

SAC GFCM
Sub-Committee on Stock Assessment

Date*	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">18</td> <td style="width: 33%; text-align: center;">October</td> <td style="width: 33%; text-align: center;">2010</td> </tr> </table>	18	October	2010	Code*	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">HKE0910F.</td> </tr> </table>	HKE0910F.		
18	October	2010							
HKE0910F.									
Authors*	F. Colloca ¹ , P. Sartor ² , A. Ligas ² , , M. Sbrana ² , A.Mannini ³ , A. Abella ⁴								
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*	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: center;">1</td> <td style="padding-left: 10px;">Source: GFCM Priority Species</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="padding-left: 10px;">Source: -</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="padding-left: 10px;">Source: -</td> </tr> </table>			1	Source: GFCM Priority Species	2	Source: -	3	Source: -
1	Source: GFCM Priority Species								
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: HKE0910F

Date*	18 Oct 2010	Authors*	F. Colloca ¹ , P. Sartor ² , A. Ligas ² , , M. Sbrana ² , A. Mannini ³ , A. Abella ⁴
-------	-------------	----------	--

Species Scientific name*	Merluccius merluccius - HKE , ,	Species common name*	European hake
--------------------------	---------------------------------	----------------------	---------------

Data Source

GSA*	09 - Ligurian and North Tirrenian Sea	Period of time*	1994-2010
------	---------------------------------------	-----------------	-----------

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*	SURBA, ICES software for HCR, Yield software, XSA

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	1	1	1

Comments, bibliography, etc.

<p>Bibliography</p> <p>Abella A., Bartolino V., Bertrand J., Colloca F., Follesa C., Mannini A., Reale B., Rinelli P., Sbrana M., Spedicato M.T., Voliani A., Zupa R., 2007. Use of composite models for the assessment of European hake, Red mullet and Norway lobster stocks in the North-Western Mediterranean (GSAs 7, 8, 9, 10 and 11). WG SAC Athens, September 2007.</p> <p>Abella A., Belluscio A., Bertrand J., Carbonara P. L., Giordano D., Sbrana M., Zamboni A., 1999. Use of MEDITS trawl survey data and commercial fleet information for the assessment of some Mediterranean demersal resources. Aquatic Living Resources, 12(3): 155-166.</p> <p>Abella A., Caddy J., Serena F., 1997. Do natural mortality and availability decline with age? An alternative yield paradigm for juvenile fisheries, illustrated by the hake <i>Merluccius merluccius</i> in the Mediterranean. Aquat. Liv. Res., 10: 257-269.</p> <p>Abella A., Fiorentino F., Mannini A., Orsi Relini L. 2008. Exploring relationships between recruitment of European hake (<i>Merluccius merluccius</i> L. 1758) and environmental factors in the Ligurian Sea and the Strait of Sicily (Central Mediterranean). Journal of Marine Systems, 71: 279-293.</p> <p>Leonart I. Salat I (1997) VIT: Software for fishery analysis. User's manual. FAO Computerized</p>
--

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.* *Cybiurn* 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: Gadiformes) 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., Leonart 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: HKE0910F.

Biology

	Somatic magnitude measured (LH, LC, etc)*			TL	Units*	cm
	Sex	Fem	Mal	Both	Unsexed	
Maximum size observed		104	62			Reproduction season mainly in february
Size at first maturity		31-37	22-26			Reproduction areas yes
Recruitment size		12	12			Nursery areas yes

Parameters used (state units and information sources)

Sex	F							
Growth model								
Data source								
L [∞] (growth)	104							
K (growth)	0.2							
t0 (growth)	0.03							
length-weight relationship								
a (length-weight)	0.006657							
b (length-weight)	3.028							
sex ratio	1							
M	vector							

Comments

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: HKE0910F

Data source*	EC Data Collection Regulation	Year (s)*	1994-2006
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	C - Minor gear with engine (6-12 metres)	07 - Gillnets and Entangling Nets	34 - Demersal slope species	HKE
Operational Unit 2	ITA	09	D - Trawl (6-12 metres)	03 - Trawls	33 - Demersal shelf species	HKE
Operational Unit 3	ITA	09	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	HKE
Operational Unit 4	ITA	09				HKE
Operational Unit 5	ITA	09				HKE

Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ITA 09 C 07 34 - HKE	50	Kg	642000				
ITA 09 D 03 33 - HKE	339*	Kg	0				
ITA 09 E 03 33 - HKE	339*	Kg	834000*				
	361						
Total	411		642000				

Legal minimum size	20
--------------------	----

Comments

*Reported hake catch for trawlers is the sum of the two fleet segments

Official data on total annual catch of accompanying important commercial species:
Eledone cirrhosa 945 tons, *Parapenaeus longirostris* 464 tons, *Mullus barbatus* 748 tons, *Nephrops norvegicus* 159 tons.

Comments

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: HKE0910F.

Page 1 / 3

Data source*	catch assessment survey EU-(DCF)	OpUnit 1*	ITA 09 C.07.34 - HKE
--------------	----------------------------------	-----------	----------------------

Time series

Year*	2004	2005	2006	2007	2008	2009
Catch	1195	2171	2581	2004	2071	1900
Minimum size	4	4	4	12	12	6
Average size Lc						
Maximum size	72	72	72	72	72	76
Fleet	344	358	361	trawl + gillnets	trawl + gillnets	trawl + gillnets

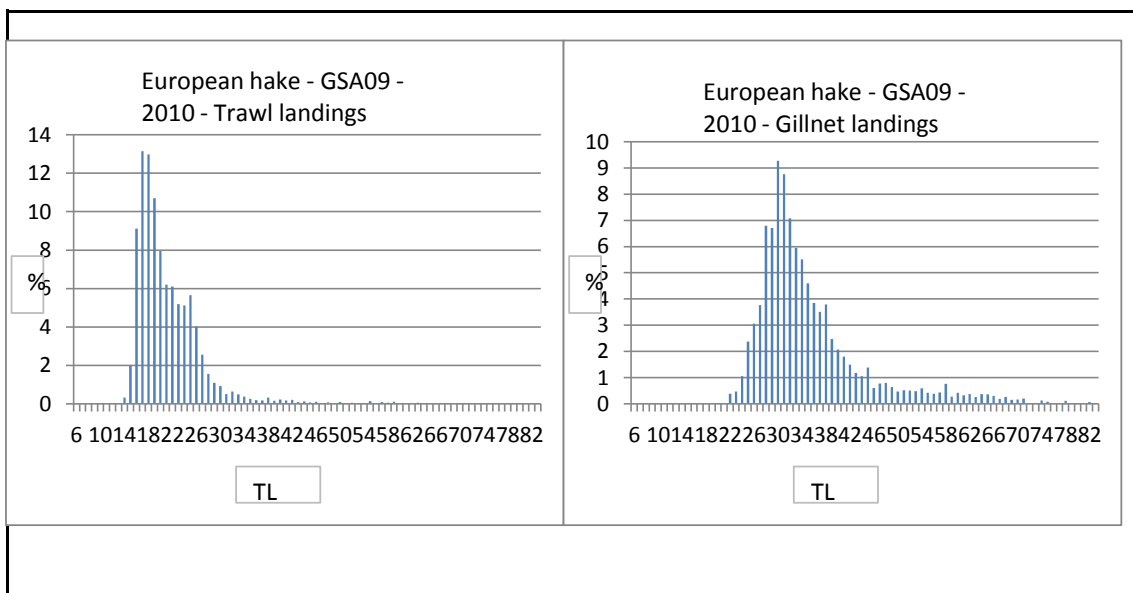
Year	2010					
Catch	1620					
Minimum size	5					
Average size Lc						
Maximum size	82					
Fleet	trawl + gillnets					

Selectivity

Remarks

L25	8	S.F.=Lc/mesh size (both in mm)
L50	12	
L75	14	
Selection factor	3	

Structure by size or age



Structure by size or age

TL (cm)	Trawl	Gillnets
6	0.000	
7	0.000	
8	0.000	
9	0.000	
10	2.096	
11	0.000	
12	2.959	
13	2.192	
14	25.266	
15	156.467	
16	718.753	
17	1035.719	
18	1022.070	
19	842.587	
20	625.850	
21	488.057	0
22	480.522	5
23	408.474	6
24	403.230	13
25	445.884	29
26	316.545	37
27	201.511	46
28	122.876	83
29	85.698	82
30	73.017	114
31	39.825	107
32	50.439	87
33	38.843	73
34	29.129	67
35	20.999	56
36	15.076	47
37	14.428	43
38	25.951	46
39	12.049	30
40	17.676	25
41	14.141	22
42	17.147	18
43	6.953	14
44	10.637	13
45	6.575	17
46	8.152	7
47	3.535	9
48	6.314	10
49	3.996	8
50	7.236	6
51	1.688	6
52	4.361	6
53	2.359	6
54	1.404	7
55	11.054	5
56	4.055	5
57	7.959	5
58	4.440	9
59	8.188	3
60	2.680	5
61	0.171	4
62	0.000	5
63	4.247	3
64	3.877	5
65	1.319	4
66	0.419	4
67	0.419	2
68	1.340	3
69	0.000	2
70	0.526	2
71	0.000	2
72	3.626	0
73	2.968	0
74	1.205	2
75	0.000	1
76	0.275	0
77	0.000	
78	0.000	1
79	0.551	
80	0.000	0
81	0.000	
82	0.000	1

n*1000

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

Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0910F.

Page 1 / 1

Data source* official data

OpUnit 1*

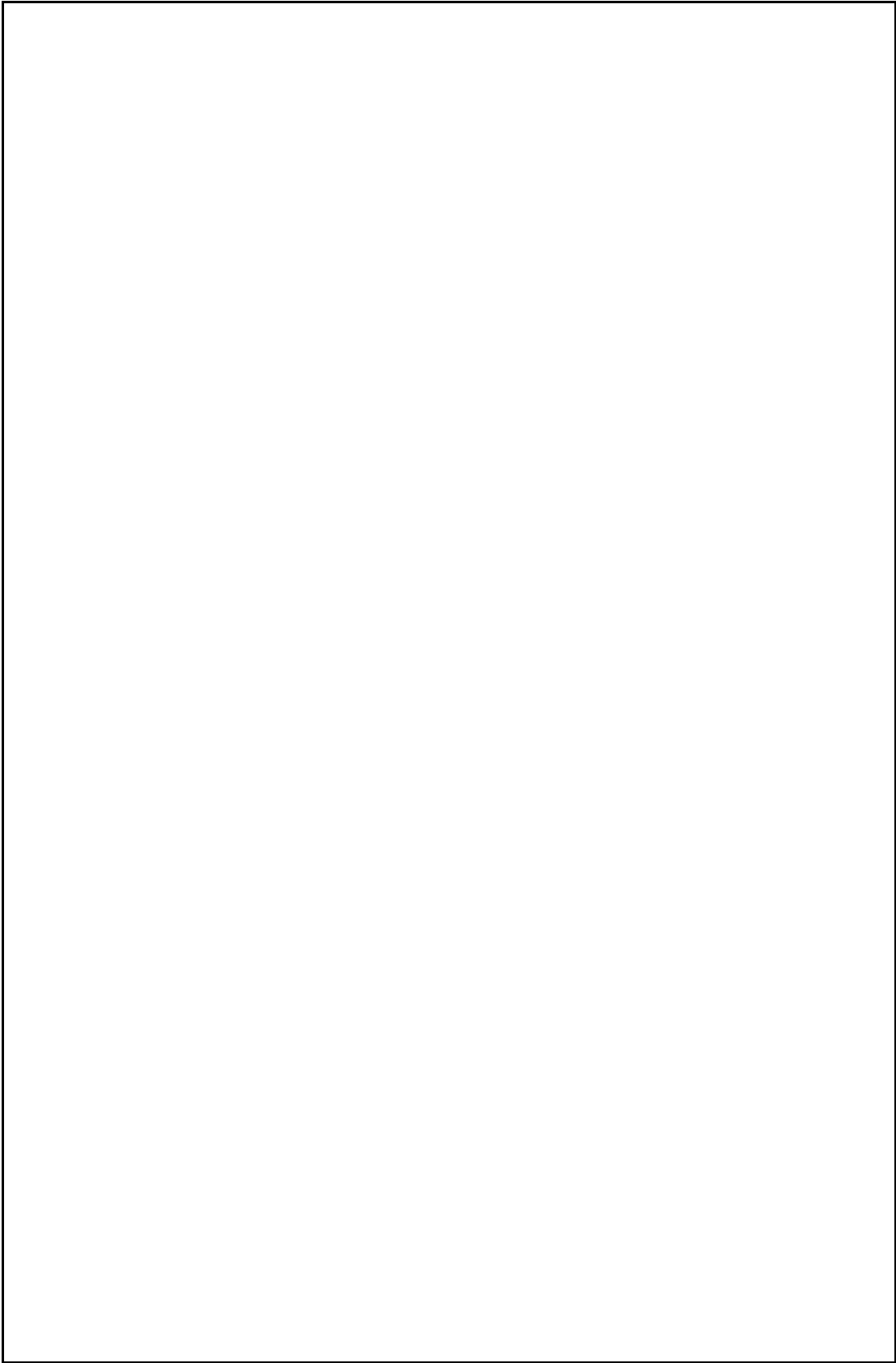
ITA 09 C 07 34 - HKE

Regulations in force and degree of observance of regulations

The maximum allowed length of gillnets is 4000 m for one fishers, 5000 m for two fishers up to 6000 m for three or more embarked fishers. The maximum allowed net height is 10 m. The minimum mesh size is 16 mm. The legal size for hake is 20 cm.

Accompanying species

The most abundant by-catch species are squids (*Illex coindetii*, *Todaropsis eblanae*), chub mackerel (*Scomber japonicus*) and horse mackerel (*Trachurus trachurus*), *Lepidopus caudatus*.



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

Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0910F.

Page 2 / 1

Data source*

OpUnit 2*

ITA 09 D 03 33 - HKE

Regulations in force and degree of observance of regulations

<p>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.</p>	

Accompanying species

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

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

Assessment form

Sheet P2b
Fishery by Operational Unit

Code: HKE0910F.

Page 3 / 1

Data source*

OpUnit 3*

ITA 09 E 03 33 - HKE

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 capellanus*), 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: HKE0910F.

Page 1 / 1

Sex* both

Analysis # * 1

Time series

Data	Size	Age
(mark with X)	x	

Model	Cohorts	Pseudocohorts
(mark with X)	x	

Equation used	catch equation	Tunig method	Extended Survivors Analysis (XSA)
# of gears	2	Software	FLXSA 2.1 (R script)
F _{terminal}	2.1		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum	5		Recruitment	65.375 millions	1307 tons
Average			Average population	75174	3427.5 tons
Maximum	82		Virgin population		
Critical			Turnover		
					SSB
					1318 tons

Average mortality

	Total	Gear				
F ₁	1.08	trawl	2010			
F ₂	0.92	gillnets	2010			
Z	2.49					

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

Comments

DCF landing data for hake catch are available for gillnets and trawl fisheries since 2005. Discard data (i.e. annual amount of discards and their size structures) were available for 2006, 2009, 2010. Discard proportion and its age composition estimated for 2006 was applied to calculate catch data for 2005 and 2007 whereas 2009 discard data were used to adjust 2008 landing data. Numbers at age of hake catch, weight at age, mortality at age and maturity at age data were compiled for age groups 1 to 5+ and used as XSA input data for 2005-2010.

During 2005-2010 SSB oscillated between 943.6 and 1443.7 tons (2010), while the total biomass was estimated to be at about 3158-3600 tons.

The largest year classes were observed in 2005 (199.6 millions) and 2008 (174.8 millions), whereas a very low recruitment was estimated in 2010 (65.37millions). Trend in recruitment from XSA is in line with the MEDITS trend that shows a peak in 2008 and a strong decline in 2010.

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

Assessment form

Sheet A2
Indirect methods: data

Code: HKE0910F

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

Data	Total catches (number of specimens)
-------------	-------------------------------------

Data

Input data

Catch-at-age (thousands)						
Age class	2005	2006	2007	2008	2009	2010
1	56407	85166	72515	18677	14276	12051
2	7940	8709	6740	17238	10114	5575
3	509	618	593	626	529	549
4	48	120	34	106	71	129
5+	19	55	5	56	42	97

Weight-at-age						
Age class	2005	2006	2007	2008	2009	2010
1	0.005685	0.006063	0.005623	0.005434	0.007179	0.02
2	0.103187	0.136246	0.128155	0.121672	0.103433	0.111
3	0.431672	0.611844	0.603328	0.596374	0.453813	0.588
4	1.34	1.369493	1.359158	1.348943	1.36	1.306
5+	2.542673	2.554371	2.530105	2.539243	2.635517	2.34375

Maturity-at-age						
Age class	2005	2006	2007	2008	2009	2010
1	0	0	0	0	0	0
2	0.21	0.21	0.21	0.21	0.21	0.21
3	0.9	0.9	0.9	0.9	0.9	0.9
4	1	1	1	1	1	1
5+	1	1	1	1	1	1

Mortality-at-age						
Age class	2005	2006	2007	2008	2009	2010
1	1.3	1.3	1.3	1.3	1.3	1.3
2	0.6	0.6	0.6	0.6	0.6	0.6
3	0.46	0.46	0.46	0.46	0.46	0.46
4	0.41	0.41	0.41	0.41	0.41	0.41
5+	0.25	0.25	0.25	0.25	0.25	0.25

Tuning data

MEDITS						
Mean abundance						
	Age					
Year	1	2	3	4	5+	
2005	3278.9	79.3	3.4	0.5	0.4	
2006	2865.0	114.0	6.2	1.1	0.4	
2007	3559.8	69.1	4.2	2.7	0.2	
2008	8529.0	94.8	3.6	1.0	1.0	
2009	5121.2	60.9	1.9	0.4	0.1	
2010	2042.4	40.8	3.1	0.4	0.2	

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

Assessment form

Sheet A3

Indirect methods: VPA results

Code: HKE0910F.

Page 1 / 1

Sex*	both	Gear*	bottom trawl + gillnet	Analysis #*	XSA
------	------	-------	------------------------	-------------	-----

Population in figures

	2005	2006	2007	2008	2009	2010
SSB (tons)	941.74	1298.53	1189.53	1084.61	991.84	1318.36
TB (tons)	3426.8	3603.1	3211.4	3158.1	3046.5	3427.5
Recruitment (millions)	199.619	105.797	81.395	174.016	163.639	65.375
Yield (including discards)	1923.3	2184.3	1977.9	1795.8	1648.6	1681.3

Population in biomass

age	2005	2006	2007	2008	2009	2010	Tons
1	1134.7	640.88	458	945.62	1174.8	1308	
2	1651.7	2020.4	1885	1373.2	1063.5	940	
3	455.33	675.78	751	430.35	401.18	588	
4	105.35	182.85	5	163.87	164.37	222	
5+	79.748	83.186	113	245.06	242.72	370	

Fishing mortality rates

F at age	2005	2006	2007	2008	2009	2010
age						
1	1.3	0.67	1	1.54	1.66	0
2	2.07	1.88	2	1.95	1.71	2
3	1.61	5.26	2	1.33	1.19	2
4	1.96	3.66	2	1.75	1.7	2
5+	1.96	3.66	2	1.75	1.7	2
Fbar₂₋₄	1.88	3.6	2	1.67	1.53	2
Fbar₁₋₂	1.69	1.27	2	1.74	1.69	1

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

Sex both	Code: HKE0910F. Analysis # Y/R
-------------	--------------------------------------

# of gears	2	Software	Yield
------------	---	----------	-------

Parameters used

Vector F	yes
Vector M	yes
Vector N	

Model characteristics

M vector Age1=1.3 , Age2=0.6, Age3=0.46, Age4=0.41, Age5=0.3; Age6=0.2
 Fmax = 0.35; F0.1= 0.22 and Fref = 0.28

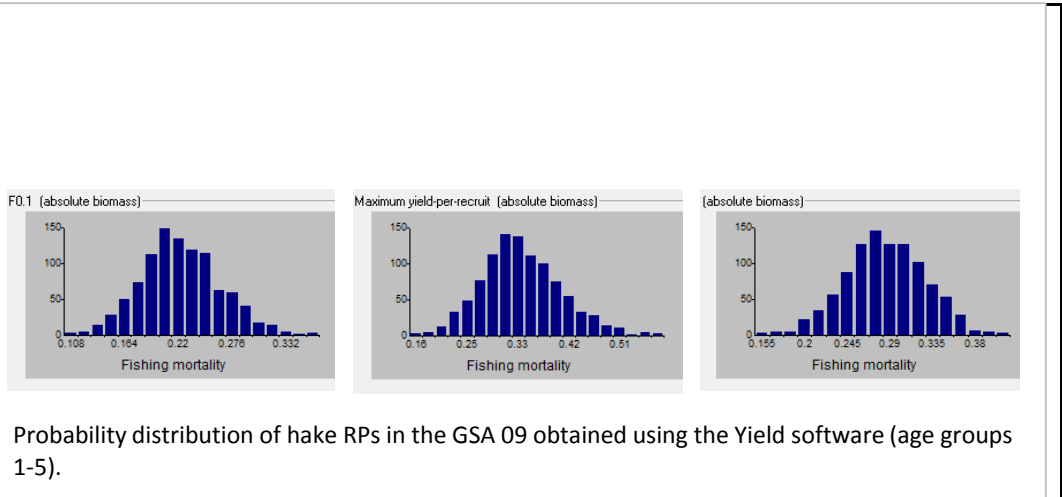
Results

	Total	Gear			
Current YR	33.7				
Maximum Y/R	46.42				
Y/R 0.1					
F _{max}	0.35				
F _{0.1}	0.22				
Current B/R					
Maximum B/R					
B/R 0.1					
Fref	0.28				

Comments

Yield software quantified uncertainty by repeatedly selecting a set of biological and fishery parameters by sampling from the probability distributions for uncertain parameters set by the user, and then calculating the quantities of interest. In this sampling, it is assumed that each of the uncertain parameters are independently distributed, even though for some biological parameters, this assumption is almost certainly incorrect (Hoggarth *et al.*, 2006). F_{max} and F_{ref}, this latter corresponding to F at SSB/initial SSB = 0.30, were assumed as limiting reference points. F_{0.1} was assumed as target reference point. The probability distributions of the three RPs showed a considerable variations (Fig. 5.7.5.3.1). The following mean values were obtained: F_{max} = 0.35; F_{0.1} = 0.22 and F_{ref} = 0.28. The maximum predicted values were respectively 0.59 (F_{max}), 0.36 (F_{0.1}) and 0.41 (F_{ref}). RPs suggest an overfishing situation for the stock considering current F about six times higher than the limit and target RPs F.

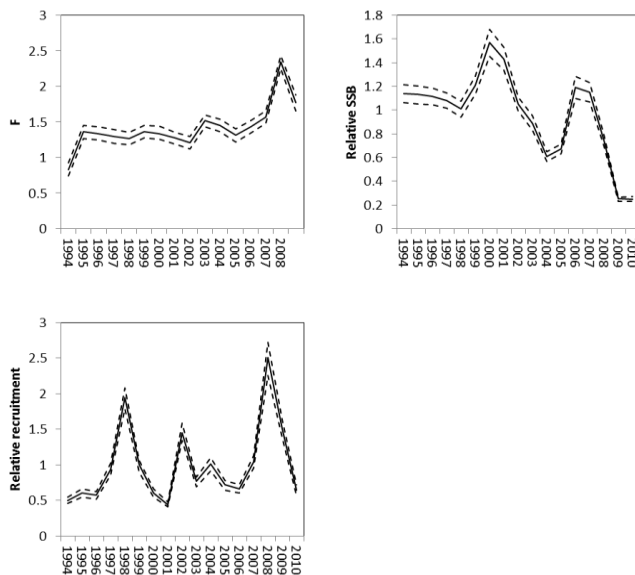
Comments



Other assessment methods

Trawl Surveys data were used expressed in kg/km². The estimation of Z was done using SURBA, after the reconstruction of the demographic structure of the stock and slicing among age classes.

F1-3 shows a clear increasing trend ($p < 0.01$) from 0.8 (1994) to 2.4 (2008), decreasing to 1.77 in 2009. Relative SSB decreased significantly ($p < 0.01$) showing the lowest values in 2009-2010. Recruitment fluctuated from year to year without a clear temporal pattern during MEDITS. The largest year classes were observed in 1998 and 2009. A low recruitment index occurred in 2010.



Estimated trend in F, relative SSB and recruitment using SURBA. 50th percentile of bootstrapped runs (solid line) and 5% and 95% percentiles of bootstrapped runs (dashed lines).

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

Assessment form

Sheet D
Diagnosis

Code: HKE0910F

Reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	3427	tons			470 as potential B at F=0
SSB	10-Aug	tons	30%		1318 tons = 10-15% of SSB at F01. Medits data shows a decline
F	1.5 to 2.0				progressive reduction of fishing pressure on juveniles
Y					
CPUE					
Fmax					
F0.1			0.22		
F30%SSB			0.28		
ZMBP					

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

Landings per unit effort show an increasing trend in the last 3-4 years in some ports. It is too early for stressing that this phenomenon is a signal of recovering of the stock that was (or is still) almost depleted.

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

Assessment form

Sheet Z

Objectives and recommendations

Code: HKE0910F

Management advice and recommendations*

The stock appeared heavily overexploited in 2009-2010 and F needs a consistent reduction from the current F towards the candidate limit reference points for long term sustainability based on F around F0.1 (0.22). However, considering the high productivity in terms of incoming year classes, this stock has the potential to increase in size quickly if F is reduced towards Fmsy. The continued lack of older fish in the surveyed population indicates exploitation rates far beyond those considered consistent with high yields and low risk. A special attention should be paid to the activity of small scale fisheries targeting adults in order to discourage any increase of catches as long as the removals of juveniles is not reduced.

The protection of the stable nursery areas identified in the GSA 9 would allow to consistently reduce the fishing mortality on juveniles, protecting the habitats where the bottom settlement take place and contributing to rebuild the spawning stock.

To this aim the selectivity of the trawl nets would need to be improved through the adoption of a set of technical improvements aimed at reducing the impact on juveniles, such as grid, escape panel, modified separator trawl etc.

Advice for scientific research*



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

Assessment form

Sheet C
Comments

Code: HKE0910F.

Page 1 / 1

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 Community.

Abstract for SCSA reporting

Authors

F. Collocal¹, P. Sartor², A. Ligas², M. Sbrana²,
A.Mannini³, A. Abella⁴

Year

2010

Species Scientific name

Merluccius merluccius - HKE

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area

09 - Ligurian and North Tirrenian Sea

Fisheries (brief description of the fishery)*

Hake is the demersal species providing the highest landings and incomes for the GSA9. About 60% of landings of hake is due to bottom trawl vessels; the remaining fraction is provided by artisanal vessels using set nets, in particular gillnets.

The trawl fleet of GSA9 at the end of 2008 accounted for 339 vessels .

Hake fishing grounds consists in soft bottoms of continental shelves and the upper part of continental slope. Fishing pressure shows some geographical differences inside the GSA9 according to the fleets size and bottom characteristics. Trawl landings in GSA 9 are dominated by small sized specimens; they are basically composed by age groups 0+ and 1+. Gillnet fishery lands mostly age 2 and age 3 fish. High quantities of small size hake are routinely discarded.

The artisanal fleets, according to the official data account for 1309 vessels; widespread in many harbours along the continental and insular coasts. Of these, about 50 vessels are located in some harbors of the GSA9 (e.g. Marina di Campo, Ponza, Porto Santo Stefano).

The fishing capacity of the GSA 09 has shown in these last 10 years a progressive reduction; from 1996 to 2010. The total fishing days carried out by all the GSA 09 trawlers decreased from about 65,000 in 2004 to about 63,000 in 2006, also as effect of a reduction from 187 to 177 in the mean number of fishing days/year. The same reduction pattern was observed in the Kw*days at sea either for trawlers and fixed nets.

Source of management advice*

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

An XSA assessment was carried out using the catch data collected under DCF from 2005 to 2010 calibrated with fishery independent data (MEDITS abundance indices for 2005-2010). SURBA analysis was also carried out using both MEDITS survey data (1994-2010) and GRUND (1995-2004).

Yield per recruit analysis allowed to define the level of F that is expected to maximize yield per recruit (Fmax) as well as the precautionary reference points F0.1 and F30%SSBo. F for each year was estimated using the software SURBA, assuming different catchability and natural mortality rate by age.

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

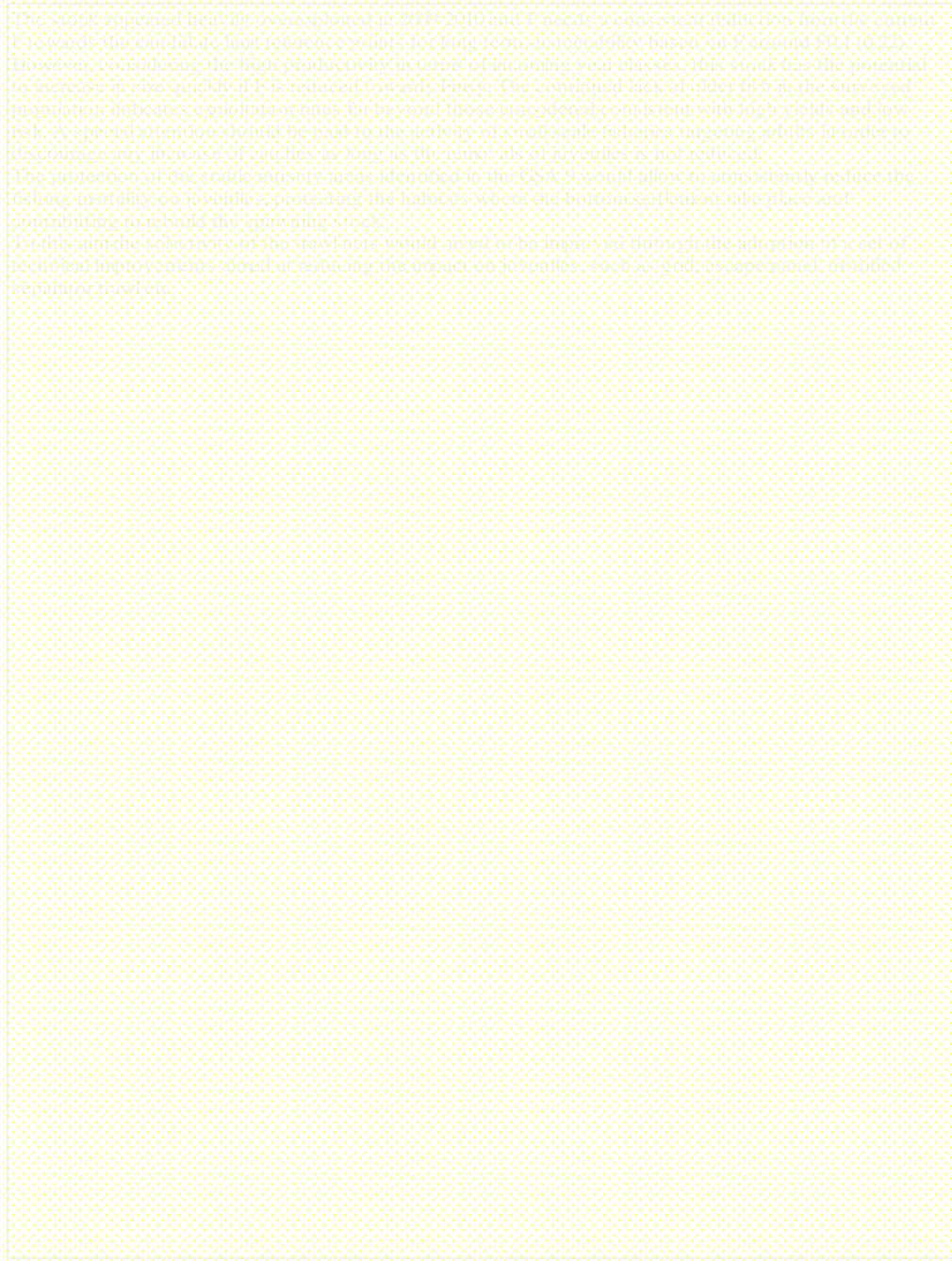
High fishing mortality

Stock abundance

Low abundance

Comments

Management advice and recommendations*



Advice for scientific research*

