di nasello (Merluccius merluccius) in un'area del Tirreno centrale. Biol. Mar. Med 7(1): 117-129.

Colloca F., Carpentieri P., Balestri E., Ardizzone G.D., 2004. A critical habitat for Mediterranean fish resources: shelf-break areas with Leptometra phalangium (Echinodermata: Crinoidea). Marine Biology, 145: 1129-1142.

Colloca, F., V. Bartolino, G. Jona Lasinio L. Maiorano, P. Sartor and G. Ardizzone.- 2009. Identifying fish nurseries using density and persistence measures. Mar Ecol Prog Ser. 381: 287–296

De Ranieri S., Belcari P., Bertolini D., Biagi F., Chiericoni V., Cognetti A.G., Mori M., Nannini N., Reale B., Rocca V., Sartor P., Sbrana M., 1997. Reclutamento di alcune specie ittiche demersali nel Mar Tirreno Settentrionale. Biol. Mar. Medit., 4(1): 237-243.

Nannini N., Pinna D., Chiericoni V., Biagi F., Belcari P., 2001. Ciclo ovarico di Merluccius merluccius (Linnaeus, 1758) nel mar Tirreno settentrionale. Biol. Mar Medit., 8 (1): 745-748.

Orsi Relini L., Capparena M., Fiorentini F., 1989. Spatial–temporal distribution and growth of Merluccius merluccius recruits in the Ligurian Sea. Observations on the 0-group. Cybium 13: 263–270.

Orsi Relini L., Papaconstantinou C., Jukic-Peladic S., Souplet A., Gil de Sola L., Piccinetti C., Kavadas S., Rossi M., 2002. Distribution of the Mediterranean hake populations (Merluccius merluccius smiridus Rafinesque, 1810) (Osteichthyes: Gadiforems) based on six years monitoring by trawl surveys: some implications for management. Sci. Mar. 66 (Suppl.2): 21-38.

Reale B., Sbrana M., De Ranieri S., 1995. Population dynamics of Merluccius merluccius exploited by two different trawl-nets in the Northern Tyrrhenian Sea. Rapp. Comm. int. Mer Médit., 34: 254.

Sartor P., Carlini F., De Ranieri S., 2003a. Diet of young european hake (Merluccius merluccius) in the northern Tyrrhenian Sea. Biol. Mar. Medit. 10 (2): 904-908.

Sartor P., Sartini M., Reale B., Sbrana M., 2001b. Analysis of the discard practices in the Merluccius merluccius (l., 1758) bottom trawl fishery of the Northern Tyrrhenian Sea. Biol. Mar. Medit. 8(1): 771-774.

Sartor, P., Recasens L., Viva C., Lleonart J., 2001a. Analysis of the impact of the fishery on the adult population of European hake in the Northwestern Mediterranean. Rapp. Comm. Int. Mer Médit., 36: 321-322.

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

Assessment form

Sheet B
Biology of the species

Code: GME0910A.A

Biology

Somatic magnitude measured (LH, LC, etc)*		TL	Units*	cm

Sex	Fem	Mal	Both	Unsexed		
Maximum size observed					Reproduction season	
Size at first maturity					Reproduction areas	yes
Recruitment size					Nursery areas	yes 150-200m

Parameters used (state units and information sources)

Sex								
Growth model								
Data source	ɔnBertalanffy							
L∞ (growth)	64							
K (growth)	0.15							
t0 (growth)	0							
length-weight relationship								
a (length-weight)	0.0025							
b (length-weight)	3.02							
sex ratio	01:01							
M	0.2							

Comments

Comments

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

Code: GME0910A.A

Data source*	EC Data Collection Regulation	Year (s)*	1996-2010
Data aggregation (by year, average figures between years, etc.)*	Monthly		

Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	ITA	09				GME
Operational Unit 2	ITA	09				GME
Operational Unit 3	ITA	09	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	GME
Operational Unit 4	ITA	09				GME
Operational Unit 5	ITA	09				GME

Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
			tons				
ITA 09 E 03 33 - GME		0	10				
Total			10				

Legal minimum size	

Comments

The blackmouth catshark *Galeus melastomus* is a deep sea species, mainly distributed in t depth range 200-1000m. Locally, the species has a quite low commercial value. The spec exclusively caught with bottom trawl nets, mainly as a by-catch of the Norway lobster fish vessels operating within the 250-500m depth range and in red shrimps fisheries in deeper v (up to 800m). Only relatively big-sized individuals are landed.

Other involved species of the Nephrops and Red shrimps fisheries are *Phycis blennoides, Micromesistius potassou, Lepidopus caudatus, Trachurus trachurus, Conger conger, Macrouridae, Etmopterus spinax, Gadiculus argenteus, Parapenaeus longirostris.*

Comments

Tab. 7.4.1 - Technical characteristics of the trawl fleet of GSA9 (DCR official data)

Year	2004	2005	2006
N. of boats	344	358	361
GT	12.818	12.961	13.191
kW	74.017	74.606	75.514
Mean GT	37.3	36.2	36.5
Mean kW	215.2	208.4	209.2

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

Assessment form

Sheet P2a
Fishery by Operational Unit

Code: GME0910A.A

Data source*	catch assessment survey EU-(DCF)	OpUnit 1*	

Time series

Year*	2004	2005	2006	2007	2008	2009
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet	344	358	361			

Year	2010					
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

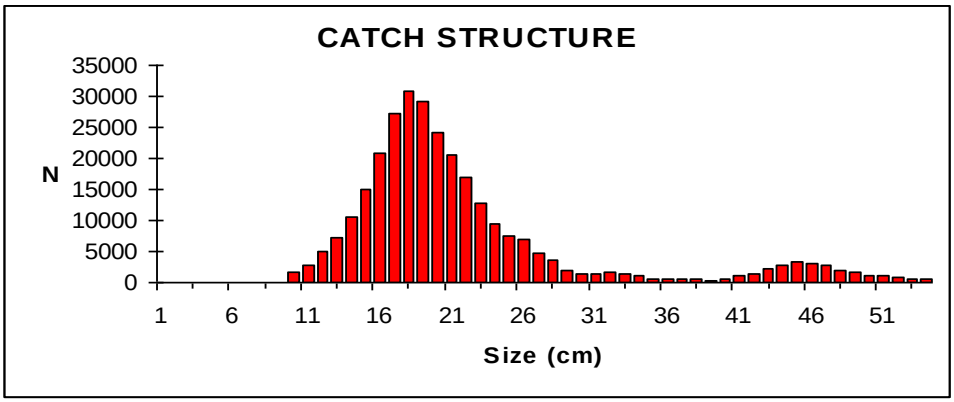
Selectivity

L25	
L50	
L75	
Selection factor	

Remarks

Structure by size or age

Structure by size or age



Fishing closure for trawling: 30 days in late summer (only enforced some years)
Minimum landing sizes: EC regulation 1967/2006: 20 cm TL for hake.
Cod end mesh size of trawl nets: 40 mm (stretched, diamond meshes) till 30/05/2010. From 1/6/2010 the existing nets will be replaced with a cod end with 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes.
Towed gears are not allowed within three nautical miles from the coast or at depths less than 50 m when this depth is reached at a distance less than 3 miles from the coast.
Two small No Take Zones ("Zone di Tutela Biologica", ZTB) are present inside the GSA9; one off the Giglio Island (50 km2, northern Tyrrhenian Sea) another off Gaeta, (125 km2, central Tyrrhenian Sea). In both areas fishing gears operating on the bottom are not allowed six months per year.

Hake trawl fishery exploits a highly diversified species assemblage: deep sea pink shrimp (*Parapenaeus longirostris)* horned octopus (*Eledone cirrhosa*), poor cod (*Trisopterus minutus capelanus*), squids (*Illex coindetii*), are among the most important species in the by catch.

Data source*		OpUnit 3*	ITA 09 E 03 33 - GME

Regulations in force and degree of observance of regulations

Fishing closure for trawling: 30 days in late summer (only enforced some years)
Minimum landing sizes: EC regulation 1967/2006: 20 cm TL for hake.
Cod end mesh size of trawl nets: 40 mm (stretched, diamond meshes) till 30/05/2010. From 1/6/2010 the existing nets will be replaced with a cod end with 40 mm (stretched) square meshes or a cod end with 50 mm (stretched) diamond meshes.
Towed gears are not allowed within three nautical miles from the coast or at depths less than 50 m when this depth is reached at a distance less than 3 miles from the coast.
Two small No Take Zones ("Zone di Tutela Biologica", ZTB) are present inside the GSA9; one off the Giglio Island (50 km2, northern Tyrrhenian Sea) another off Gaeta, (125 km2, central Tyrrhenian Sea). In both areas fishing gears operating on the bottom are not allowed six months per year.

Accompanying species

Hake trawl fishery exploits a highly diversified species assemblage: deep sea pink shrimp (*Parapenaeus longirostris)* horned octopus (*Eledone cirrhosa*), poor cod (*Trisopterus minutus capelanus*), squids (*Illex coindetii*), are among the most important species in the by catch.

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

Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: GME0910A.A

Sex*	both

Analysis # *	1

Time series

Data	Size	Age
(mark with X)	x	

Model	Cohorts	Pseudocohorts
(mark with X)	x	

Equation used		Tunig method	
# of gears	1	Software	
$F_{terminal}$	0.4		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum			Recruitment		
Average			Average population		
Maximum			Virgin population		
Critical			Turnover		

Average mortality

		Gear					
	Total						
F_1	0.35	LCA					
F_2							
Z							

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

Comments

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

Assessment form

Sheet A2
Indirect methods: data

Code: GME0910A.A

Sex*	both	Gear*	bottm trawl=gear 1; gillnet=gear 2	Analysis # *	**1**

Data	Total catches (number of specimens)

Data

Input data

size	N	size	N
0		28	3543
1	0	29	1984
2	0	30	1503
3	0	31	1486
4	0	32	1773
5	0	33	1521
6	0	34	1032
7	0	35	474
8	0	36	531
9	0	37	535
10	1804	38	425
11	2794	39	326
12	4949	40	480
13	7094	41	992
14	10627	42	1420
15	15112	43	2274
16	20745	44	2717
17	27173	45	3268
18	30765	46	2918
19	29136	47	2727
20	24304	48	2022
21	20554	49	1655
22	17070	50	1210
23	12675	51	1108
24	9583	52	996
25	7369	53	690
26	7068	54	621
27	4622	55	234

Sex*	both	Gear*	bottom trawl	Analysis #*	LCA

Population in figures

age	Prop mature	B year	SSB year	total F year	ind W year	N	C OTB land	C OTB disc	F OTB land	F OTB di
0	0.0	1124651	0	0	0.2	4057932	0	0	0.00	0
1	0.0	16327918	0	0.094668749	4.5	3811847	0	42381	0.00	0
2	0.0	34395926	0	0.669124446	18.2	1980318	0	169748	0.00	0
3	0.0	26989128	0	0.394147657	41.8	657818	0	41316	0.00	0
4	0.0	30841478	0	0.127478777	75.0	429485	0	10290	0.00	0
5	0.0	28206394	0	0.263408346	115.1	256902	1720	1838	0.13	0
6	0.9	30769074	0	0.035118687	159	201208	1274.02095	492	0.03	0
7	1.0	23228457	23228457	0.147909471	200	116771	4685.24105	0	0.15	0
8	1.0	18899539	18899539	0.40216856	246.5	77459.5	8902.46768	0	0.40	0
9	1.0	8338661	8338661	0.518934563	189	28926.3	4748.80272	0	0.52	0
10	1.0	5366028	5366028	0.496056803	327	16438.4	2864.88511	0	0.50	0
11	1.0	3182328	3182328	0.69024561	370	8657.51	2104	0	0.69	0
12	1.0	874218.3	874218.3	0.874338224	400	2169.54	690	0	0.87	0
13	1.0	529530.2	529530.2	0.5	430	1242	621	0	0.50	0
14	1.0				445		0	0	0	0
15	1.0				485		0	0	0	0

Population in biomass

Fishing mortality rates

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

Assessment form

Sheet Y

Indirect methods: Y/R

Code: GME0910A.A

Sex	both

Analysis #	Y/R

# of gears	2	Software	Yield

Parameters used

Vector F	yes
Vector M	
Vector N	

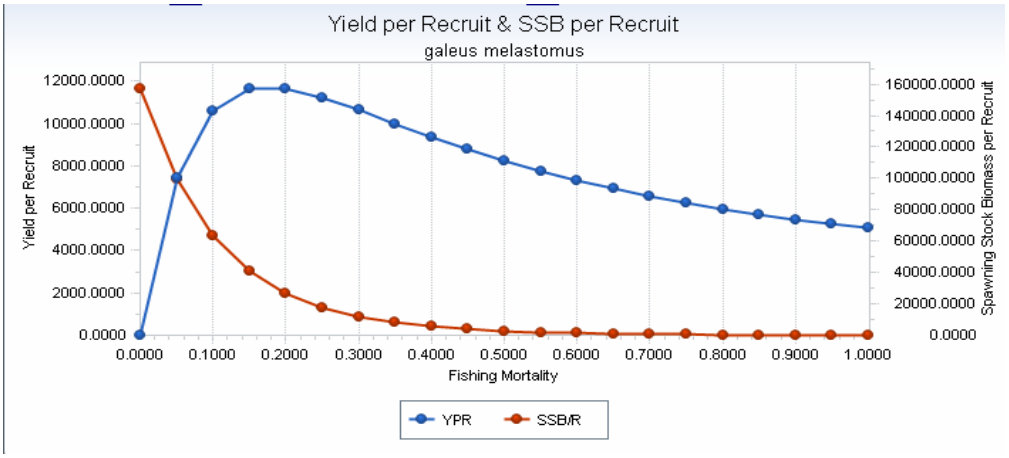
Model characteristics

Results

	Total	Gear			
Current YR					
Maximum Y/R					
Y/R 0.1					
F_{max}	0.18				
$F_{0.1}$	0.13				
Current B/R					
Maximum B/R					
B/R 0.1					
Fref					
F40%SSB	0.1				

Comments

Comments



Reference Point Summary Table

Reference Point	F	Yield per Recruit	SSB per Recruit	Total Biomass per Recruit
F Zero	0.00000	0.00000	157286.72604	239593.70248
F-01	0.13000	11384.41293	48843.30212	103172.63998
F-Max	0.18000	11731.46664	31924.86827	78697.92348
F at 40 % MSP	0.10000	10598.43334	63434.15284	123033.18089

Other assessment methods

does not exist. As a complementary it was performed analysis a demographic model that rely primarily on life history parameters. Such analysis is expected to provide some useful information for management.

The Leslie Matrix was adapted to include information on fishing mortality at specific ages, or changes in the reproductive schedule. In order to assess how much influence the changes in the used estimates of the vital rates fecundity at age and mortality rates have on the population growth rate, the software allows the performance of sensitivity analyses. In this case, such sensitivity analysis is reported as the elasticity, which is the proportional (relative) change of sensitivity. This choice facilitates the comparisons related to the consequences (impact on the estimates of population growth rate) of small changes in fecundity and on the mortality rates, which are obviously expressed in different absolute scales. Elasticity is calculated from the elements of the transition matrix , the population growth rate (r) and the elements of the right and left eigenvectors. While the Leslie matrix was modifi for allowing the inclusion of fishing mortality rates and changes in age of first capture, this allowed the of the values of the rate of population growth r_m obtained with different combinations of age of first capture and fishing mortality rate F. In the figure, the green area represents combinations that define a positive v r_m. *An Fc=0.08 was defined as threshold for the current exploitation pattern.*

The use of the elasticity analysis made possible to estimate how much vulnerable to changes in the survival of the juveniles (or the adults) depending on the characteristics of the species in question (small or large, slow or fast-growing, long or short-lived species. The results, that allowed a comparison among the consequences (sensitivity) to small changes in fecundity and on the mortality rates, derive from standardized information, considering that data are originally expressed in different absolute scales.

Isoplets of the rate of population growth r_m obtained with different combinations of age of first capture L

SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	**Sheet D Diagnosis**

Code: GME0910A.A

Reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					
SSB					
F					
Y					
CPUE					
Fmax					
F0.1					
F30%SSB					
ZMBP					

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

Unidimensional

○	? - (or blank) Not known or uncertain. Not much information is available to make a judgment;
○	U - Underexploited, undeveloped or new fishery. Believed to have a significant potential for expansion in total production;
○	M - Moderately exploited, exploited with a low level of fishing effort. Believed to have some limited potential for expansion in total production;
○	F - Fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;
◉	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;
○	D - Depleted. Catches are well below historical levels, irrespective of the amount of fishing effort exerted;
○	R - Recovering. Catches are again increasing after having been depleted or a collapse from a previous;

Bidimensional

Exploitation rate

○	No or low fishing
○	Moderate fishing
◉	High fishing mortality
○	Uncertain / Not assessed

Stock abundance

○	Virgin or high abundance
○	Intermediate abundance
◉	Low abundance

○	Depleted
○	Uncertain / Not assessed

Comments

Code: GME0910A.A

Management advice and recommendations*

The species is considered overexploited, with consistent diagnosis of the current exploitation status obtained with the 2 used approaches aimed at the definition of precautionary Reference Points (Fc = 0.08 and F 0.1=0.13) which values are much lower than the current estimate of fishing mortality rate of F=0.35. The size of first capture is too low (growth overfishing) and an increase in yield and a more safe situation for the stock as regards the possibility of self-renewal can be expected in the case a reduction of fishing effort do occur and/or more selective gears are used

Advice for scientific research*

Comments*

Most of the assessments have been performed during the Working groups organized by the Scientific Technical and Economic Commission of Fisheries (STECF) of the European Comunity.

Abstract for SCSA reporting

Authors A.Abella4, F. Colloca1, P. Sartor2, A. Ligas2, , M. Sbrana2, A.Mannini3,

Year 2010

Species Scientific name Galeus melastomus- GME

Source: -

Source: -

Source: -

Geographical Sub-Area 09 - Ligurian and North Tirrenian Sea

Fisheries (brief description of the fishery)*

The blackmouth catshark Galeus melastomus is a deep sea species, mainly distributed in the depth range 200-1000m. Locally, the species has a quite low commercial value. The species is exclusively caught with bottom trawl nets, mainly as a by-catch of the Norway lobster fishery, by vessels operating within the 250-500m depth range and in red shrimps fisheries in deeper waters (up to 800m). Only relatively big-sized individuals are landed.
Other involved species of the Nephrops and Red shrimps fisheries are Phycis blennoides, Micromesistius potassou, Lepidopus caudatus, Trachurus trachurus, Conger conger, Macrouridae, Etmopterus spinax, Gadiculus argenteus, Parapenaeus longirostris.

Source of management advice*

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

A LCA was performed aimed at the estimation of a vector of F-at-size, using data on total annual catches by size for the year 2010, including discards. Considering the availability of only one year of data, it was not possible to perform a formal VPA. The size distribution of the catch for the year 2010 was hence used assuming to be representative of an equilibrium status.

The Y/R analysis allowed to estimate the expected relative yields and surviving fraction of the parental biomass at different mortality rates and to produce an estimate of F0.1 which can be considered a proxy of FMSY.
The age-based Yield per Recruit (YPR) routine, included in the stock assessment toolbox of NOAA was used. It is based on the Thompson-Bell model for estimating the expected lifetime yield and biomass from a cohort subjected to varying levels of fishing mortality.

A demographic analysis was used for the definition of the status of the stock regarding its capacity of self-renewal (Caswell, 1989).
A Leslie Matrix was adapted to include information on fishing mortality at specific ages, or changes in the reproductive schedule.
Elasticity analysis allowed identifying the ages at which smallest changes in vital rates can produce biggest changes in the population growth rate. Elasticity analysis allows defining the management choices likely to produce more benefits to the stock, by estimating how much vulnerable is the species to changes in the survival of the juveniles (or for the adults)

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*