

SAC GFCM Sub-Committee on Stock Assessment

Date*	24 November 2009	Code*	DPS0909Abe
Authors*	Abella A.(4), Colloca F.(1), Sartor P. (2); Mannini A.(3),		
Affiliation*	1- ARPAT-Livorno; 2- CIBM- Livorno; 3- DipTERis, Univ. Genova 4- Univ.La Sapienza, Dip. Biologia Animale e dell'Uomo, Roma		
Species Scientific name*	1	Source: GFCM Priority Species	
	2	Source: -	
	3	Source: -	
Geographical area*	Western Mediterranean (FAO Subarea 37.1.)		
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: DPS0909Abe

Date*	24 Nov 2009	Authors*	Abella A.(4), Colloca F.(1), Sartor P. (2); Mannini A.(3),
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Species Scientific name*	Parapenaeus longirostris - DPS	Species common name*	Deep-sea pink shrimp
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Data Source

GSA*	09 - Ligurian and North Tirrenian Sea	Period of time*	1994-2008
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Description of the analysis

Type of data*	Catch, trawl survey indices	Data source*	Official Statistics
Method of assessment*	Length cohort analysis, Surba, Y/R	Software used*	VIT, SURBA, YIELD

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.

Deep-Sea pink shrimp has been assessed using both trawl survey data (MEDITS 1994-2008; GRUND 1994-2007) and catch data (DCR 2006-08). The survey-based stock assessment model SURBA (Needle, 2003) was used to reconstruct trend in population structure and fishing mortality. Equilibrium YPR reference points (F01) for the stock were estimated through the Yield software (Hoggarth et al., 2006) assuming recruitment fluctuating randomly around a constant value and 20% uncertainty in input parameters. SURBA analysis was performed using an M vector obtained using ProdBiom. Average fishing mortality (F1-3) estimated from MEDITS ranged between 0.78 and 1.8 (1.16 in 2007). A different picture was obtained using LCA on 2006-08 landing data. F1-3 was between 0.5 and 0.6, little below the estimated reference value of F0.1=0.7. Relative indices derived from scientific MEDITS survey for the period 1994-2008 indicated an increasing trend of the spawning stock biomass with three peaks in 1999 and 2006 and 2008. In 2008 the SSB was the highest observed since 1994. GRUND data shows a very similar temporal trend in SSB. Given the current uncertainty in F estimates, the relevant fleet effort should not be increased, in order to avoid future low stock productivity and landings.

Comments, bibliography, etc.

Bibliography (Published papers and books):

- Abella A., Caddy J.F., Serena F. (1997) Declining natural mortality with age and fisheries on juveniles: a Mediterranean demersal fishery yield paradigm illustrated for *Merluccius merluccius*. *Aquatic Living Resources* 10: 257–269.
- Ardizzone G. D., Corsi F., 1997. Atlas of Italian Demersal Fishery Resources. *Biol. Mar. Medit.*, 4: 568 pp.
- Ardizzone G.D., Gravina M.F., Belluscio A., Schintu P., 1990. Depth-size distribution pattern of *Parapenaeus longirostris* (Lucas, 1846) (Decapoda) in the central Mediterranean Sea. *Journal of Crustacean Biology*, 10(1): 139-147.
- Biagi F., Sartor P., Ardizzone G.D., Belcari P., Belluscio A., Serena F., 2002. Analysis of demersal fish assemblages of the Tuscany and Latium coasts (north-western Mediterranean). *Scientia Marina*, 66 (Supp. 2): 233-242.
- Caddy, J.F. (1991). Death rates and time intervals: Is there an alternative to the constant natural mortality axiom? *Rev. Fish Bio./ Fisheries*, 1: 109-13 8.
- Colloca F., Cardinale M., Belluscio A., Ardizzone G., 2003. Pattern of distribution and diversity of demersal assemblages in the Central Mediterranean Sea. *Estuarine, Coastal and Shelf Science*, 56: 469-480.
- 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.
- 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.
- Hoggarth D. D., Abeyasekera S., Arthur R. I., Beddington J. R., Burn R. W., Halls A. S., Kirkwood G. P., McAllister M., Medley P., Mees C. C., Parkes G. B., Pilling G. M., Wakeford R. C., Welcomme R. L., 2006. Stock assessment for fishery management- A framework guide to the stock assessment tools of the fisheries management sciences Programme (FMSP). *Fao Fish. Tech. Pap.* No 487, 261p.
- 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.
- Reale C, Sartor P, Ligas A, Viva C, Bertolini D, De Ranieri S, Belcari P., 2005. Demersal resources assemblages on the *Leptometra phalangium* (J. Müller, 1841) (Echinodermata; Crinoidea) bottoms in the Northern Tyrrhenian Sea. *Biol Mar Medit* 12 (1): 571-574.
- Sartor P., Reale B., Sbrana M., Biagi F. (1998) - Analisi dello sbarcato commerciale con reti a strascico presso un porto del Mar Tirreno Settentrionale negli anni 1990-95. *Biol. Mar. Medit.*, 5 (2): 81-91.
- Sartor P., Sbrana M., Reale B., Belcari P., 2003b. Impact of the deep sea trawl fishery on demersal communities of the northern Tyrrhenian Sea- (Western Mediterranean). *J. Northw. Atl. Fish. Sci.*, 31: 1-10.

SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	Sheet B Biology of the species

Code: DPS0909Abe

Biology	Somatic magnitude measured (LH, LC, etc)*			Carapace Length	Units*	1 millimeter
	Sex	Fem	Mal	Both	Unsexed	
Maximum size observed			50		Reproduction season	spring
Size at first maturity			18		Reproduction areas	at about 80-100m
Recruitment size			8		Nursery areas	coastal

Parameters used (state units and information sources)

		Sex				
		Units	female	male	both	unsexed
Growth model	L_{∞}	cm			54.3	
	K	year-1			0.118	
	t_0	year			-1.12	
	Data source	Length frequency distributions				
Length weight relationship	a				0.00274	
	b				2.9556	
M		0.27			M vector (see comments)	
sex ratio (mal/fem)		1				

Comments

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

Code: DPS0909Abe

Data source*	Official Statistics+ MEDITS trawl surveys	Year (s)*	1990-2008
Data aggregation (by year, average figures between years, etc.)*	By year 1994-2008		

Fleet and catches (please state units)

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

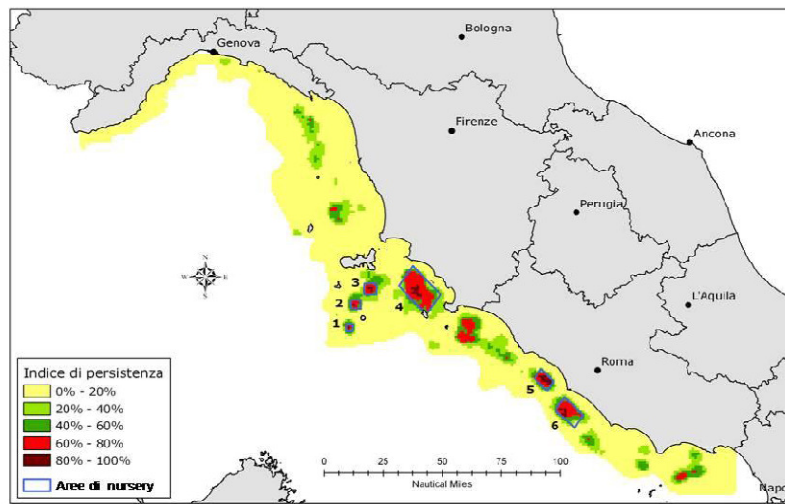
Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ITA 09 E 03 33 - DPS	361	Tons	254	ephrops, horse m		macroramphosus	
Total	361		254				

Legal minimum size	22 mm CL
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Comments

The fishing grounds are located in the southern part of the GSA 09, to the south of Elba Island (northern and central Tyrrhenian Seas); they are mainly exploited by several trawlers of Porto Santo Stefano, Porto Ercole, Fiumicino, Terracina and Gaeta. *P. longirostris* belongs to a fishing assemblage distributed from 150 to 400 m depth, where the main target species are *Merluccius merluccius*, *Eledone cirrhosa* and *Nephrops norvegicus* at greater depths (Biagi et al., 2002; Colloca et al., 2003; Sartor et al., 2003; Sbrana et al., 2006).

Comments



Distribution and temporal persistence of nurseries of *Parapenaeus longirostris* in the GSA 9 estimated from MEDITS data (1994-2006)

Data source*	Official Statistics	OpUnit 1*	ITA 09 E 03 33 - DPS
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Time series

Year*	2003	2004	2005	2006	2007	2008
Catch	323	376	431	462	217	254
Minimum size				13	13	17
Average size Lc				30	28.3	27.9
Maximum size				43	42	43
Fleet				361	361	360

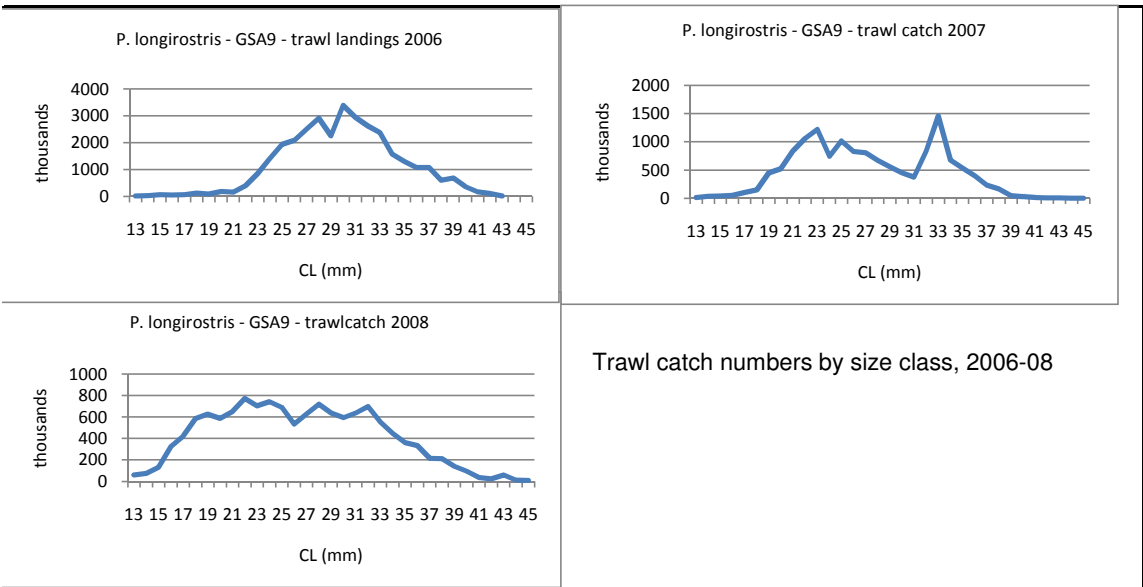
Year						
Catch						
Minimum size						
Average size Lc						
Maximum size						
Fleet						

Selectivity

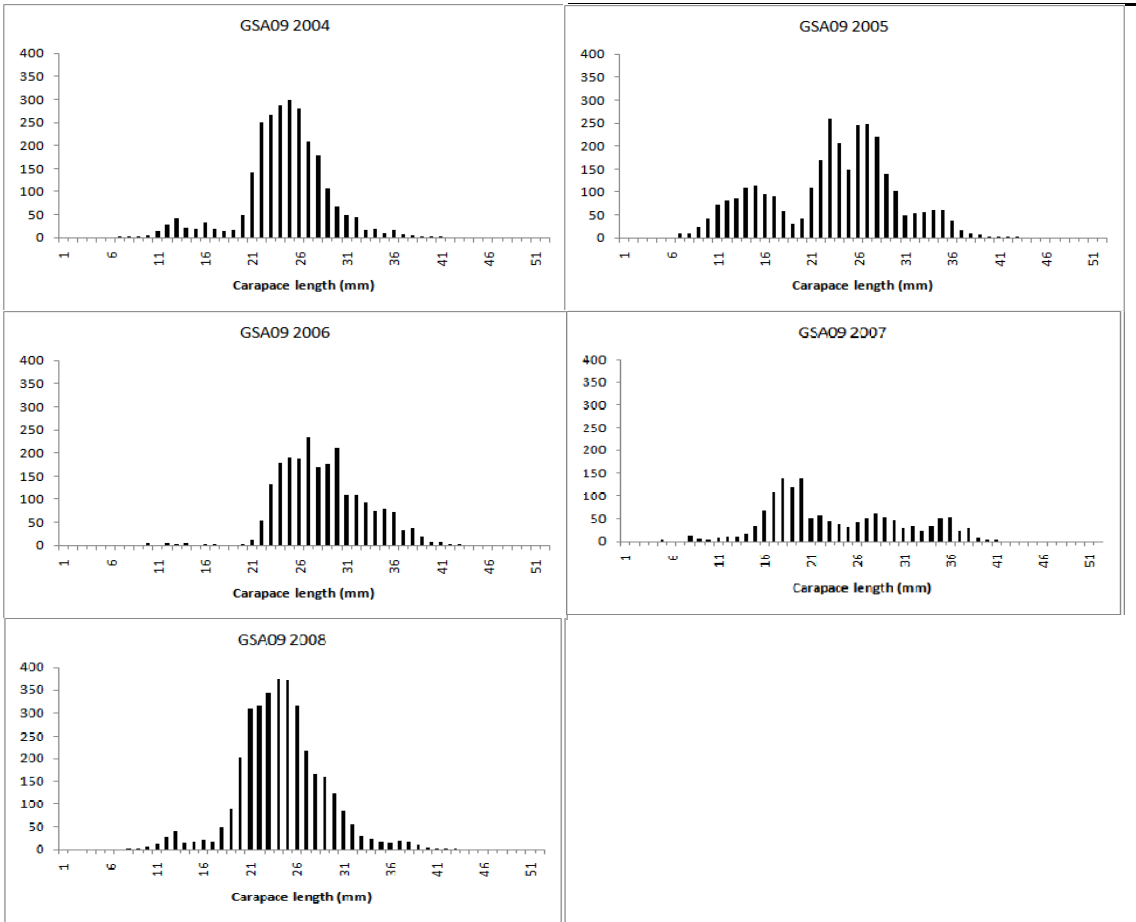
Remarks

L25		This L50 value was obtained with a 40 mm stretched mesh size in the cod end (estimated during GRUND survey 1998).
L50	14.8	
L75		
Selection factor	0.37	

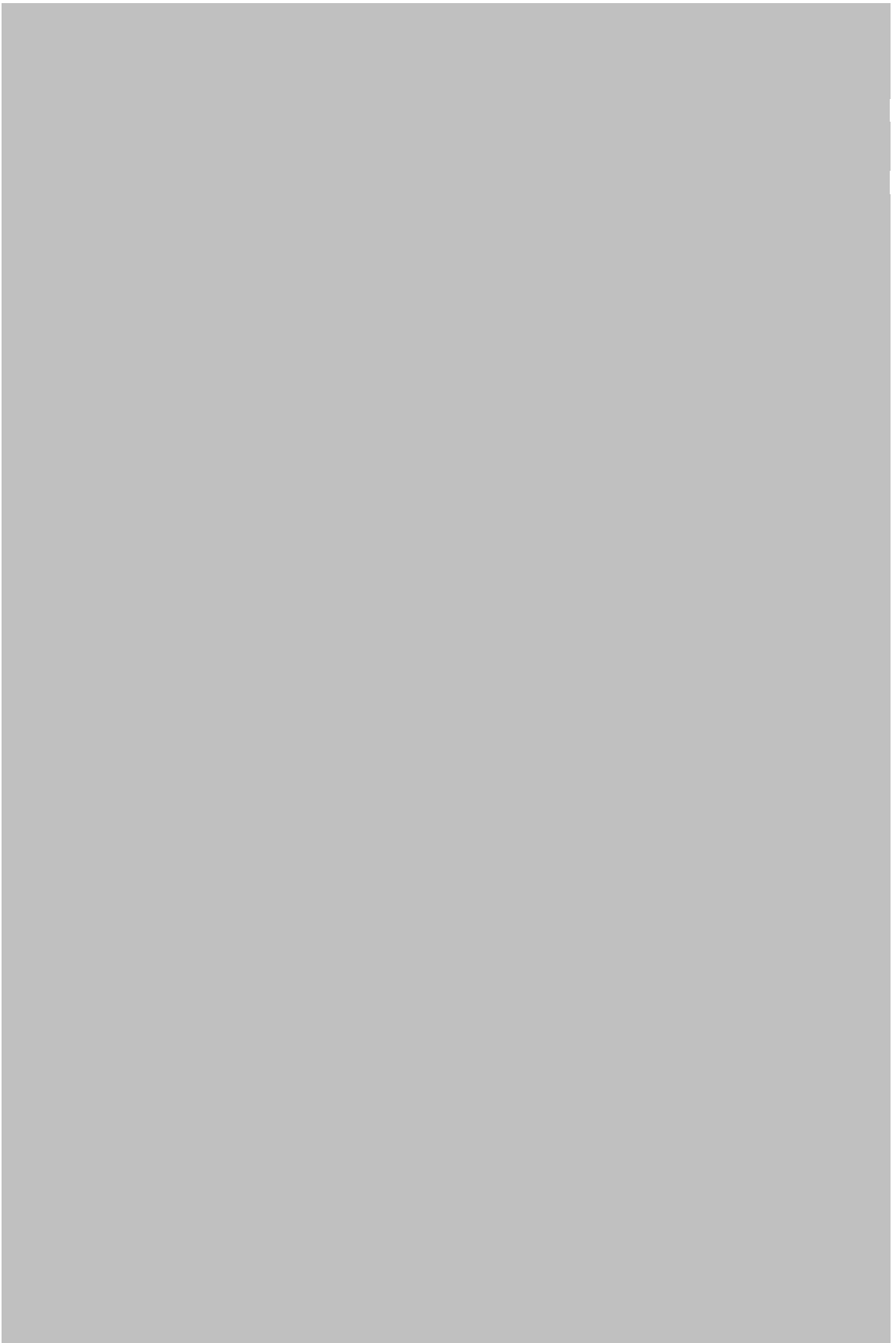
Structure by size or age



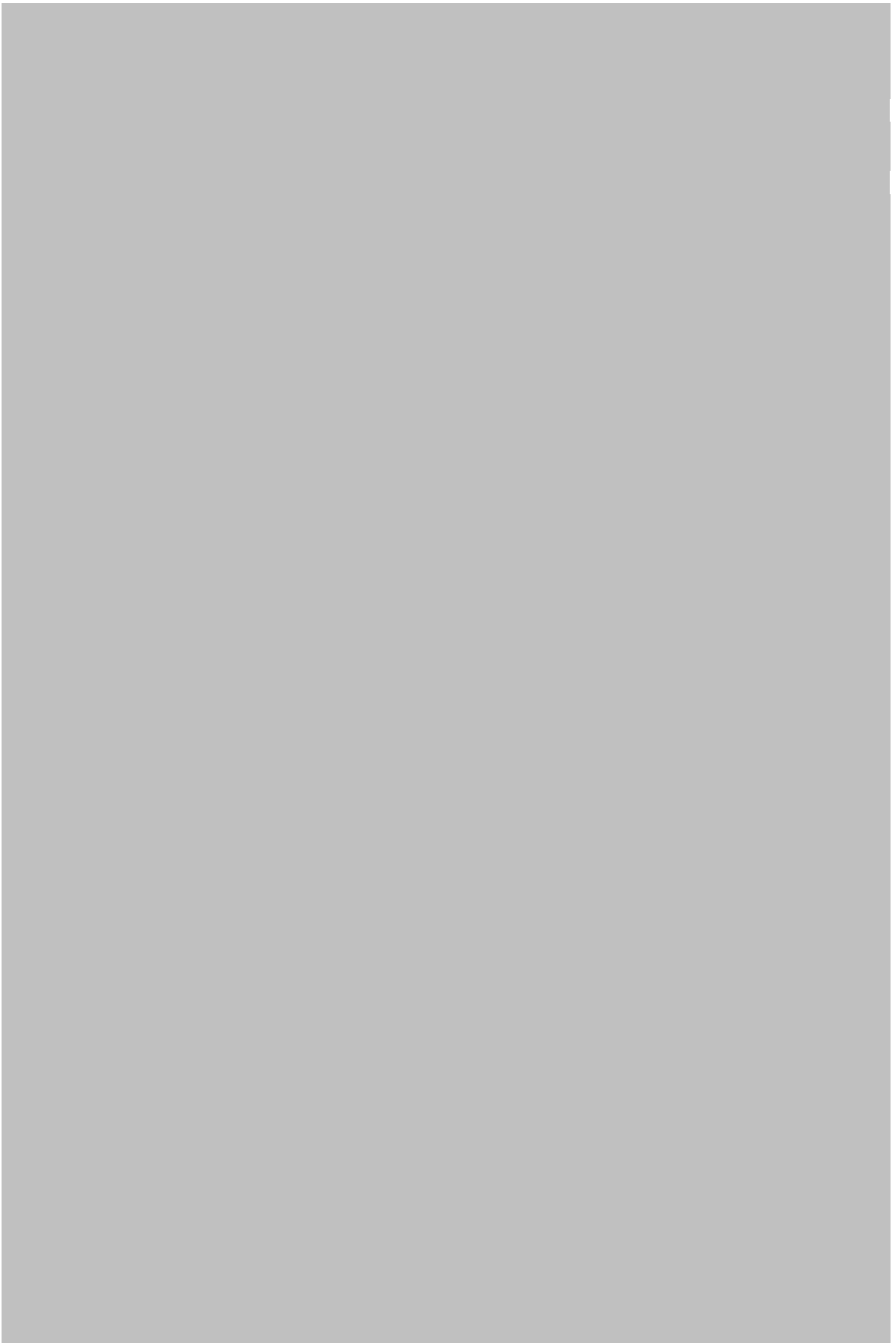
Structure by size or age



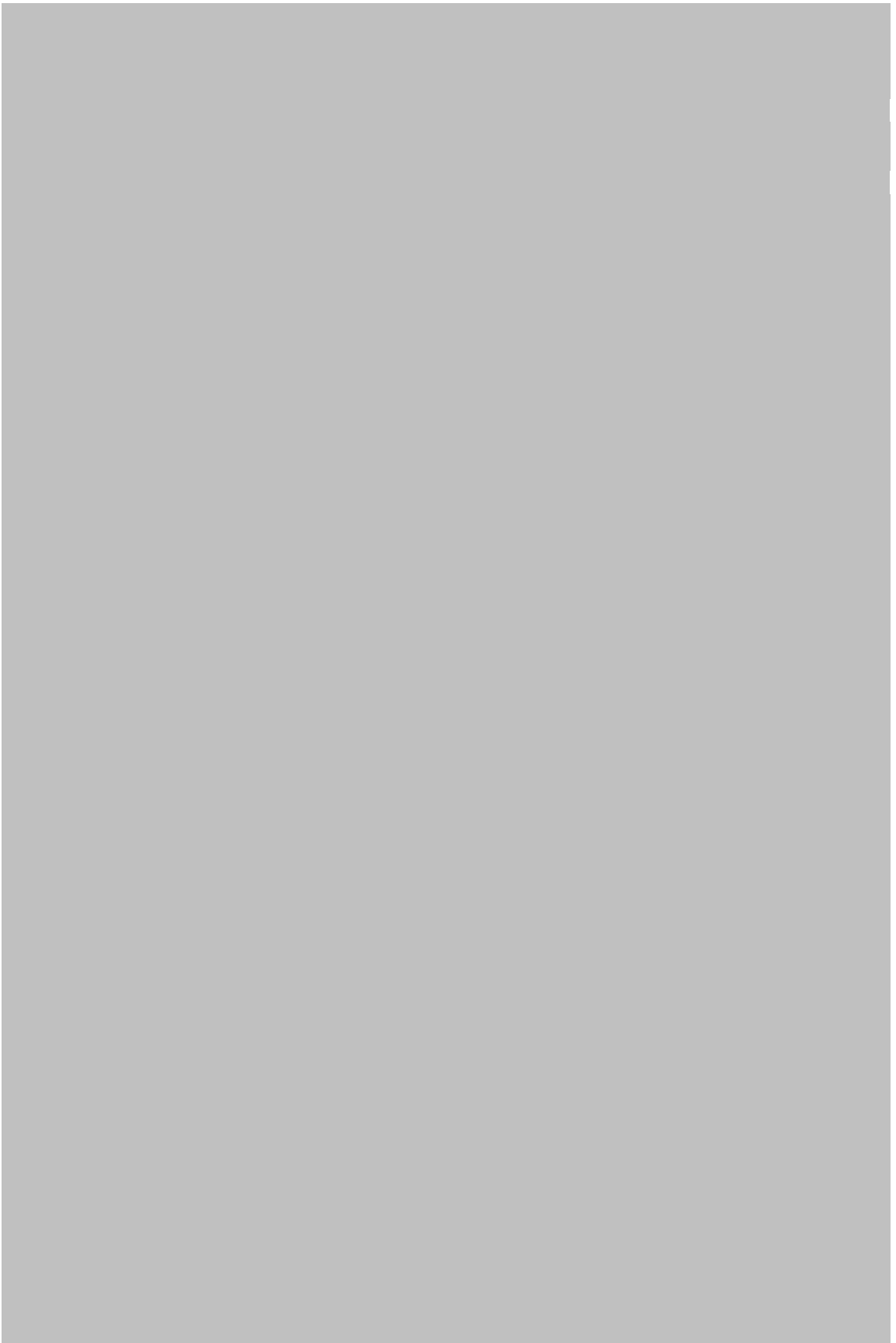
Stratified abundance index by size class of *P. longirostris* obtained during MEDITS 2004-08

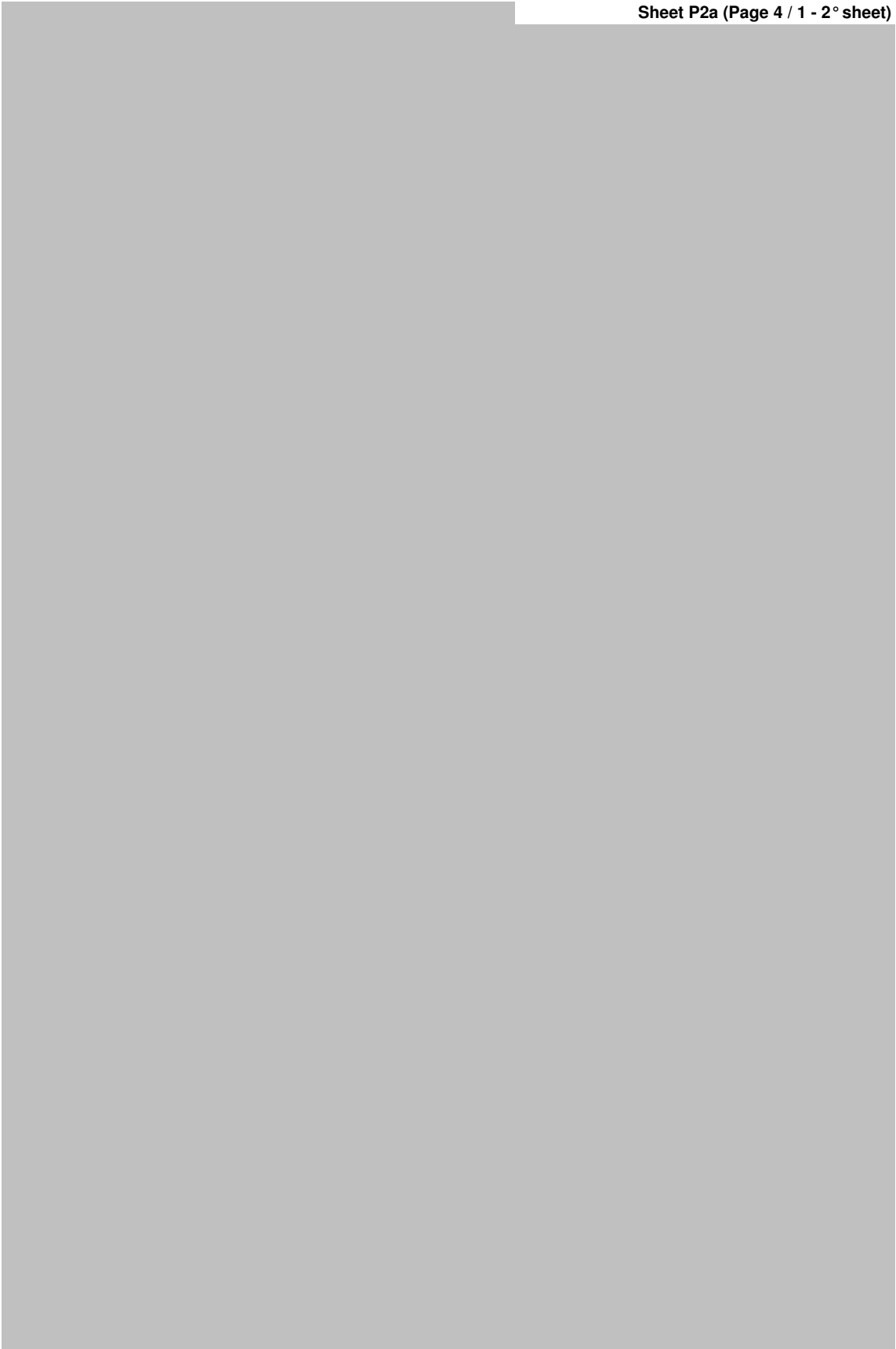


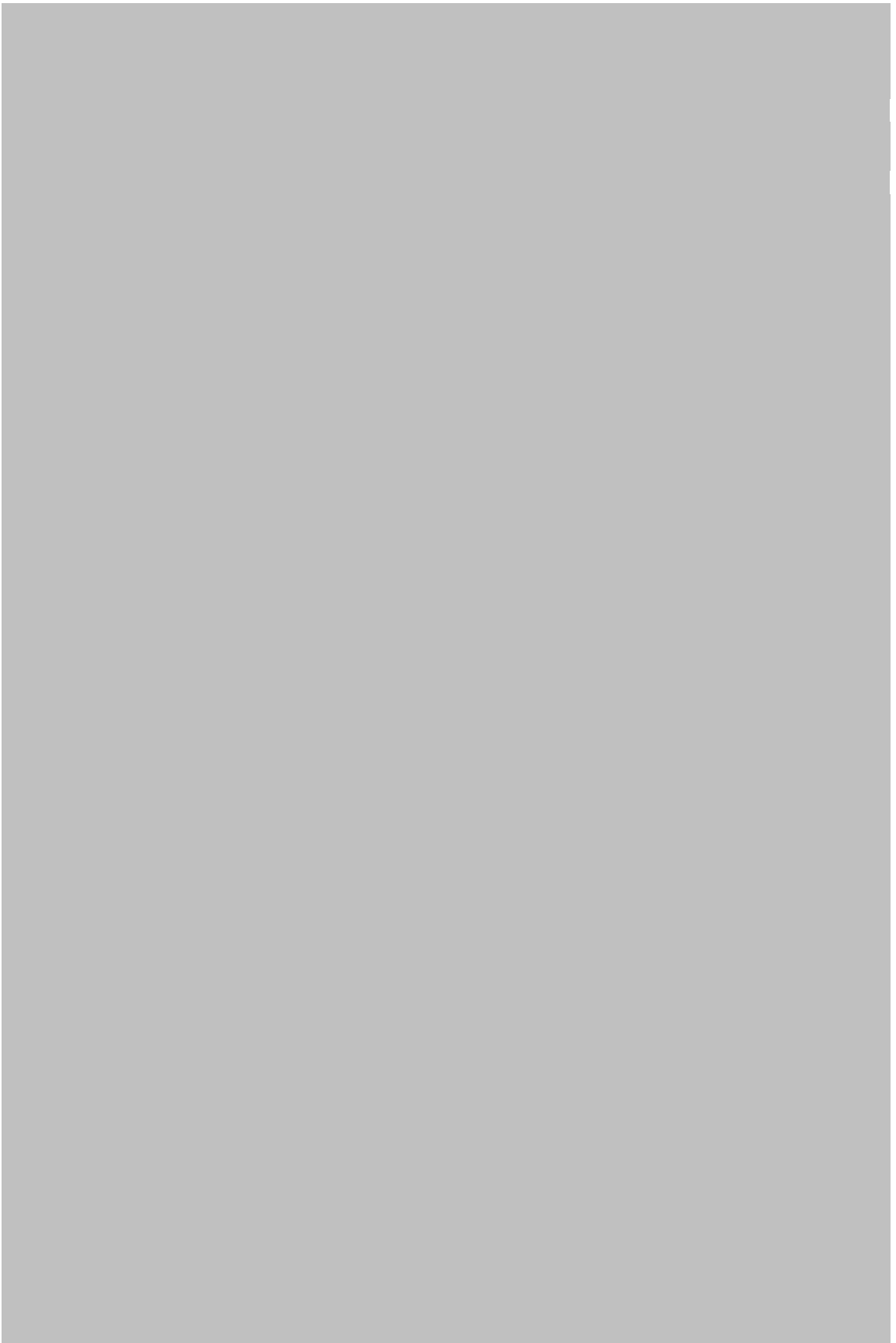


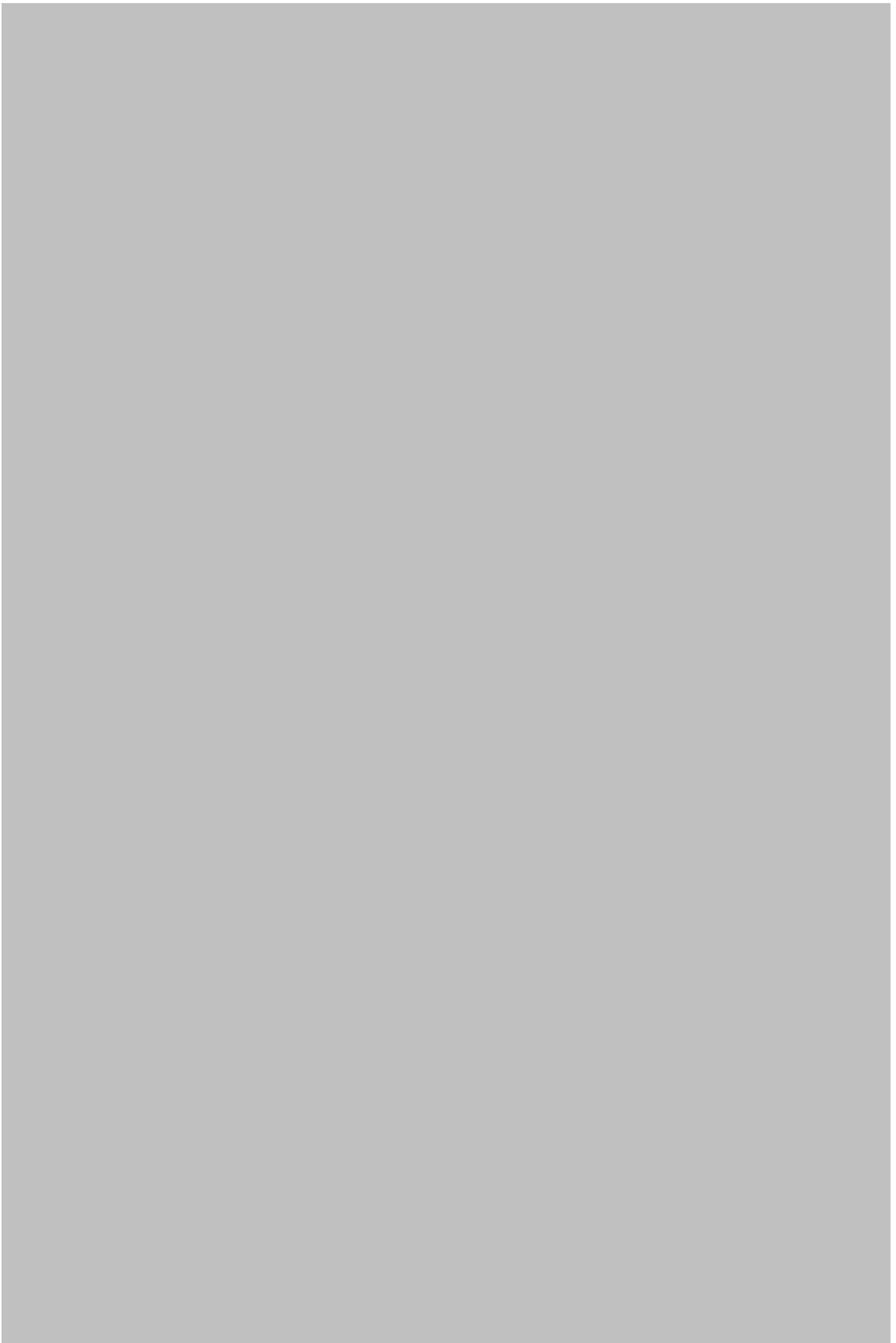












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Assessment form

Sheet P2b
Fishery by Operational Unit

Code: DPS0909Abe

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Data source* Official Statistics

OpUnit 1*

ITA 09 E 03 33 - DPS

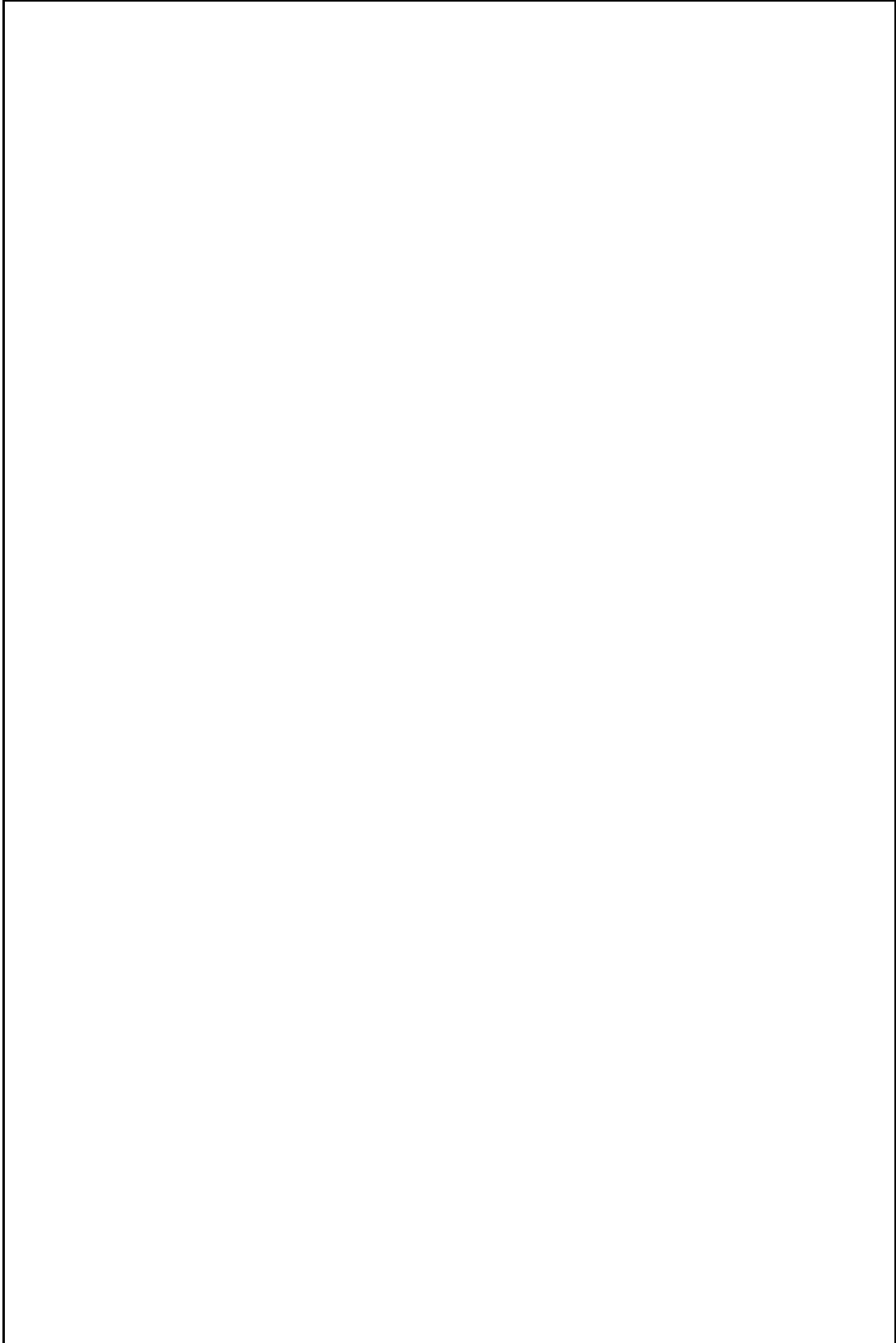
Regulations in force and degree of observance of regulations

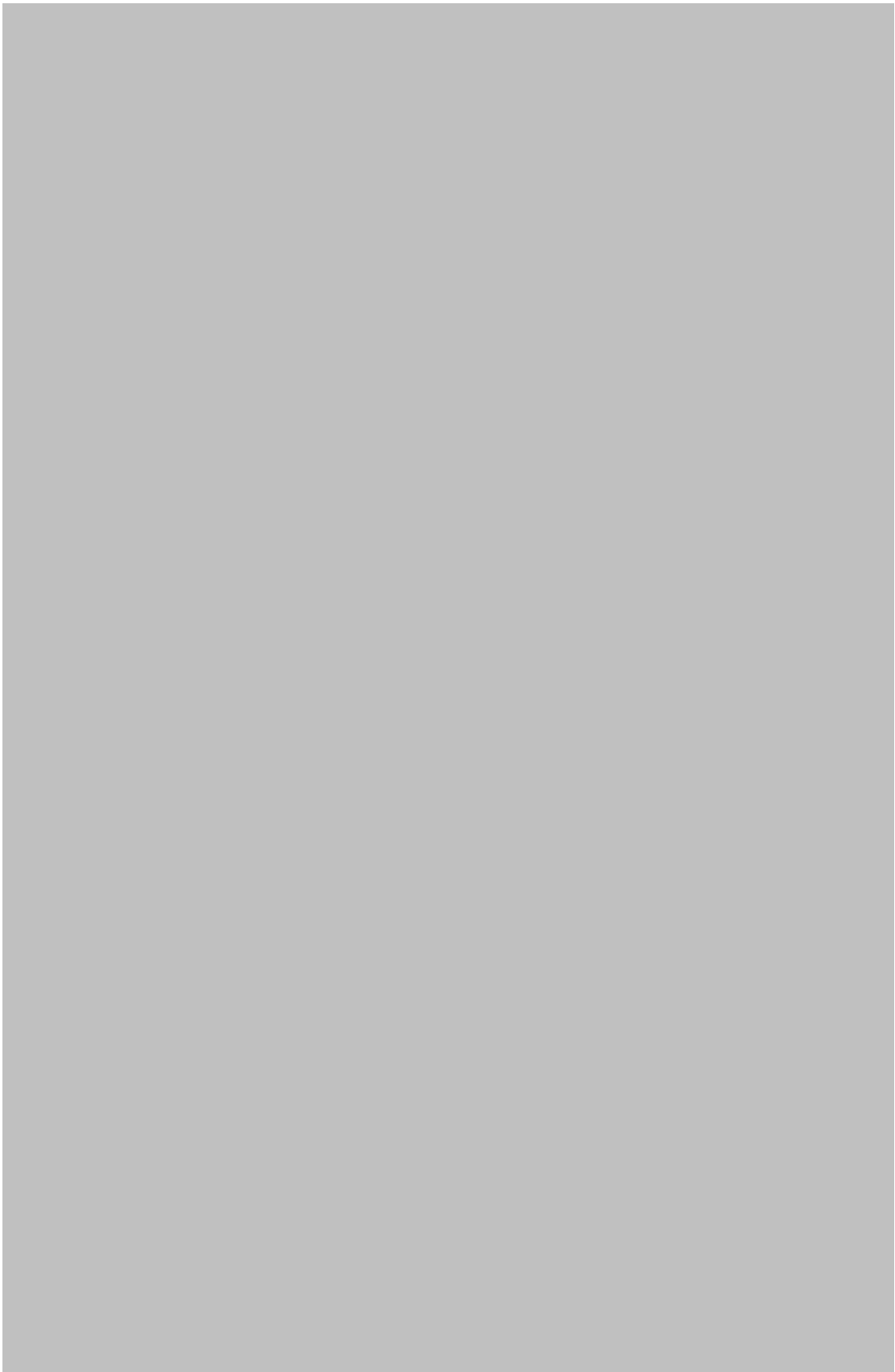
Fishing license: fully observed
Minimum landing size 20 mm: almost observed
Fishing allowed for 5 days a week: fully observed
Technical measures regulations fully observed

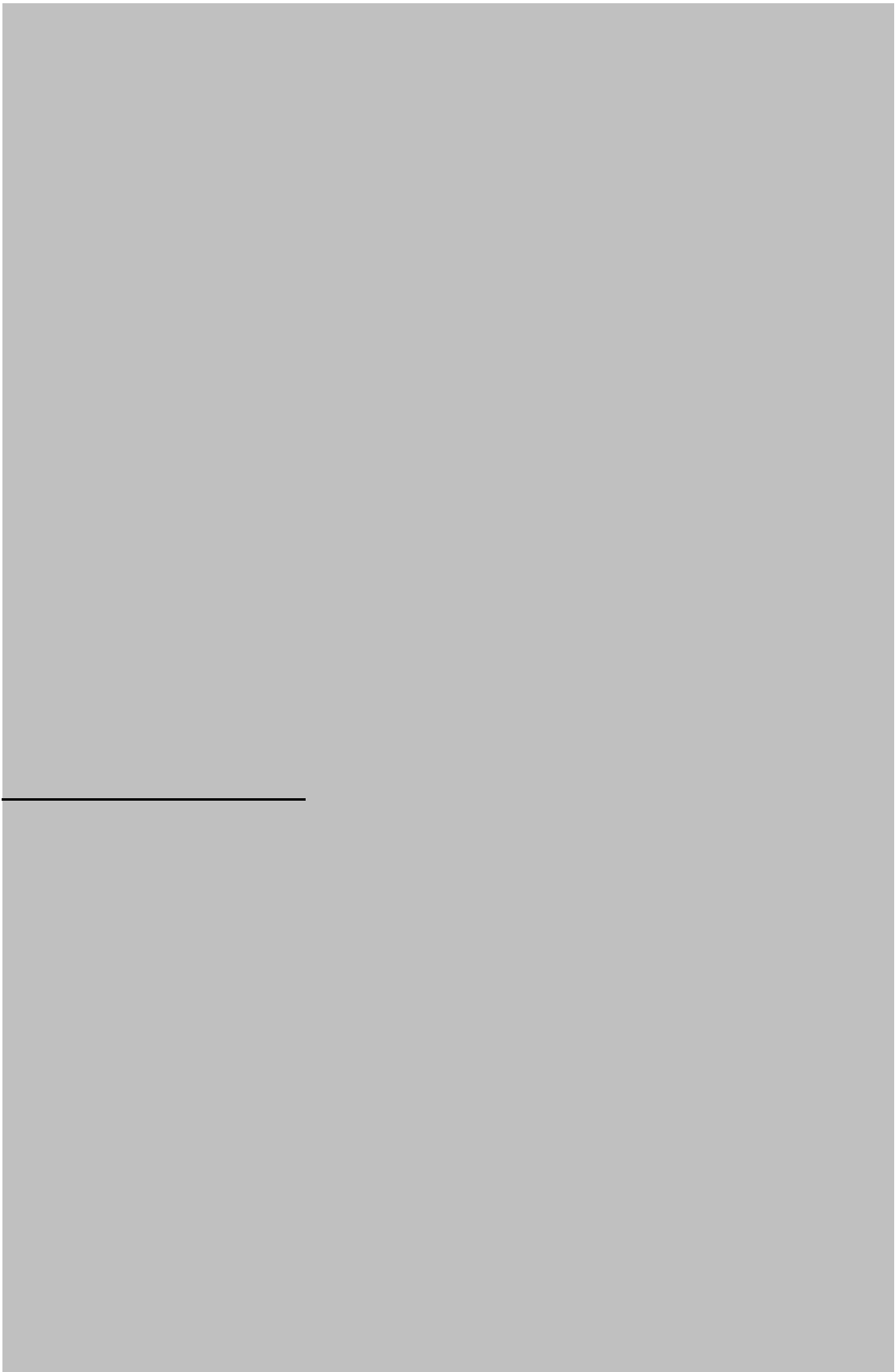
Accompanying species

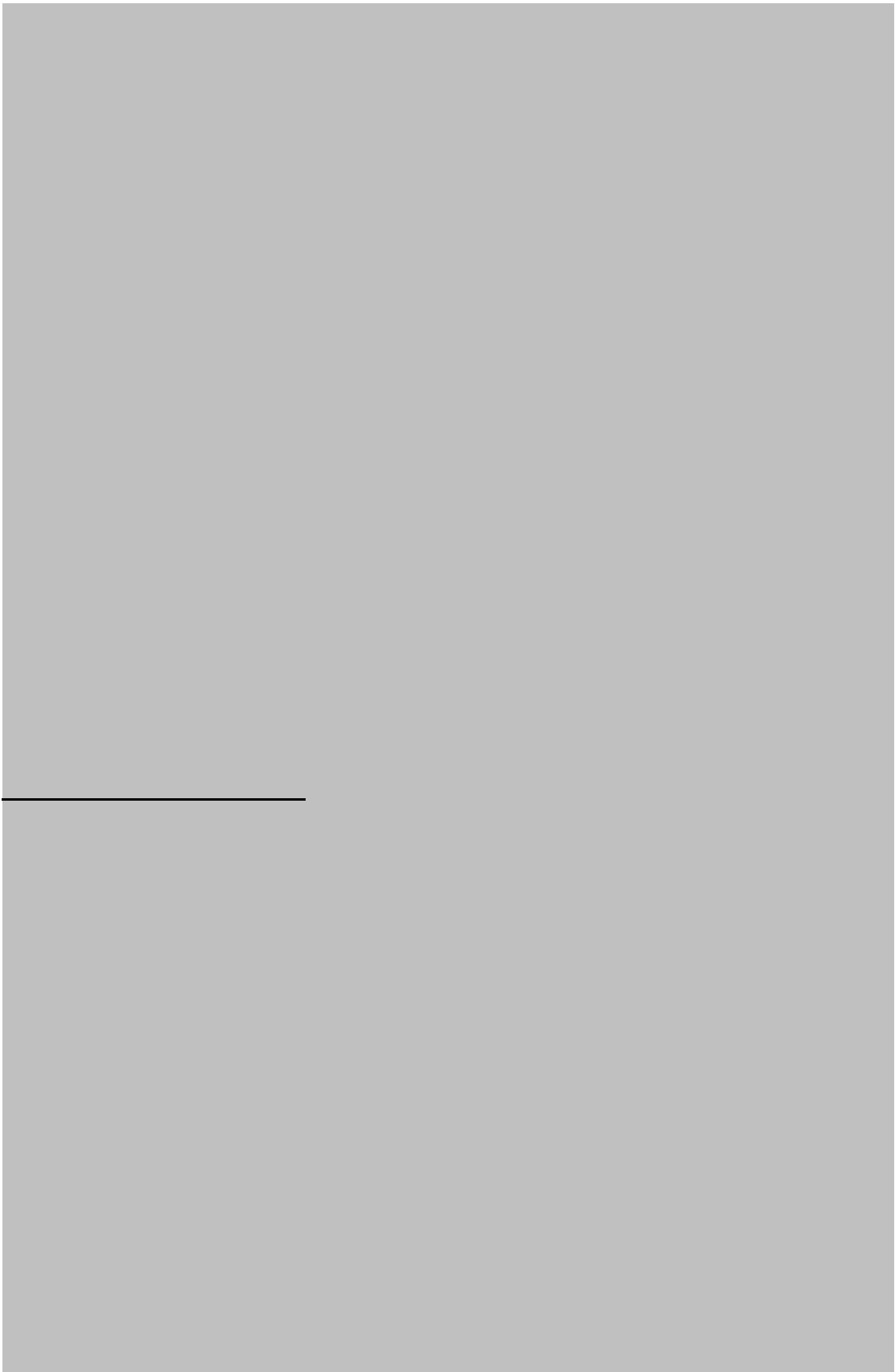
The most important are:

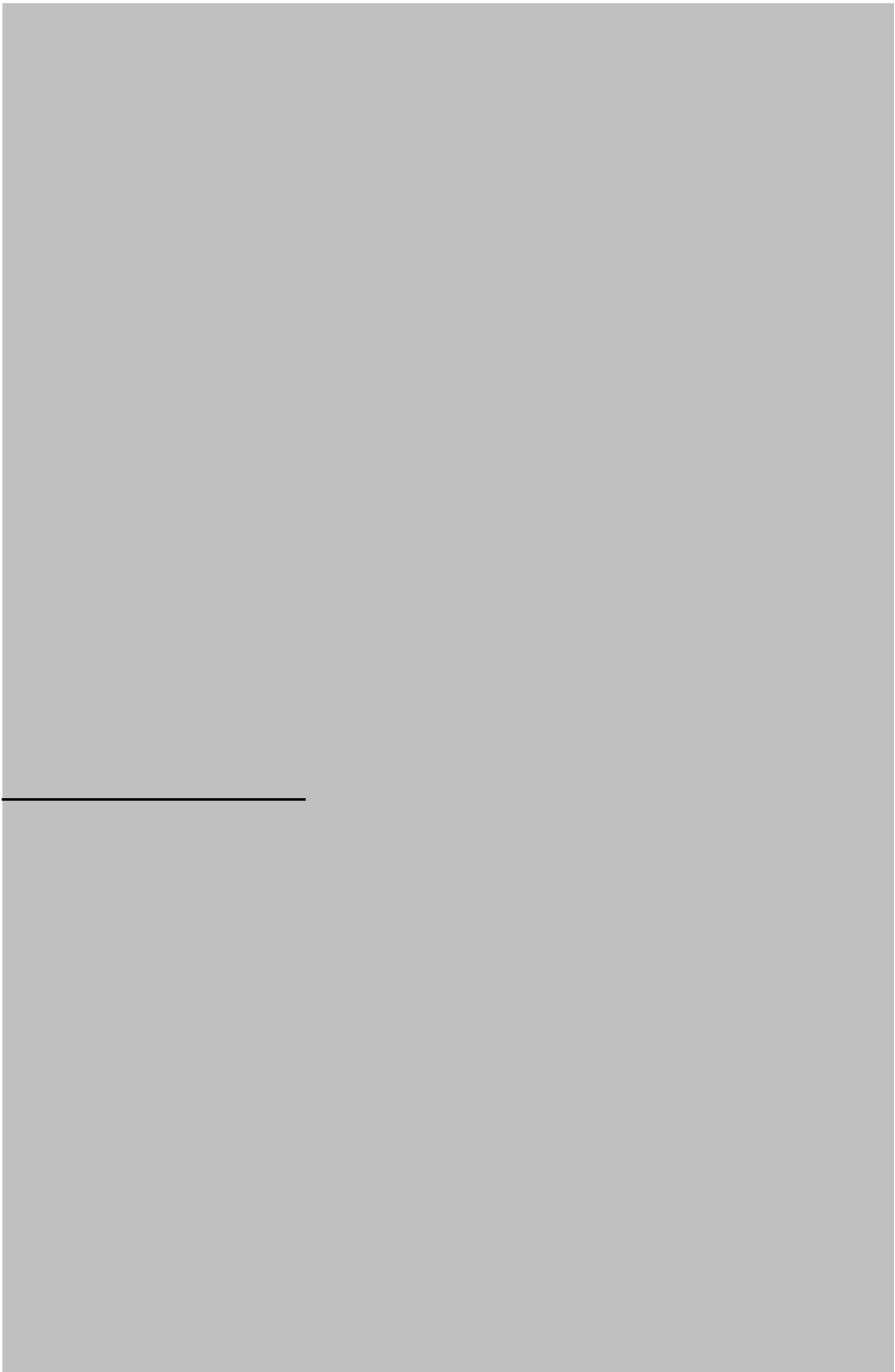
Horse mackerel (*Trachurus trachurus*)
Hake (*Merluccius merluccius*)
Norway lobster (*Nephrops norvegicus*)
Horned octopus (*Eledone cirrhosa*)
Southern shortfin squid (*Illex coindetii*)
Blue whiting (*Micromesistius poutassou*)











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Assessment form	Sheet A1 Indirect methods: VPA, LCA

Sex*	both
------	------

Code: DPS0909Abe
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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		Tunig method	
# of gears	TRAWL	Software	VITM
F _{terminal}			

Population results (please state units)

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

Average mortality

	Total	Gear				
F ₁						
F ₂						
Z						

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

Comments

Code: **DPS0909Abe**
Page 2 / 1

Sex*	
------	--

Analysis # *	
--------------	--

Time series

Data	Size	Age
(mark with X)		

Model	Cohorts	Pseudocohorts
(mark with X)		

Equation used		Tunig method	
# of gears		Software	
F _{terminal}			

Population results (please state units)

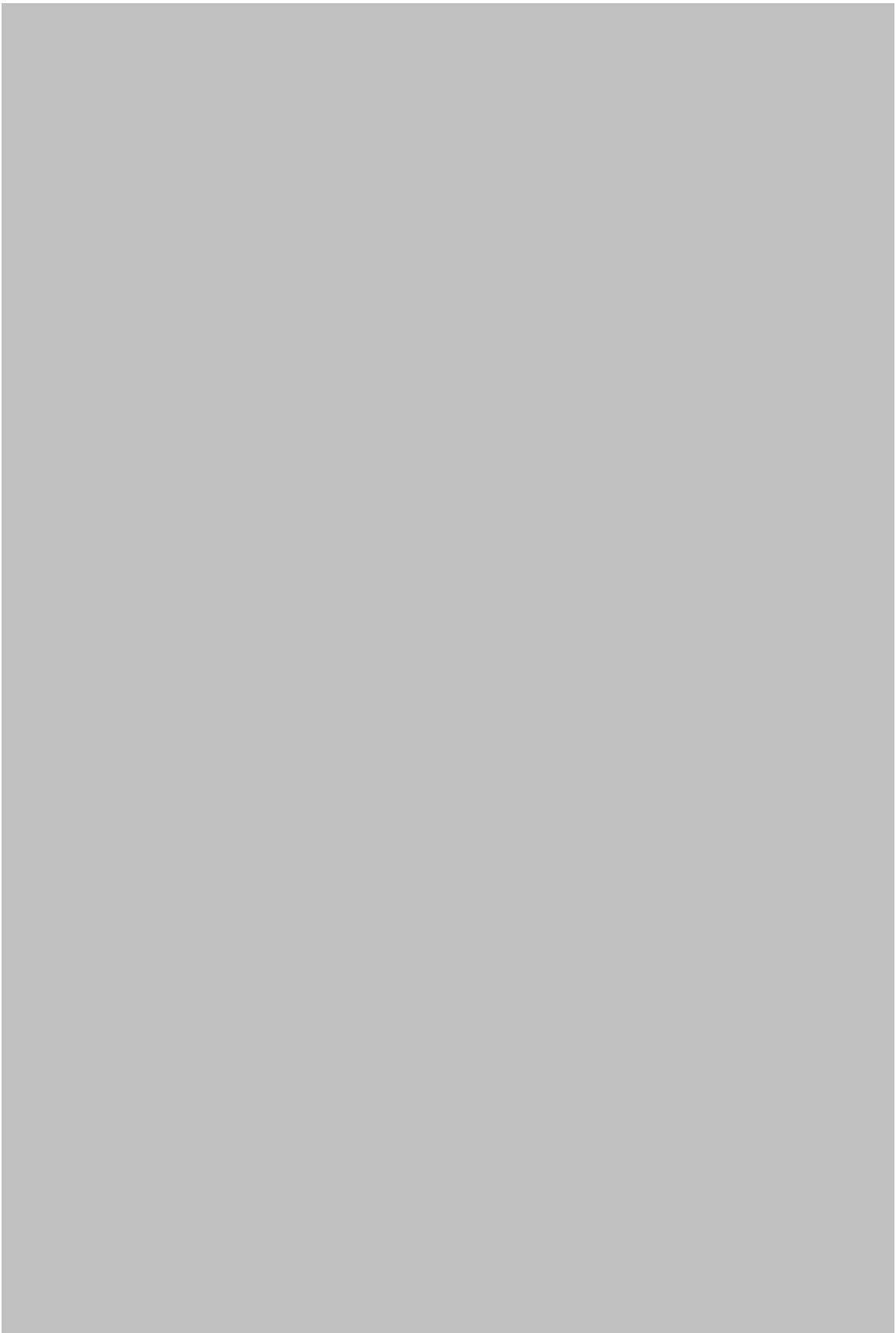
	Sizes	Ages		Amount	Biomass
Minimum			Recruitment		
Average			Average population		
Maximum			Virgin population		
Critical			Turnover		

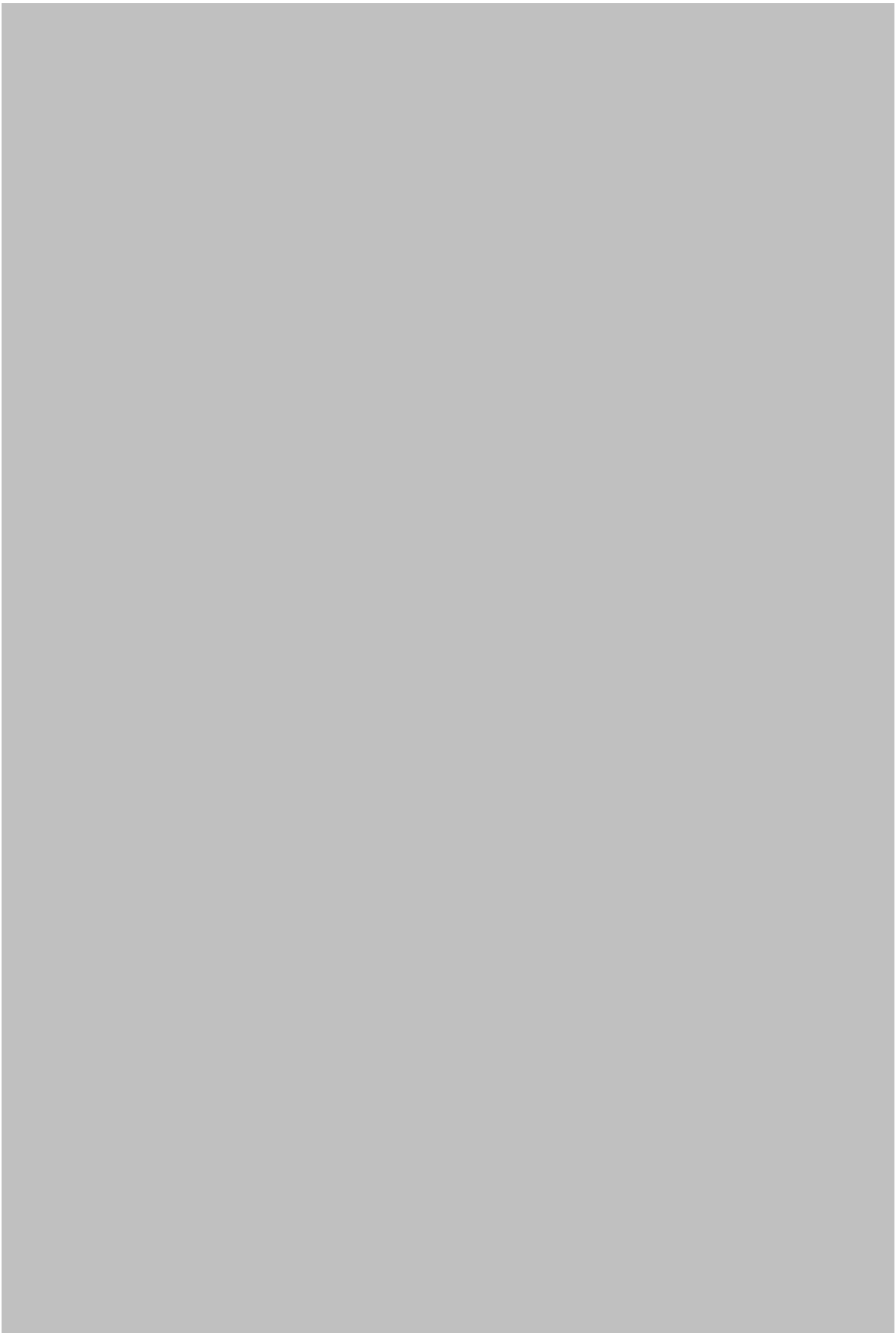
Average mortality

	Total	Gear				
F ₁						
F ₂						
Z						

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

Comments





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Assessment form

Sheet A2

Indirect methods: data

Code: DPS0909Abe

Sex*	m+f	Gear*	bottom trawl	Analysis # *	1
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Data	
------	--

Data

Parapenaeus longirostris

CL (mm)	Landings (thousands)		
	2006	2007	2008
13	18.2	11.1	
14	27.2	32.1	
15	65.9	40.2	
16	55.8	52.0	
17	67.4	102.0	419.9
18	120.8	147.0	584.2
19	91.6	447.4	626.3
20	181.9	520.8	585.6
21	164.5	843.7	650.6
22	396.3	1059.5	771.0
23	850.9	1223.9	703.7
24	1409.8	746.0	742.4
25	1938.5	1017.4	687.0
26	2088.3	827.1	532.3
27	2509.0	804.4	628.9
28	2907.6	667.7	718.3
29	2257.0	557.5	633.8
30	3385.7	446.6	593.5
31	2949.6	374.8	638.4
32	2627.6	832.4	696.6
33	2373.1	1460.4	550.4
34	1579.8	678.1	446.6
35	1298.3	531.9	361.0
36	1074.2	397.6	333.4
37	1072.9	232.8	214.0
38	596.3	165.8	212.4
39	690.0	46.7	139.7
40	363.0	29.1	95.6
41	170.7	12.6	36.8
42	109.9	6.6	24.5
43	16.1	3.7	61.0

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

Assessment form

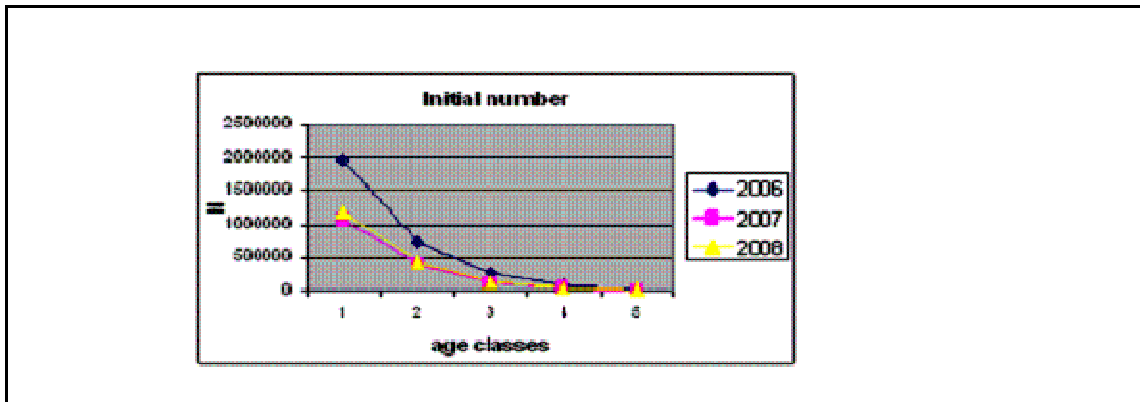
Sheet A3
Indirect methods: VPA results

Code: DPS0909Abe

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Sex*	m+f	Gear*	trawl	Analysis #*	1
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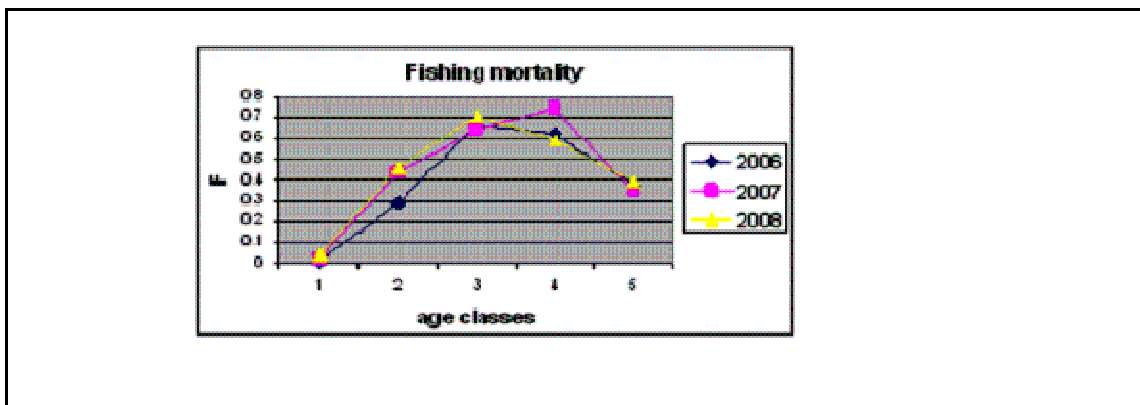
Population in figures



Population in biomass



Fishing mortality rates



Code: DPS0909Abe

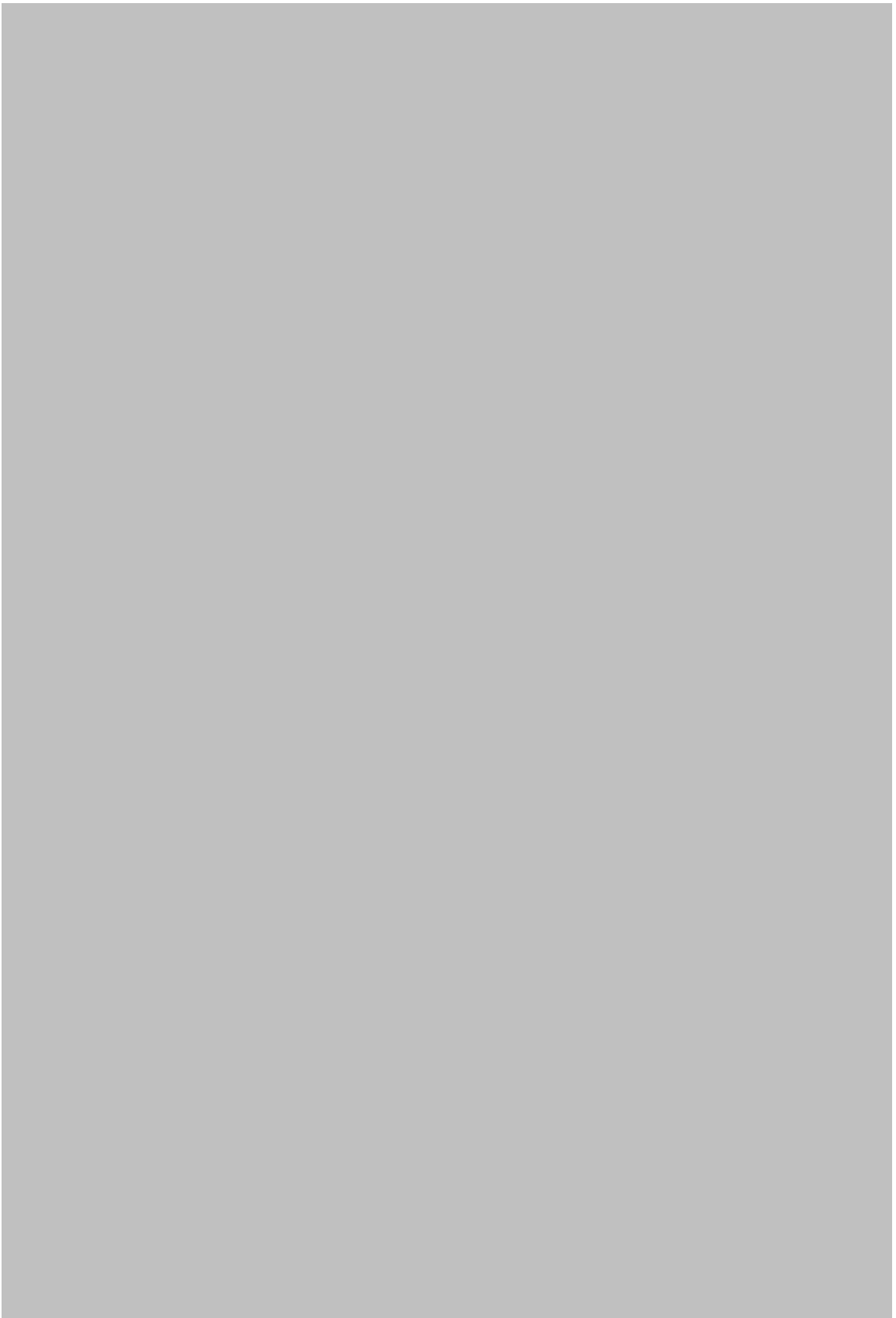
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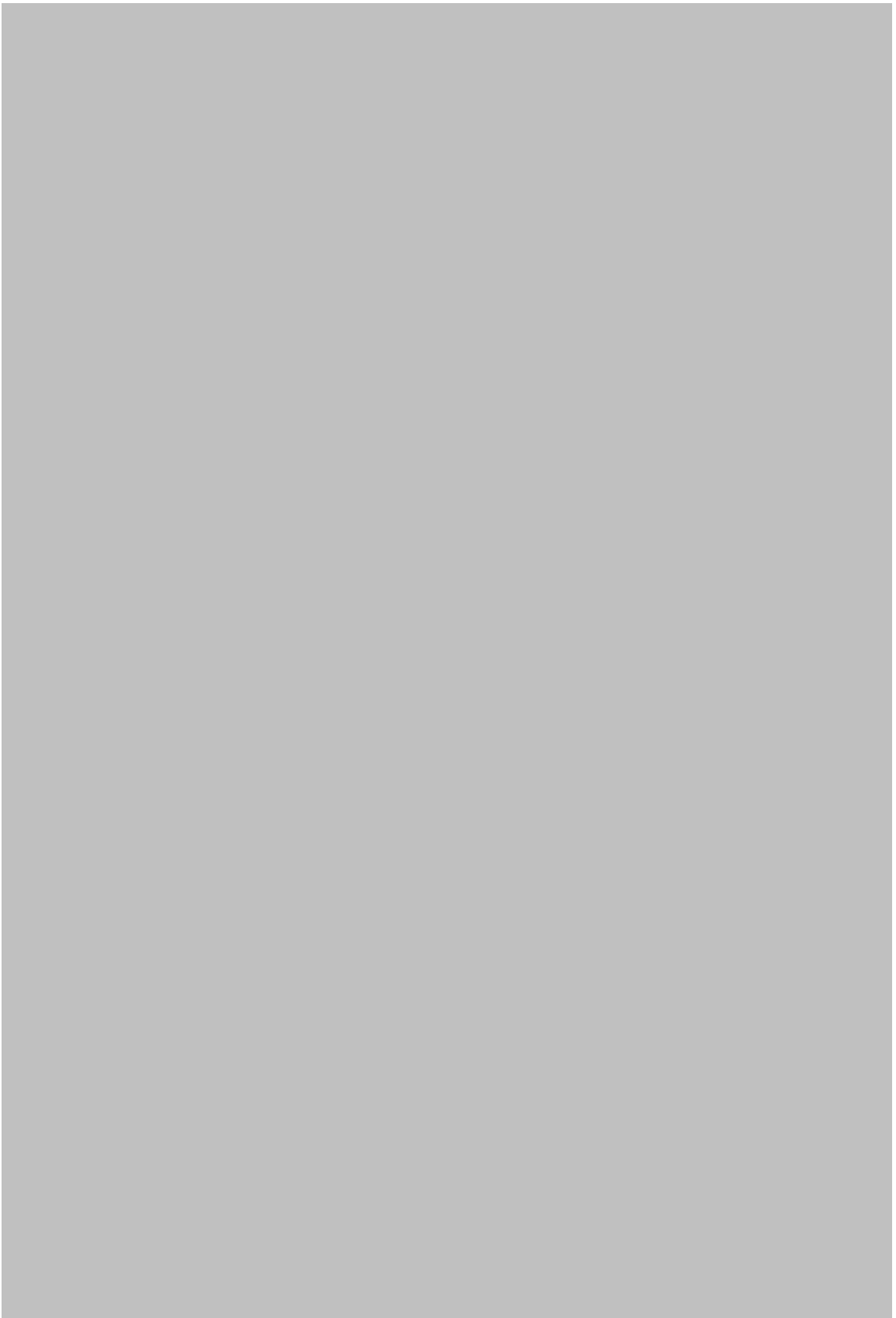
Sex*		Gear*		Analysis #*	
------	--	-------	--	-------------	--

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	both	Code: DPS0909Abe
		Analysis #
		Y/R

# of gears		Software	YIELD
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Parameters used

Vector F	0-3
Vector M	0.75 CV=0.2
Vector N	recruitment = 10.000

Model characteristics

The Yield software uses a standard analytical model to estimate yield and biomass-based indicators and reference points, allowing for uncertainty in parameter inputs. Yield predicts both the yield to the fishery and the biomass of the fish stock that might occur at different levels of F, and with different closed seasons and size limits. Both the indicators and reference points can be expressed per recruit, or as absolute values. In the first case, constant numbers of new recruits are assumed each

Results

	Total	Gear			
		Trawl			
Current YR	2.35 g				
Maximum Y/R					
Y/R 0.1	2.62 g				
F _{max}					
F _{0.1}	0.78				
Current B/R	5.25 g				
Maximum B/R					
B/R 0.1	5.21 g				

Comments

Equilibrium YPR reference points (F01) for the stock were estimated through the Yield software (Hoggarth et al., 2006) assuming recruitment fluctuating randomly around a constant value and 20% uncertainty in input parameters.

The current fishing mortality (F1-3) estimated from catch data (LCA) for the period 2006-08 was between 0.5 and 0.6, little below the estimated reference value of F0.1=0.7.

The stock can be therefore considered harvested sustainably. It is important to consider that this stock could be strongly driven by environmental and ecological factors (e.g. water temperature, predatory release effect) that can make difficult to evaluate the effect of fishing on the stock.

Comments

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Other assessment methods

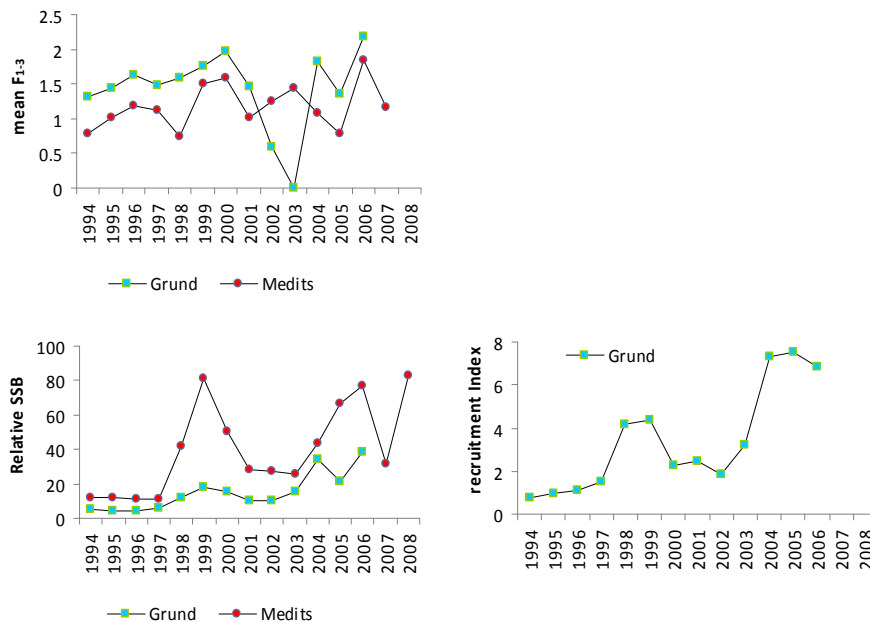
The survey-based stock assessment model SURBA (Needle, 2003) was used to reconstruct trend in population structure and fishing mortality.

Figure below shows the population trend in relative spawning stock biomass, recruitment and fishing mortality as estimated using GRUND (1994-2007) and MEDITS (1994-2008) survey indices.

Standardized time series of length-frequency-distributions were sliced into different age-groups using the following parameters for the whole time series:

- Growth: $L_{inf} = 43.5$ mm carapace length; $K = 0.6$; $t_0 = 0$
- Length-Weight relationships: $a = 0.00686$; $b = 2.24$
- Natural mortality: $M_{vector} = 1.0$ (age 1), 0.78 (age 2), 0.69 (age 3), 0.65 (age 4)
- Length-at-maturity $L_{50} = 24$ mm
- $L_{c100} = 20$ mm

Average mortality (F1-3) estimated from MEDITS ranged between 0.78 and 1.8 (1.16 in 2007). GRUND returned higher F1-3 values with some outliers in 2002-03. Relative indices derived from MEDITS survey for the period 1994-2008 indicated an increasing trend of the spawning stock biomass with three peaks in 1999, 2006 and 2008. In 2008 the SSB was the highest observed since 1994. GRUND data showed a very similar temporal trend in SSB. Young of the year (0+) are poorly sampled by the MEDITS survey. GRUND survey showed a clear increase of 0+ specimens since 1994.



Surba estimates for mean F, relative SSB and relative recruitment (age 0+) obtained using GRUND and MEDITS survey indices.

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

Assessment form

Sheet other

Code: DPS0909Abe

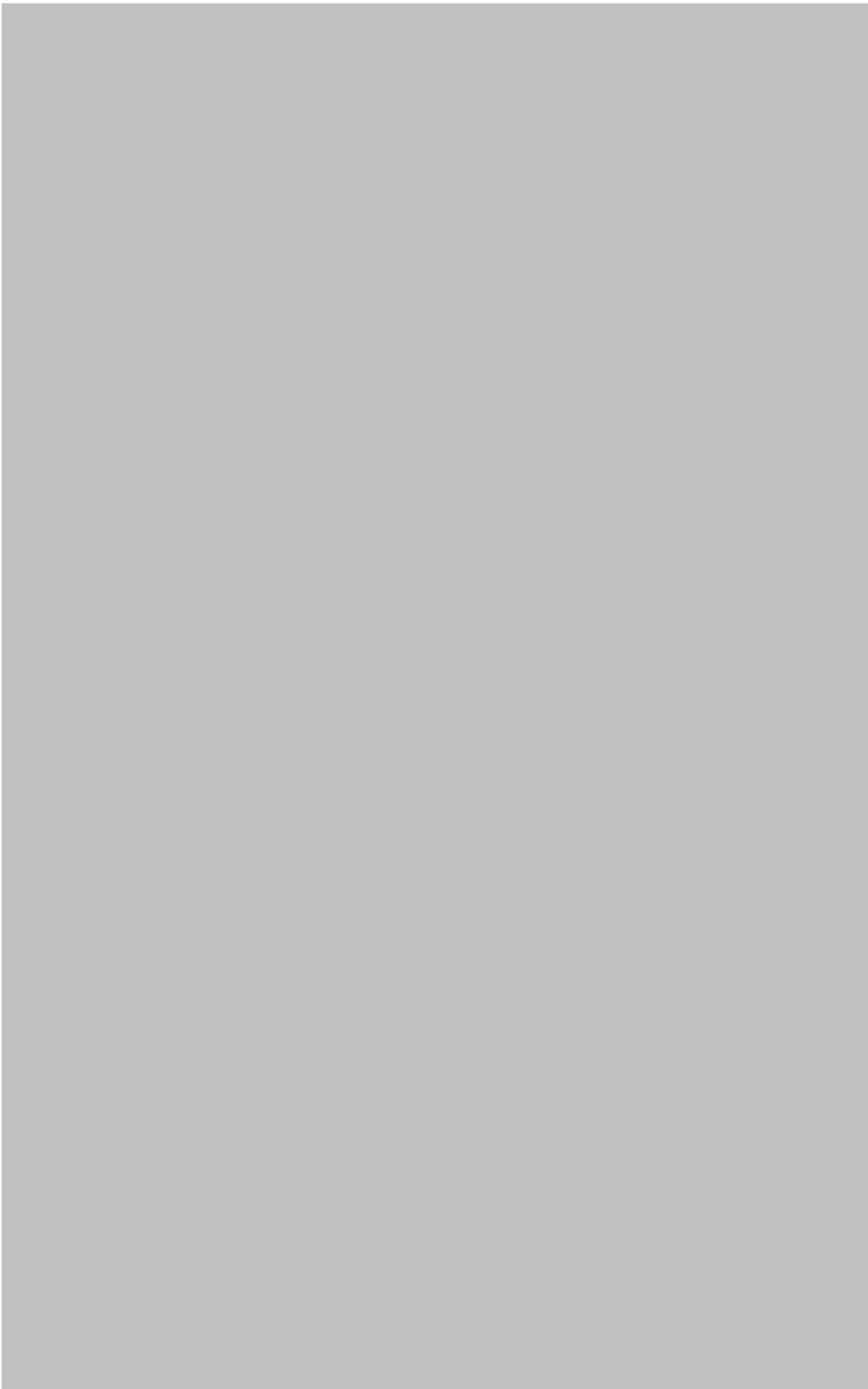
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Other assessment methods

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Code: DPS0909Abe

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B					
SSB					
F					
Y					
CPUE					
F0.1	0.58	x year	0.78		high uncertainty in F estimates SURBA higher values
Fmsy					

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

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

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

Comments

The stock can be considered harvested sustainably. It is important to consider that this stock could be strongly driven by environmental and ecological factors (e.g. water temperature, predatory release effect) that can make difficult to evaluate the effect of fishing on the stock.

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

Assessment form

Sheet Z

Objectives and recommendations

Code: DPS0909Abe

Management advice and recommendations*

The results of LCA suggest that F is lower the F0.1 value. SURBA suggest higher values, but the results of this last approach are considered less reliable. Given the current uncertainty in F estimates, it would be advisable to not increase relevant fleet effort, in order to avoid future low stock productivity and landings. .

Advice for scientific research*

We recommend to increase the current knowledge on the effect of environmental variability on the spatio-temporal dynamic of the stock in order to disentangle environmental and fishing effects. Also knowledge on catchability need to be improved to better understand the impact of fishery on recruitment. Even though current trawl mesh (40 mm) retains small-sized individuals ($L_{50} = 15$ mm) the proportion of juveniles ($LC < 20$ mm) either in the commercial or experimental trawl catch is always very reduced.

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Assessment form

Sheet C
Comments

Code: DPS0909Abe

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Comments*

Total landings of deep water rose shrimps fluctuated from 161 tons in 2002 to 254 tons in 2008, showing a peak in 2006 corresponding to 462 tons

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

Assessment form

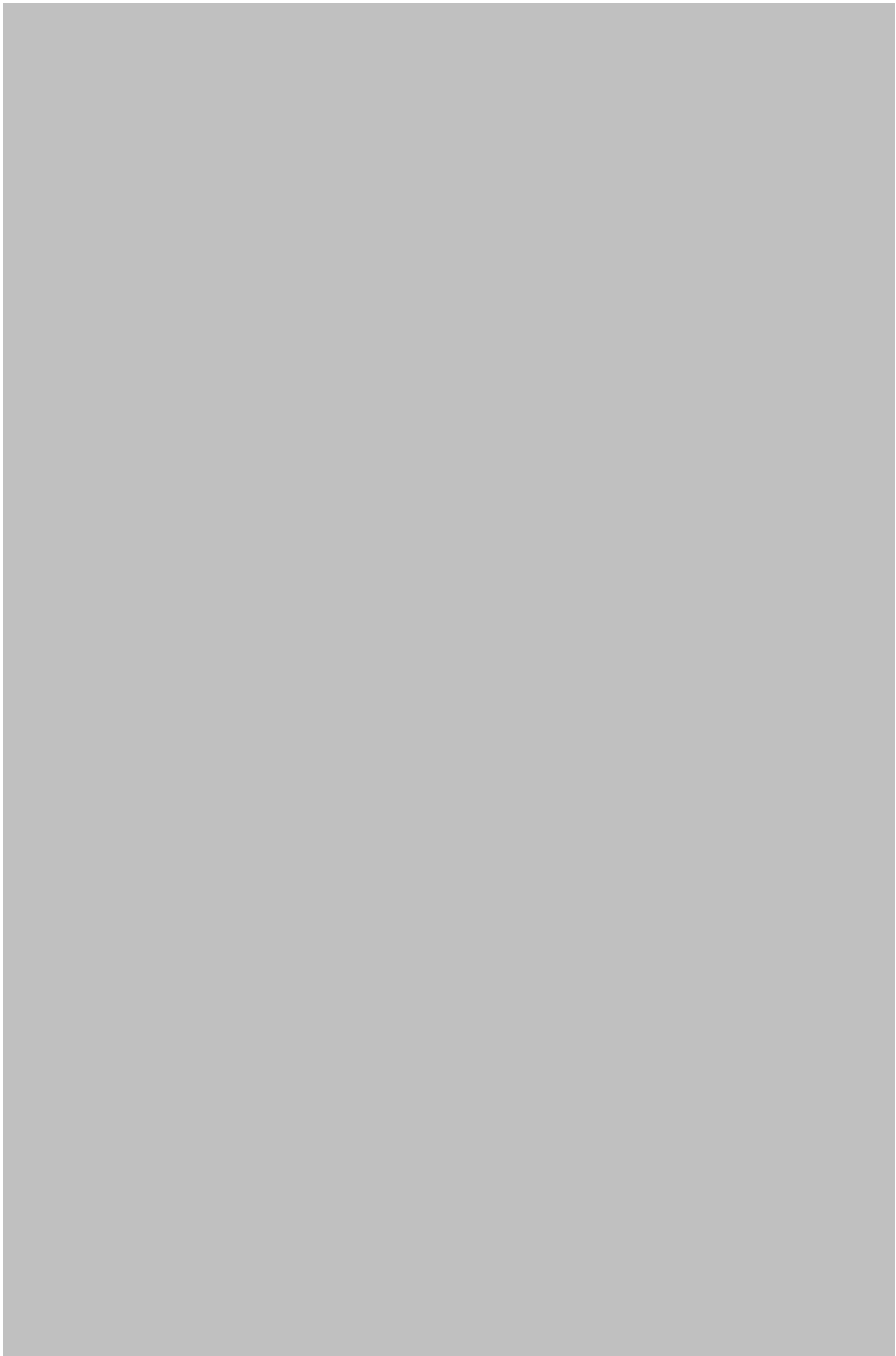
Sheet C
Comments

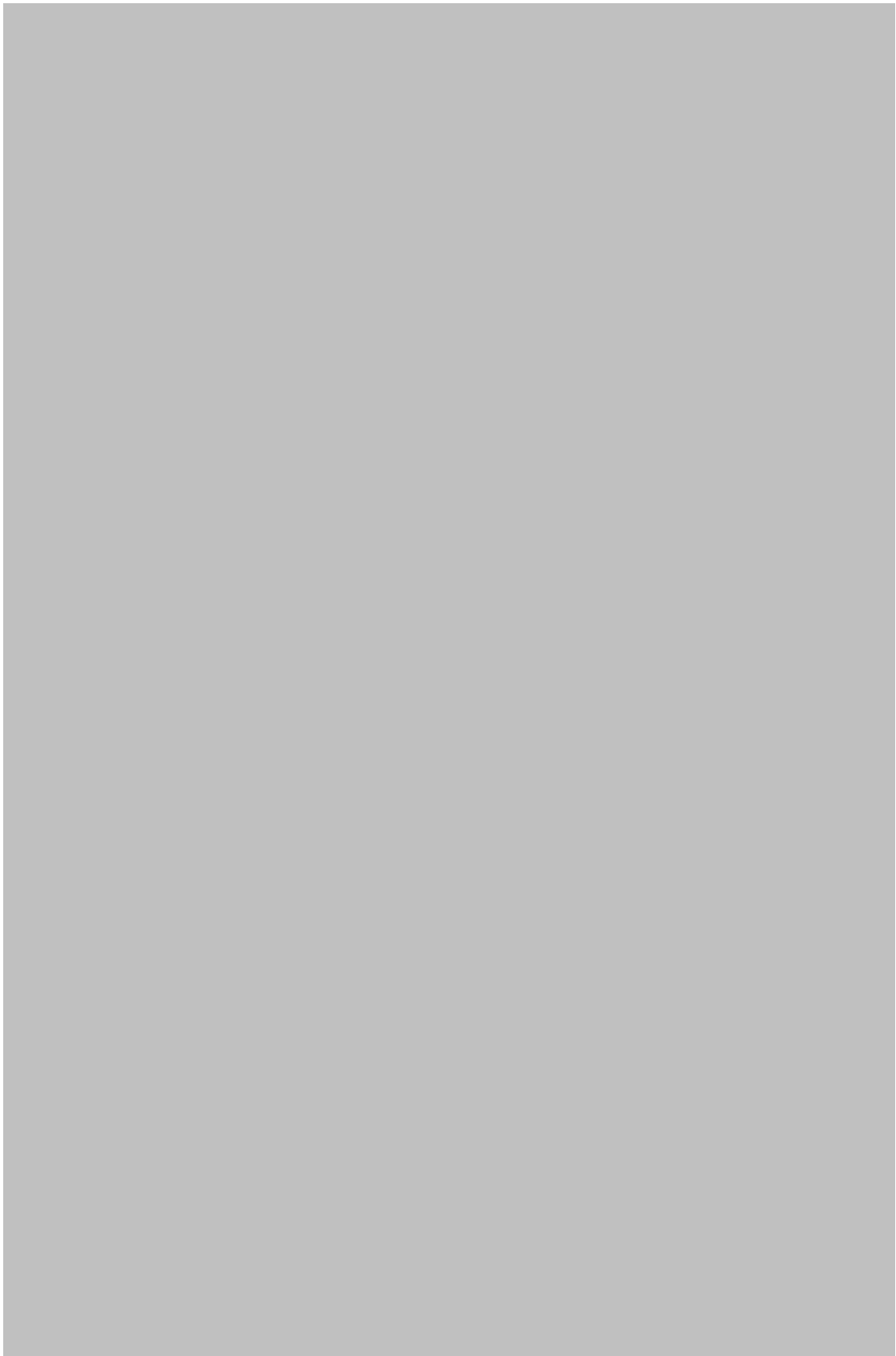
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Comments*

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Abstract for SCSA reporting

Authors

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Year

2009

Species Scientific name

Parapenaeus longirostris - DPS

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area

09 - Ligurian and North Tyrrhenian Sea

Fisheries (brief description of the fishery)*

The deep sea pink shrimp is one of the most important species exploited commercially by the trawl fleet (361 vessels) in the GSA9. The fishing grounds are distributed from 150 to 400 m depth, where the main target species are hake, *Merluccius merluccius*, horned octopus, *Eledone cirrhosa* and Norway lobster, *Nephrops norvegicus*, at greater depths. The stock is more abundant in the southern part (central northern Tyrrhenian Sea) than in the northern part (Ligurian Sea). Landings in 2006 and 2008 were concentrated on adults of age classes 2-4. High landings were observed in 2006. Fishing mortality peaked for specimens of age classes 2 and 3. Recruitment and relative SSB showed an increasing trend in the last ten years. Current fishing mortality estimated from catch data (2006-08) using LCA is currently slight below the estimated F reference point (F01). Trawl surveys data returned higher F values well above F01.

Source of management advice*

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

Data used: catch data collected from 2006-08. Trawl survey data (Grund: 1994-2007; Medits: 1994-2008).

Assessment has been done comparing F_{curr} respect to F_{ref} (F01). Estimates of F_{curr} have been obtained using Length Cohort Analysis (LCA) and Survey Based Assessment (SURBA). Yield software has been used to estimate F01 given a set of biological parameters and fisheries data and assuming a given uncertainty level for some parameters (CV=0.2).

Stock Status*

F - Fully exploited. The fishery is operating at or close to an optimal yield level, with no expected room for further expansion;

Exploitation rate

Moderate fishing mortality

Stock abundance

Comments

The stock can be considered harvested sustainably. It is important to consider that this stock could be strongly driven by environmental and ecological factors (e.g. water temperature, predatory release effect) that can make difficult to evaluate the effect of fishing on the stock.

Management advice and recommendations*

The results of LCA suggest that F is lower the $F_{0.1}$ value. SURBA suggest higher values, but the results of this last approach are considered less reliable. Given the current uncertainty in F estimates, it would be advisable to not increase relevant fleet effort, in order to avoid future low stock productivity and landings. .

Advice for scientific research*

We recommend to increase the current knowledge on the effect of environmental variability on the spatio-temporal dynamic of the stock in order to disentangle environmental and fishing effects. Also knowledge on catchability need to be improved to better understand the impact of fishery on recruitment. Even though current trawl mesh (40 mm) retains small-sized individuals ($L_{50} = 15$ mm) the proportion of juveniles ($L_C < 20$ mm) either in the commercial or experimental trawl catch is always very reduced.