SAC GFCM
Sub-Committee on Stock Assessment

Date*	**27**	**September**	**2010**	**Code***	**HKE0610Gar**

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Species Scientific name*

1
Source: GFCM Priority Species

2
Source: -

3
Source: -

Geographical area* Mediterranean 37.1.1 FAO

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: HKE0610Gar

Date*	27	Sep	2010	Authors*	García-Rodriguez*1 M., A. Fernández2, J. L. Pérez-Gil3 and A. Esteban2.

Species Scientific name*	Merluccius merluccius - HKE	Species common name*	European Hake Merluza Merlu, Naselo

Data Source

GSA*	06 - Northern Spain	Period of time*	1995-2009

Description of the analysis

Type of data*	Size composition of commercial landings	Data source*	I.E.O. Sampling and Information Network. Official landings data from CC.Aas.
Method of assessment*	Extended Survivor Analysis (XSA)	Software used*	Lowestof VPA suite

Sheets filled out

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

Comments, bibliography, etc.

García-Rodriguez M. And Esteban A. Algunos aspectos sobre la biología y pesca de la merluza meditterránea Merluccius merluccius (Linnaeus, 1758) en la Bahía de Santa Pola (sureste de la península ibérica). (1995). Bol.Inst,Esp.Oceanogr; 11(1).3-25.

García-Rodriguez M. And Esteban A. (2002). How fast does hake grow?. A study on the Mediterranean hake (Merluccius merluccius L.) comparing whole otoliths readings and length frequency distributions data. SCI .MAR.,66(2):145-156.

Lleonart J. and J. Salat (1992) VIT. Programa de Análisis de Pesquerías. Inf. Téc. Sci. Mar., 168-169.

Martín P., P. Sartor and M. García-Rodríguez (1999) Exploitation patterns of the European hake Merluccius merluccius, red mullet Mullus barbatus and striped red mullet Mullus surmuletus in the western Mediterranean. Journal of Applied Ichthyology, 15: 24-28.

Maynou F., J. Lleonart and J.E. Cartes (2003) Seasonal and spatial variability of hake (Merluccius merluccius L.) recruitment in the NW Mediterranean. Fisheries Research, 60: 65-78.

Orsi Relini L., C. Papaconstantinou, S. Jukic-Peladic, A. Souplet, L. Gil de Sola, C. Piccinetti, S. Kavadas and M. Rossi (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. Scientia Marina, 66(Suppl. 2): 21-38.

Comments, bibliography, etc.

Sartor P., L. Recasens, C. Viva and J. Lleonart (2001) 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.

García Rodríguez, M. and A. M. Fernández, 2005. Influencia de la geometría de la malla del copo de arrastre en las capturas, selectividad y rendimientos de algunas especies de peces comerciales en el Golfo de Alicante (S.E. España). Inf. Téc. Inst. Espa. Oceanog.185. 27 pp

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Assessment form	**Sheet B** **Biology of the species**

Code: HKE0610Gar

Biology

Somatic magnitude measured (LH, LC, etc)*			TL		Units*	cm
Sex	Fem	Mal	Both	Unsexed		
Maximum size observed	76	53	76		Reproduction season	All year: Feb and
Size at first maturity	31	25	33		Reproduction areas	Upper Slope
Recruitment size	4	4	4		Nursery areas	Continental Shelf

Parameters used (state units and information sources)

			Sex			
		Units	female	male	both	unsexed
Growth model	L∞	106.0 cm				
	K	0.20 cm year-1				
	t0	0.0028				
	Data source	García Rodriguez and Esteban, 2002				
Length weight relationship	a	0.0048				
	b	3.12				
	M	0.54				
	sex ratio (mal/fem)	0.31				

Comments

Although several biological data sets of this species are available in the western Mediterranean, we have used those from García and Esteban (1995-2002), carried out in one of the sampling ports used for the present assessment (Santa Pola). In this assessment, a new set of parameters (fast growth hypothesis) were considered . M is mean of a Natural mortality vector, PROBIOM Caddy and Abella, 1999.

Comments

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Assessment form

Sheet P1
General information about the fishery

Code: HKE0610Gar

Data source*	I.E.O. Sampling and Information Network.	Year (s)*	1995-2009
Data aggregation (by year, average figures between years, etc.)*	By year		

Fleet and catches (please state units)

	Country	GSA	Fleet Segment	Fishing Gear Class	Group of Target Species	Species
Operational Unit 1*	ESP	06	E - Trawl (12-24 metres)	03 - Trawls	33 - Demersal shelf species	HKE
Operational Unit 2						
Operational Unit 3						
Operational Unit 4						
Operational Unit 5						

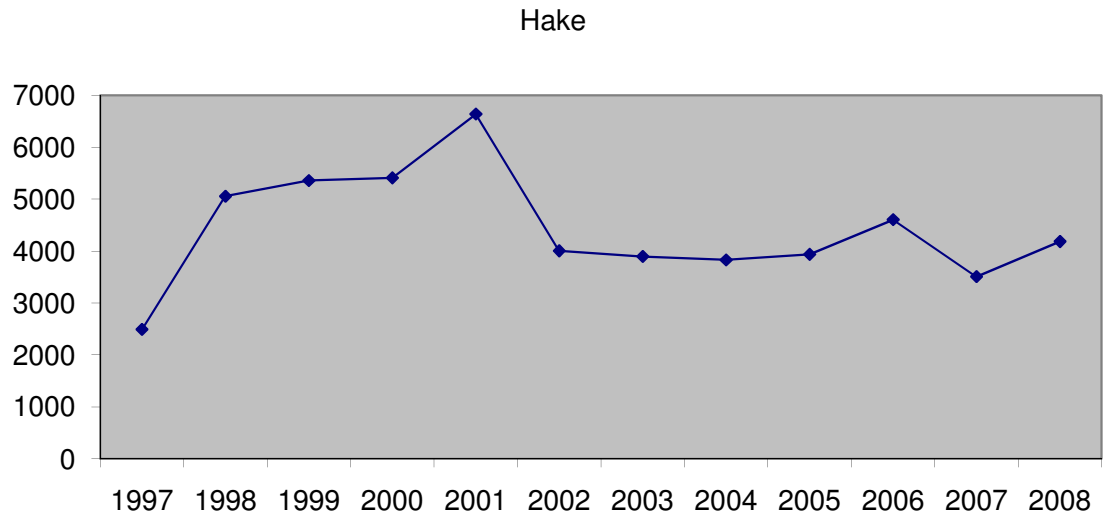
Operational Units*	Fleet (n° of boats)*	Kilos or Tons	Catch (species assessed)	Other species caught	Discards (species assessed)	Discards (other species caught)	Effort units
ESP 06 E 03 33 - HKE	567	Tons	3800				boat/day
Total	567		3800				

Legal minimum size	20 cm total length

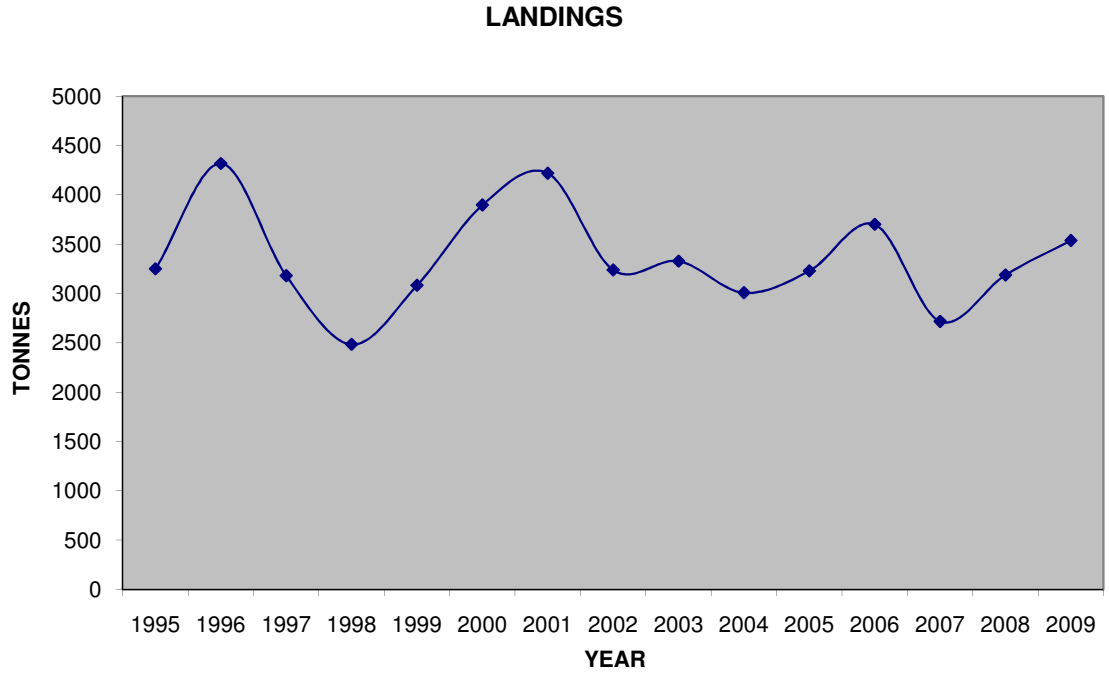
Comments

From official data, in 2009 the total trawl fleet of the whole geographical sub-area 06 (Northern Spain) is made up by 567 boats: on average, 47 TRB, 58 GT and 297 HP. Some of these units (smaller vessels) operate almost exclusively on the continental shelf (targeted at red mullet, octopus, hake and sea breams), others (bigger vessels) operate almost exclusively on the continental slope (targeted at decapod crustaceans) and the rest can operate indistinctly on the continental shelf and slope fishing grounds, depending on the season, the weather conditions and also economic factors (e.g. landings price). The percentage of these trawl fleet segments have been estimated* around 30, 40 and 30% of the boats, respectively.

Comments



Estimated landings (EUROSTAT data) of Merluccius merluccius in the Balearic area for the period 1997 – 2008.



Evolution of Merluccius merluccius landings in the GSA 6 (Norther Spain) for the period 1995 – 2009.

Data source*	IEO: size composition of trawl catches. Official la	OpUnit 1*	ESP 06 E 03 33 - HKE

Time series

Year*	1997	1998	1999	2000	2001	2002
Catch	3180	2484	3083	3898	4220	3239
Minimum size	4	4	4	4	4	4
Average size Lc	12	12.9	10.7	12	9.2	10.5
Maximum size	68	68	68	68	74	78
Fleet	850	810	797	774	760	757

Year	2003	2004	2005	2006	2007	2008
Catch	3329	3008	3229	3702	2717	3188
Minimum size	4	4	4	4	4	4
Average size Lc	10.9	11.6	11.4	11	12.4	12.6
Maximum size	80	76	70	60	66	70
Fleet	738	729	722	716	691	624

Selectivity

L25	8.8 cm
L50	10.3 cm
L75	11.9 cm
Selection factor	2.57

Remarks

García Rodríguez, M. and A. M. Fernández, 2005.

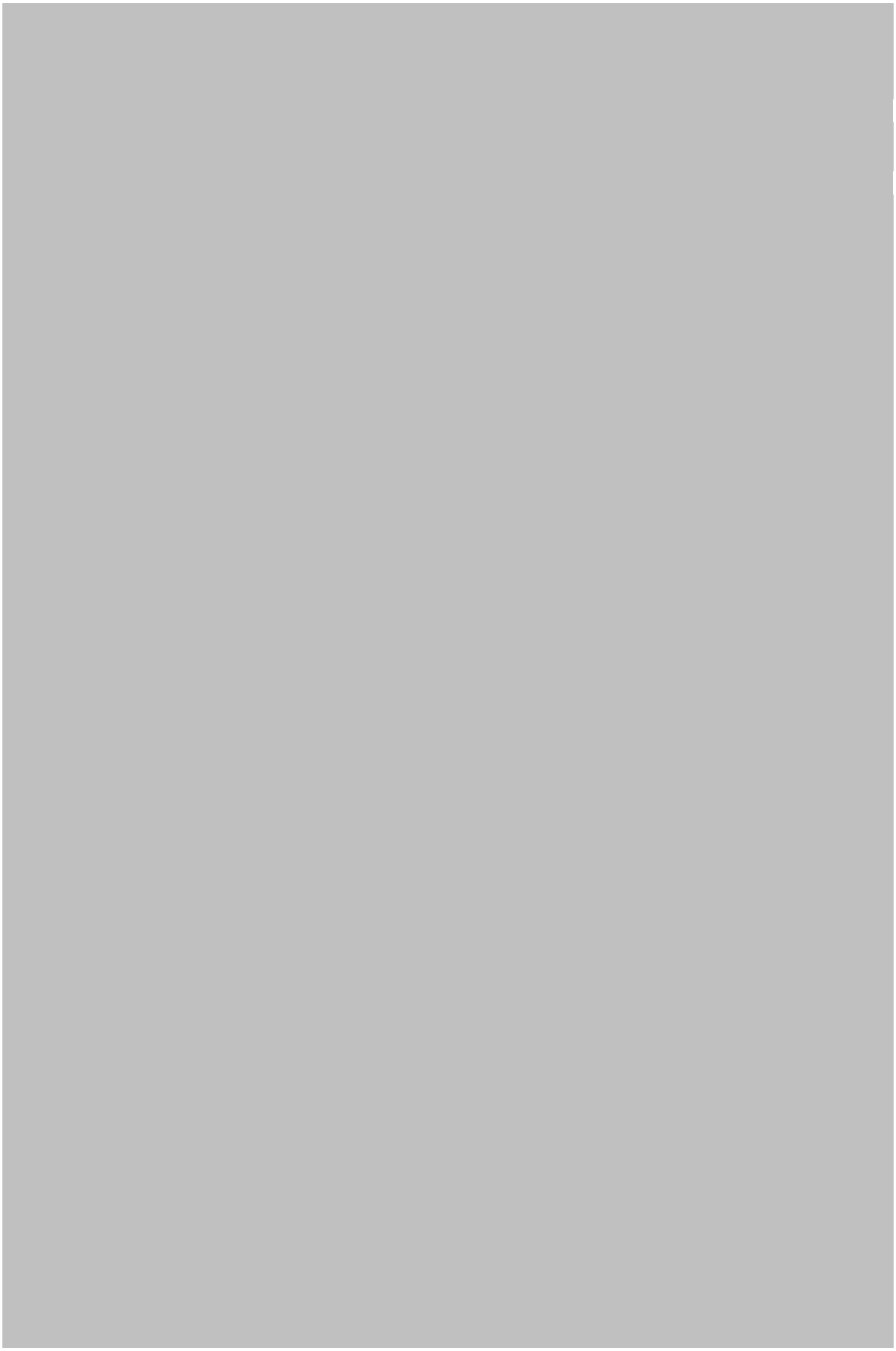
Structure by size or age

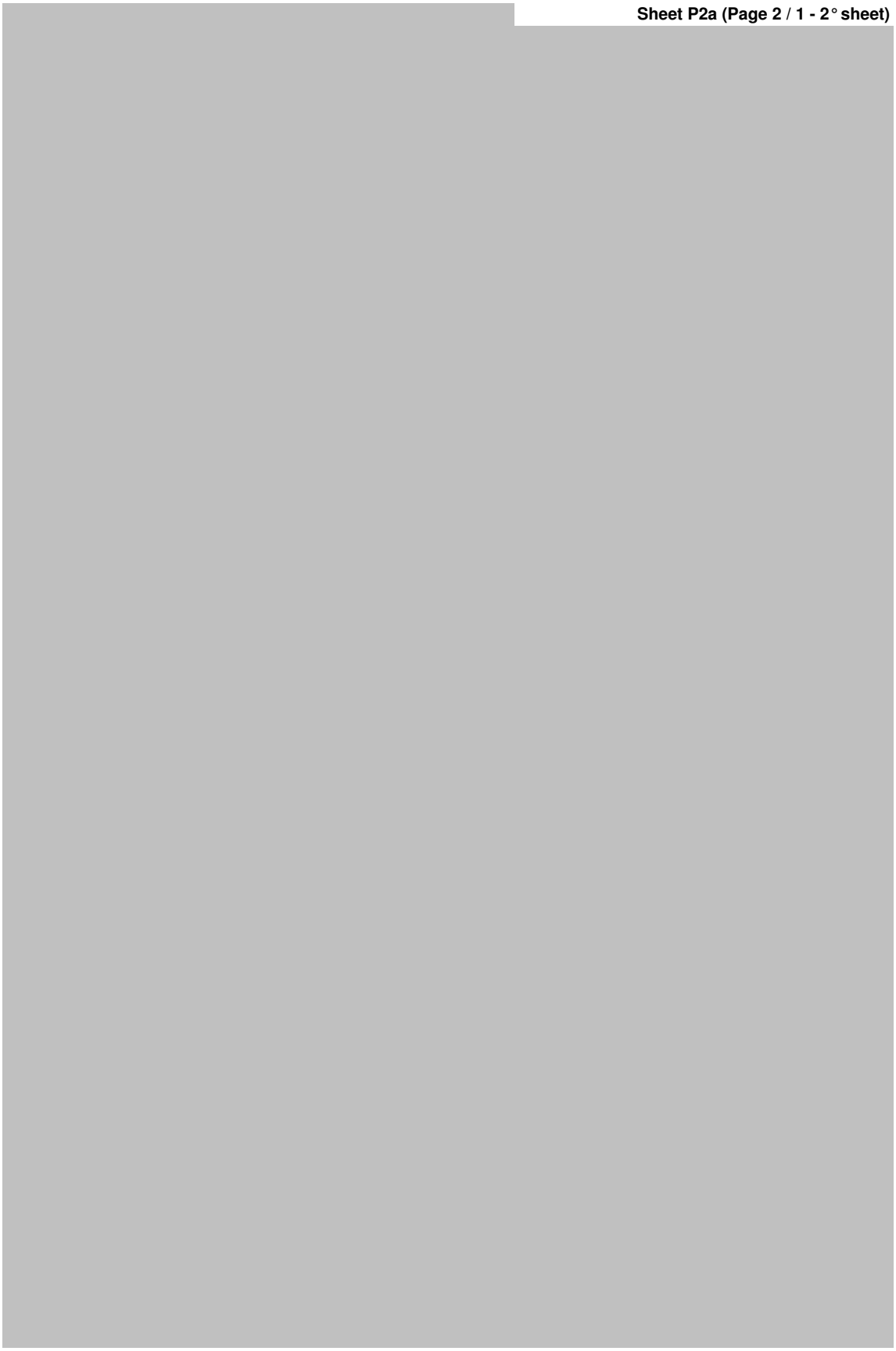
Age/Year	1995	1996	1997	1998	1999	2000
0	115918.6	406544.2	169084.1	166377.5	186487.1	195018.1
1	10370.4	7568.1	10988.4	7410.5	8107	12876.5
2	1470.7	848.8	972.3	983.4	585.8	994.3
3	341.6	225.4	228.7	145.7	127.5	82.8
4	89.4	132.9	58.7	39.7	16.2	10.9
5	6.1	28.7	21	14.1	0.4	3.4
6	0.3	4.8	10.6	0.3	0.3	3.4
7	0.1	0.1	0.1	0.1	0.1	0.1

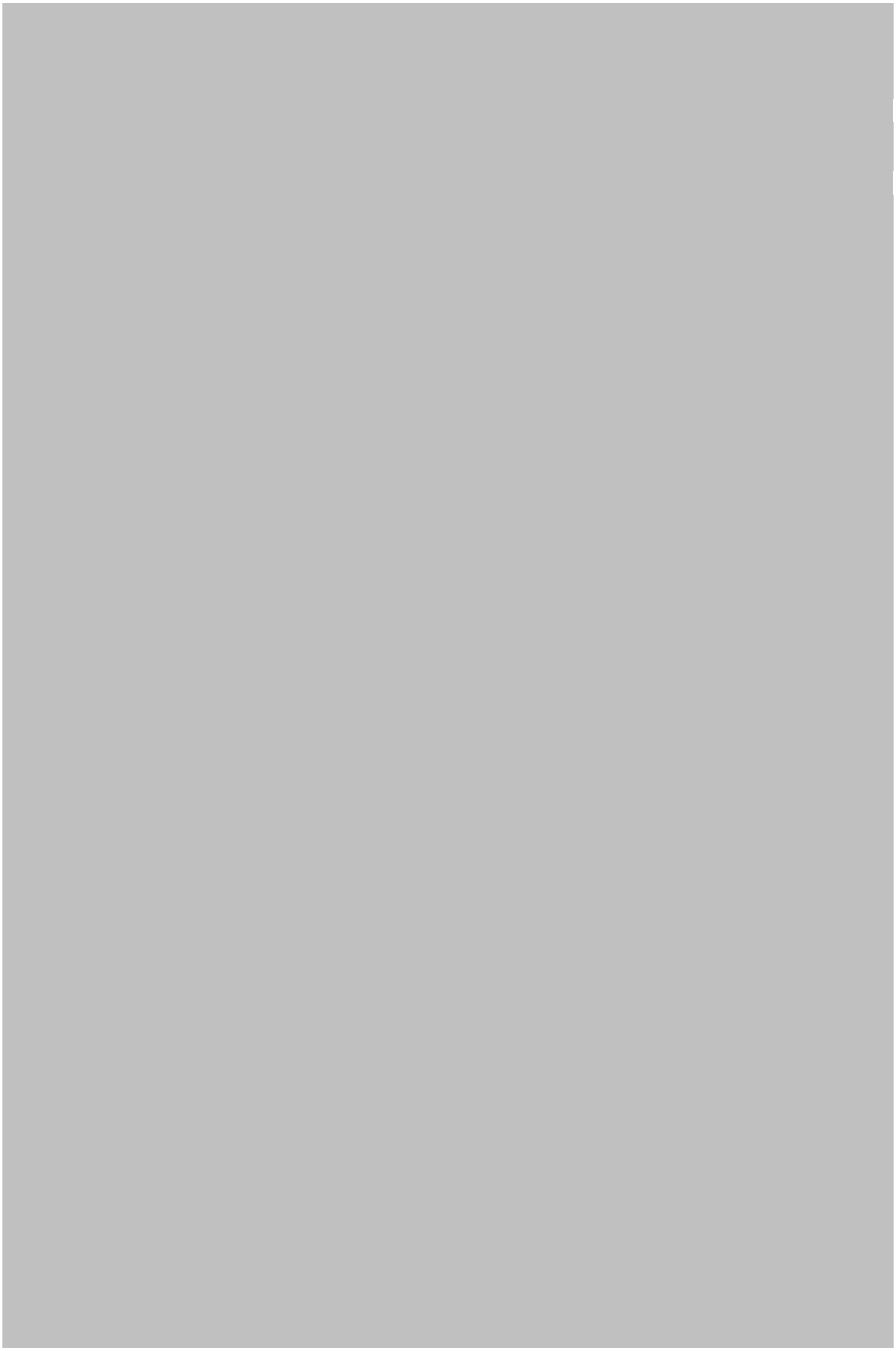
Structure by size or age

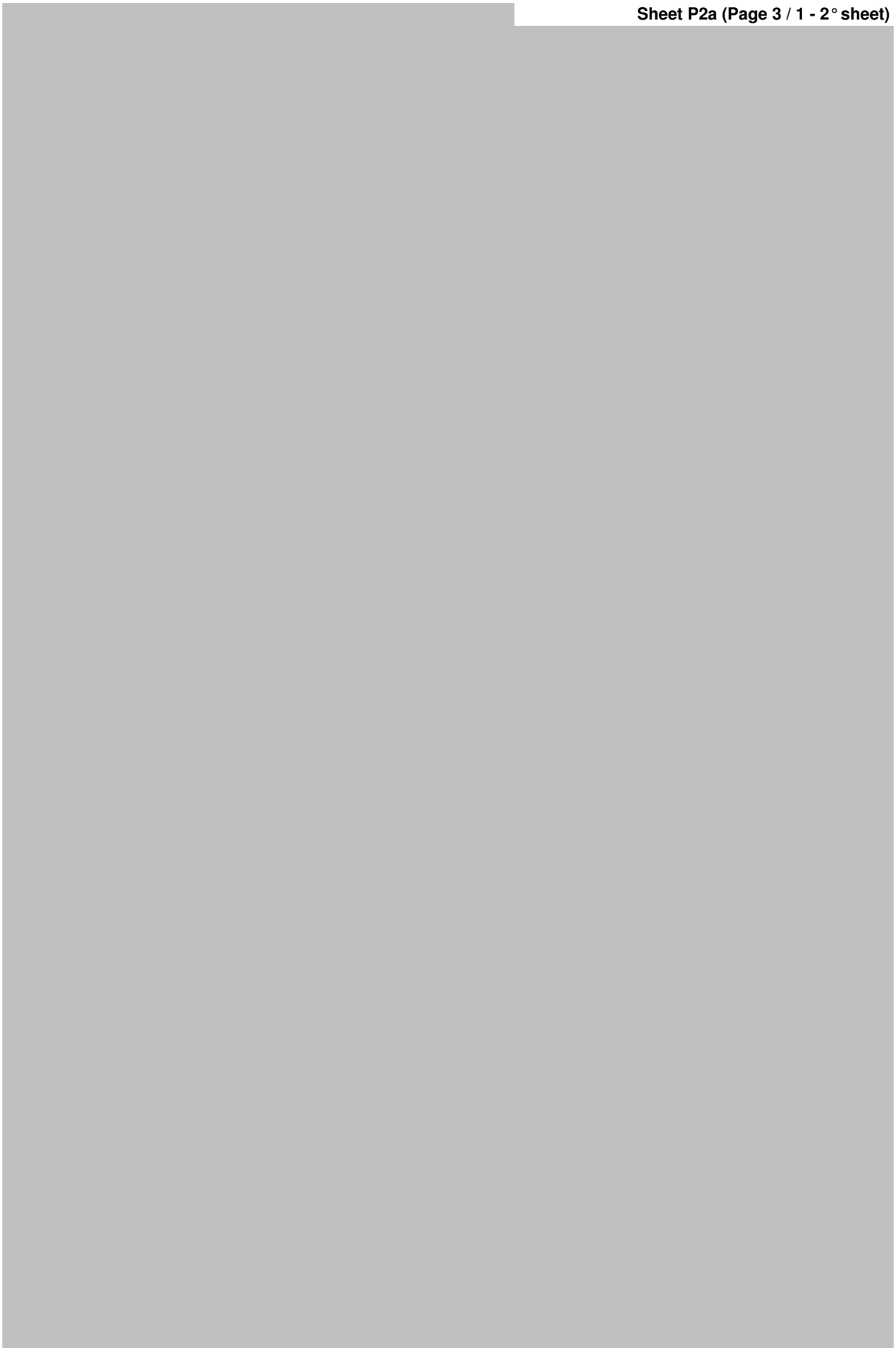
2001	2002	2003	2004	2005	2006	2007
136263.8	140122.8	113039.7	116229.2	93188.9	73275.8	75194.5
10376.3	8610	10617.1	11981.8	12525.1	8971.6	12633.6
945.5	1011.5	901.3	457.5	820.2	738.8	1729.9
57.6	129.7	153.9	90.2	70.7	166	255
1.7	10.7	33.3	9.5	0.4	7	28.8
1.7	0.4	1.2	1.6	0.4	2.3	0.4
0.3	0.3	0.3	0.3	0.3	0.3	4.8
0.1	0.1	0.1	0.1	0.1	7.1	2.2

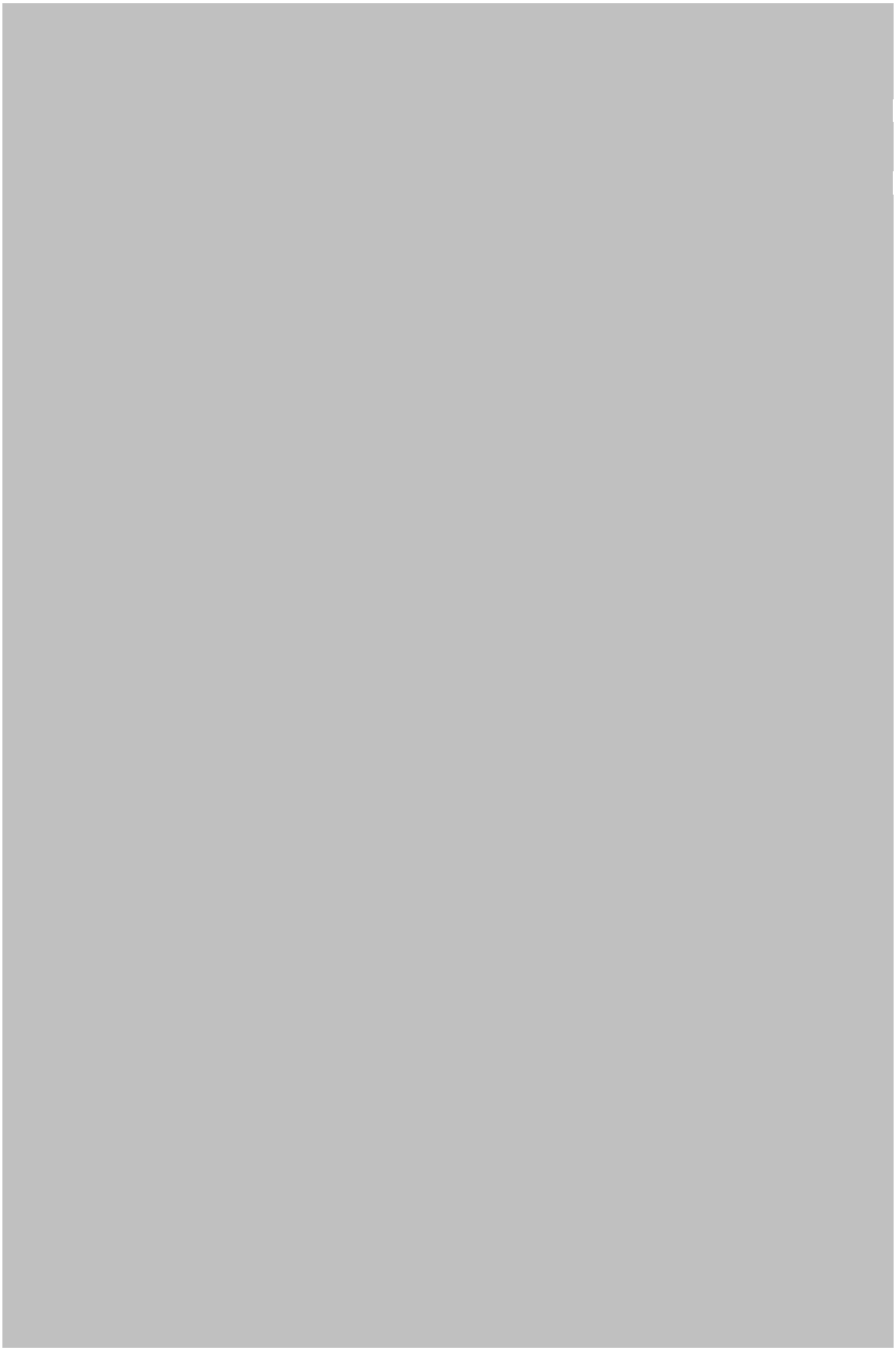
2008	2009
55591.5	78700.9
17784.5	14844
1349.3	935.8
190.1	139.4
38.8	0.4
3.3	0.4
0.3	0.3
0.1	0.1

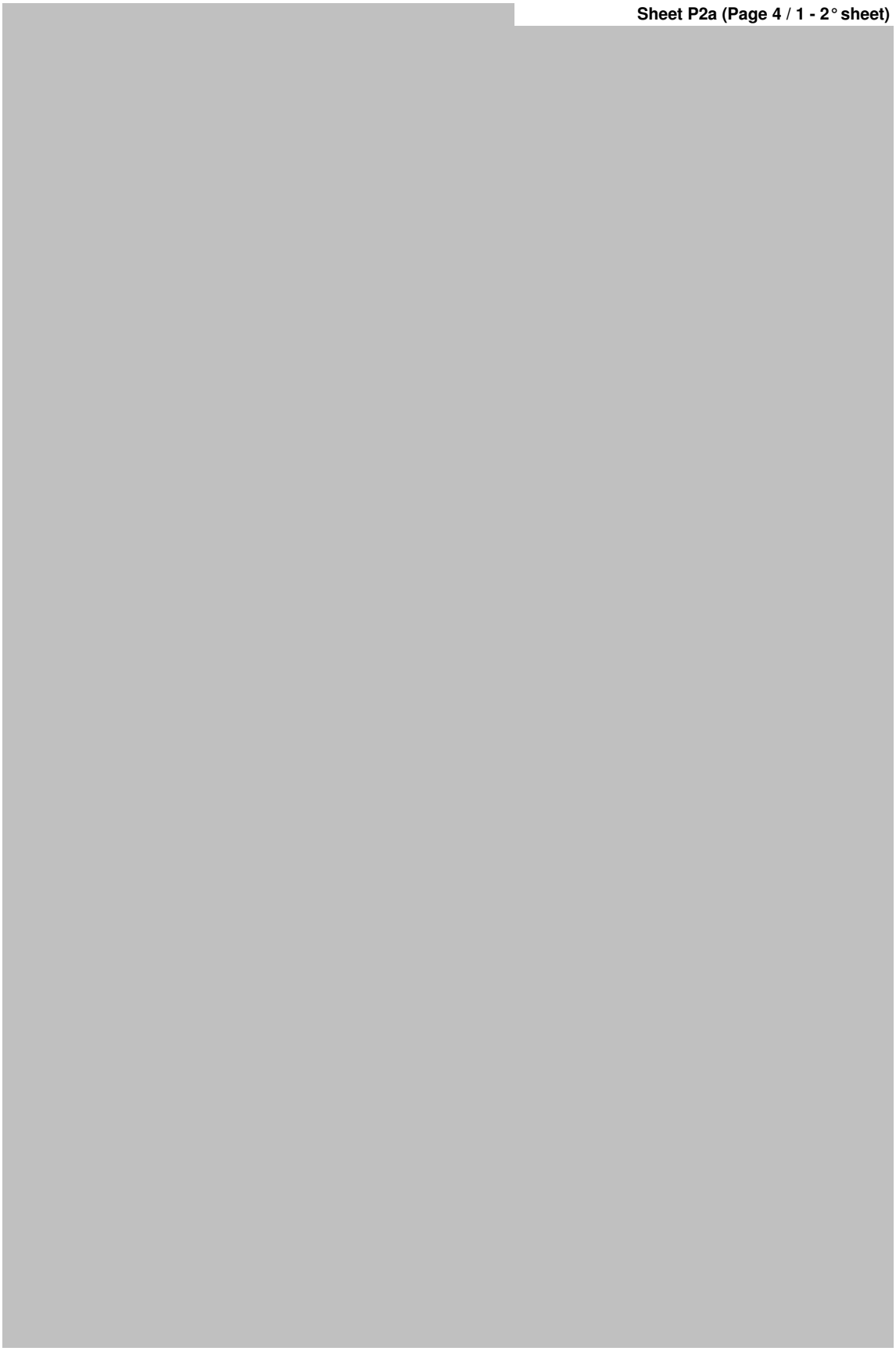


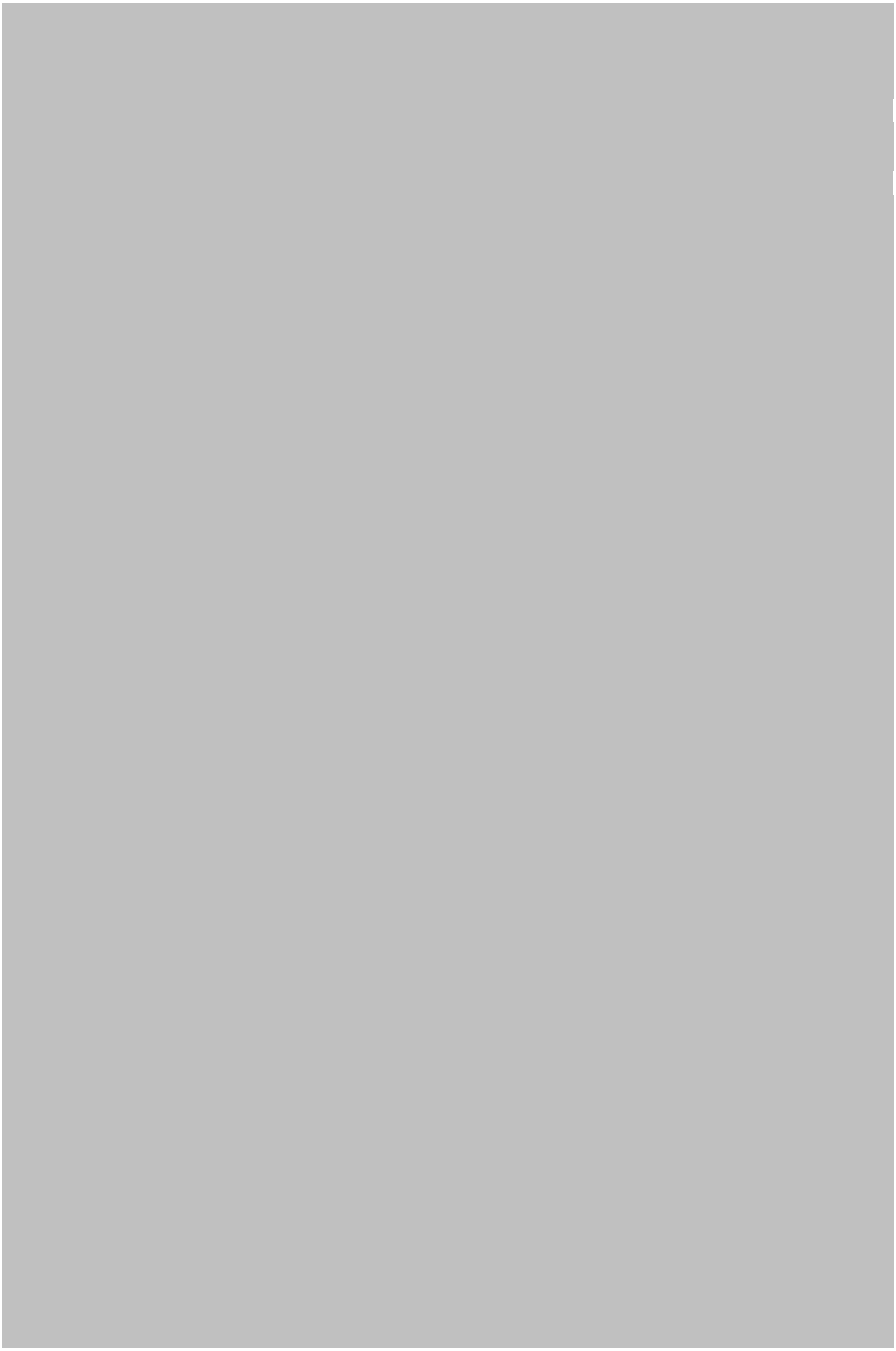


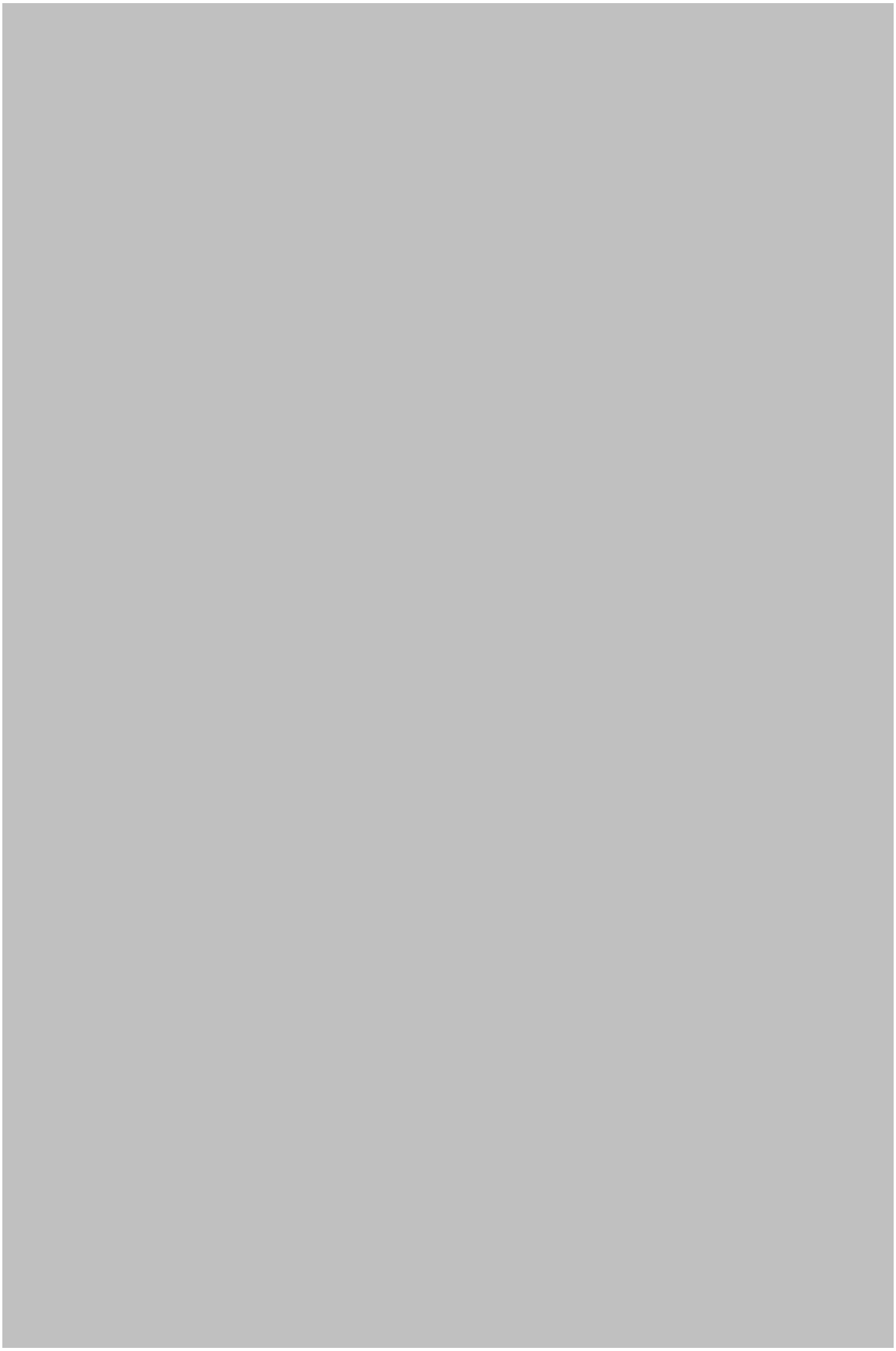












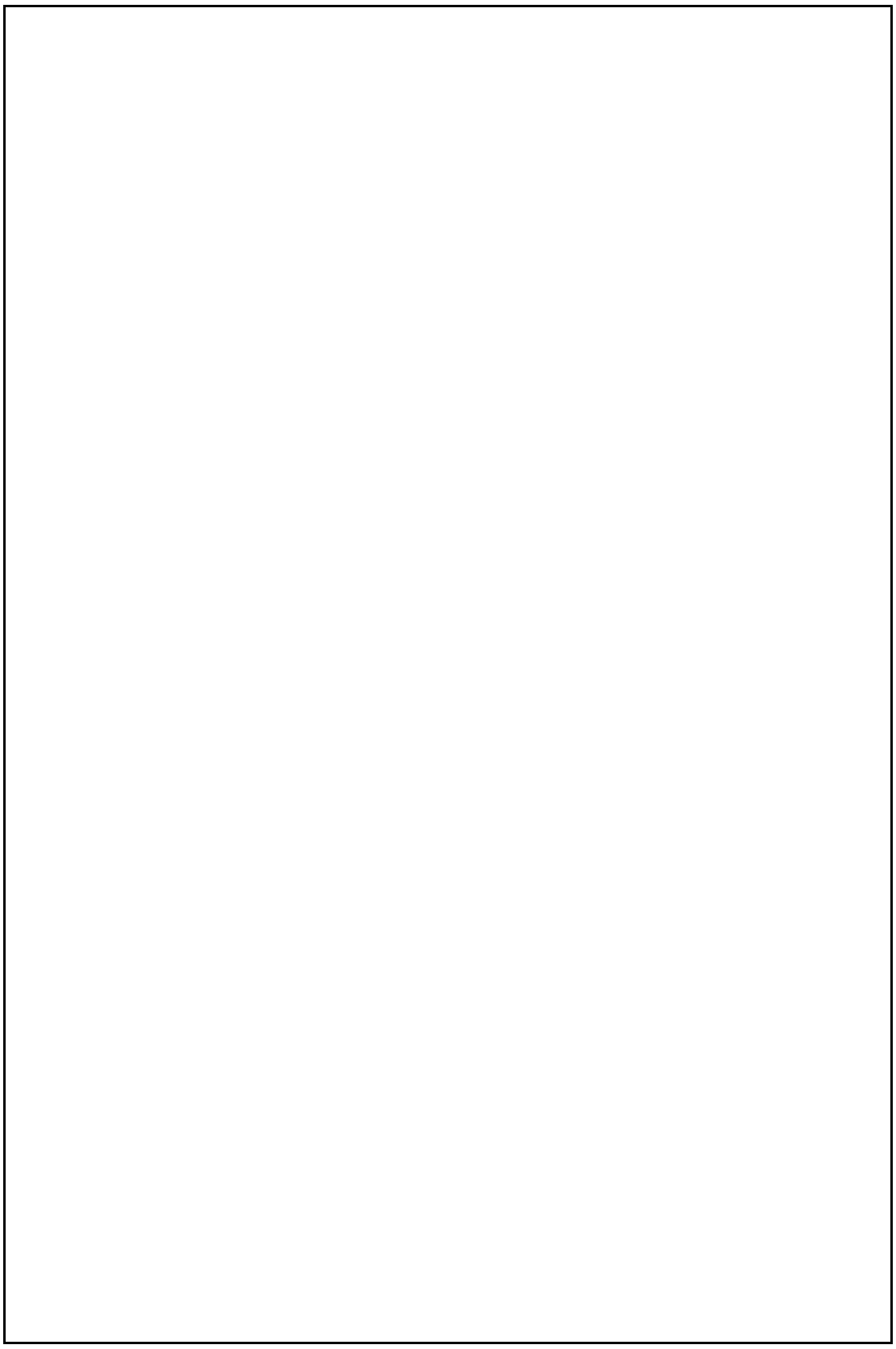
Data source*	IEO: size composition of trawl catches. Official landin	OpUnit 1*	ESP 06 E 03 33 - HKE

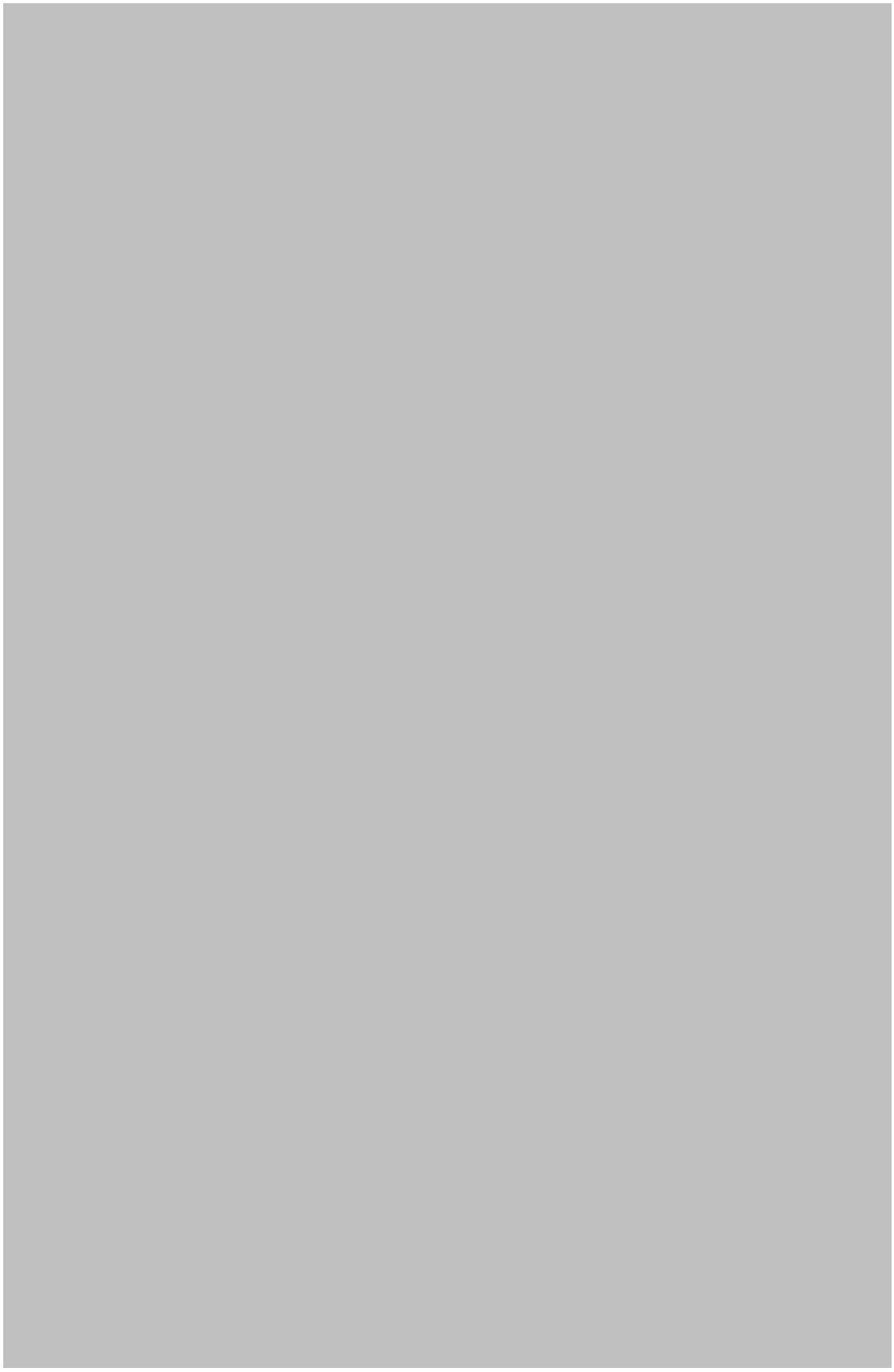
Regulations in force and degree of observance of regulations

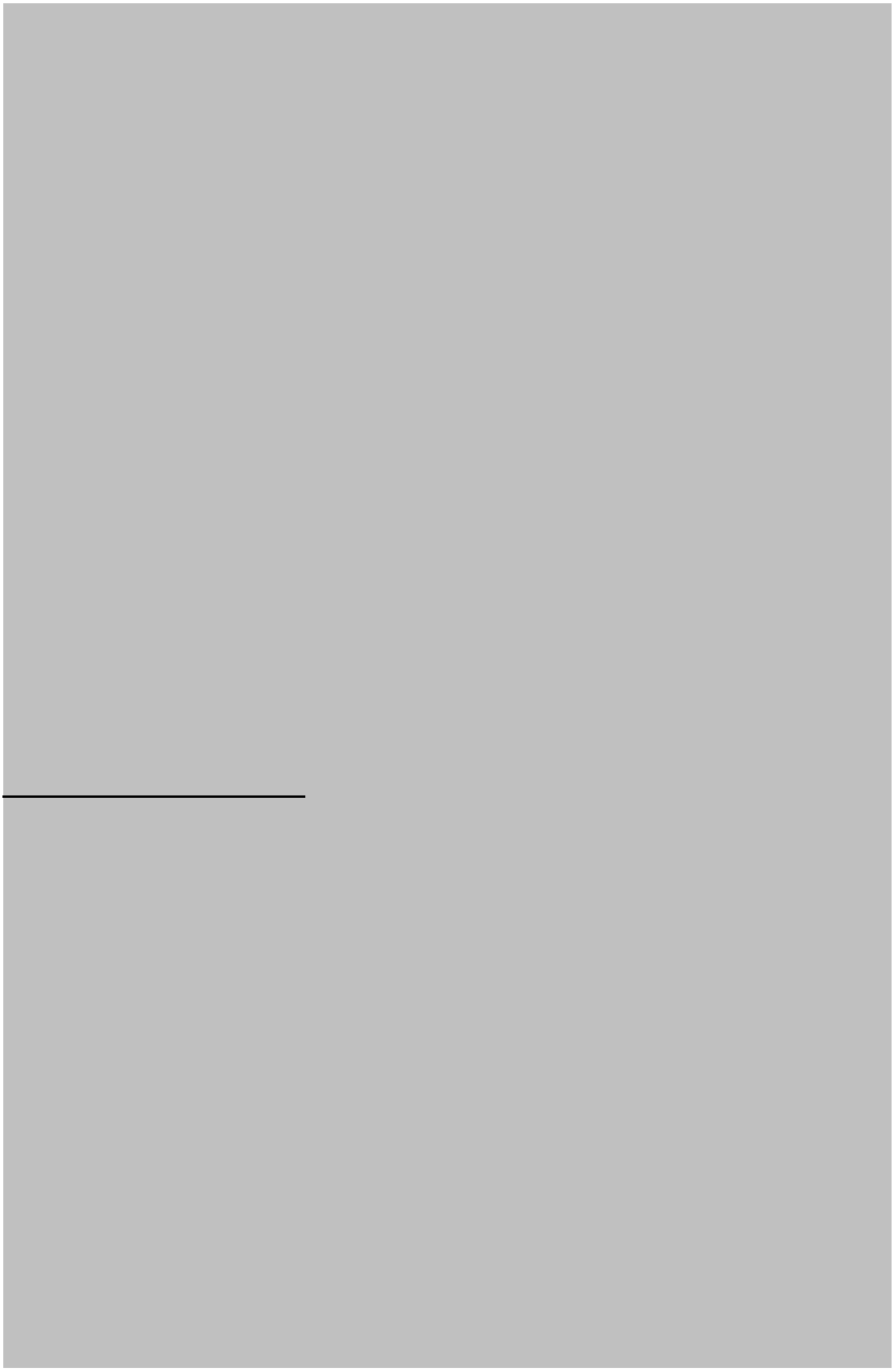
- Fishing license : fully observed
- Engine power limited to 316 KW or 500 HP: not fully observed
- Mesh size in the codend (40 mm stretched): fully observed
- Fishing forbidden within upper 50 m depth: not fully observed
- Time at sea (12 hours per day and 5 days per week): fully observed

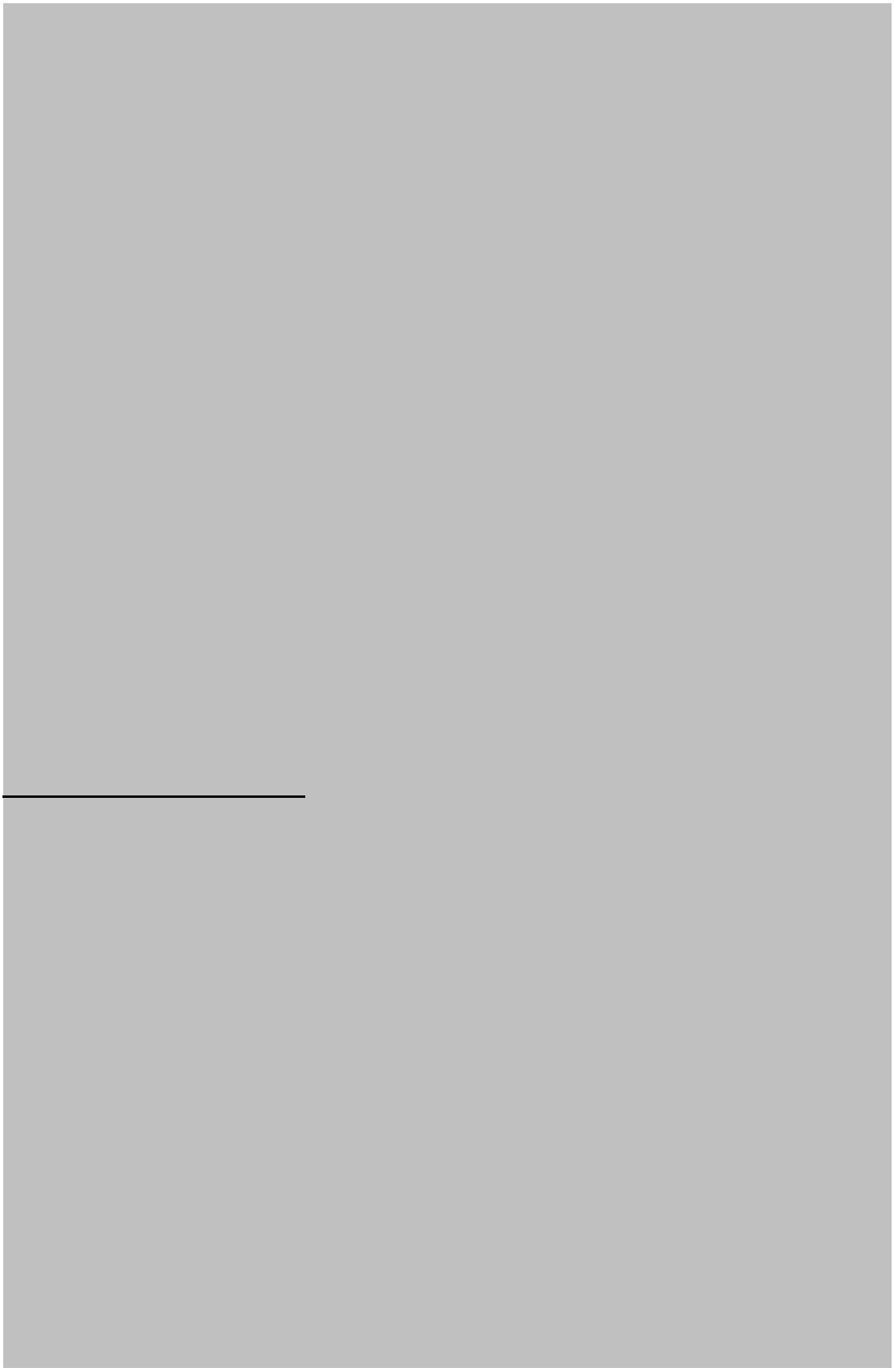
Accompanying species

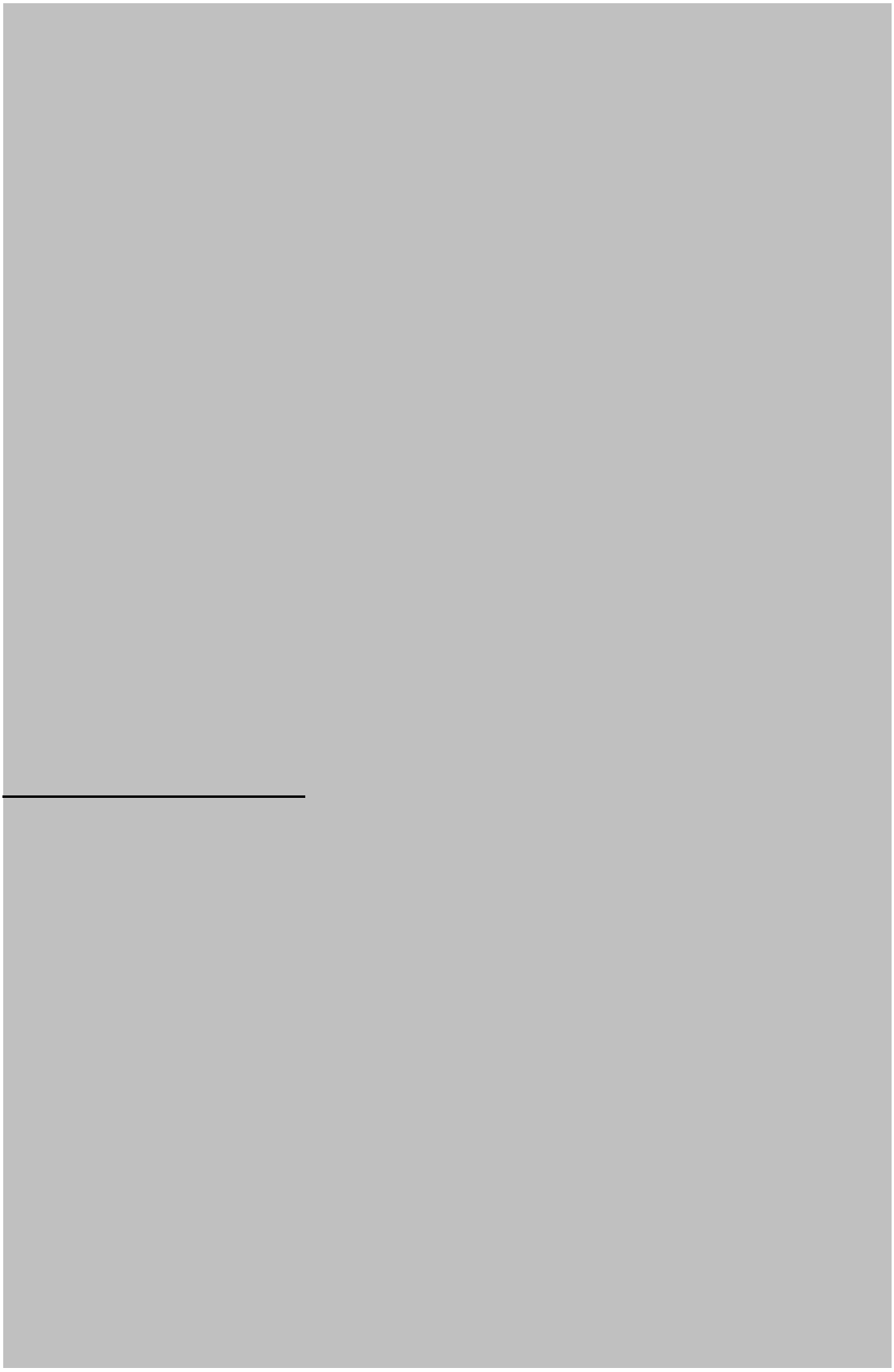
- Conger conger
- Galeus melastomus
- Helicolenus dactylopterus
- Lepidopus caudatus
- Lepidorhombus spp.
- Lophius spp.
- Micromesistius poutassou
- Mullus barbatus
- Mullus surmuletus
- Nephrops norvegicus
- Octopus vulgaris
- Pagellus bogaraveo
- Phycis blennoides
- Parapenaeus longirostris
- Scyliorhinus canicula
- Scorpaena spp.
- Trisopterus minutus capelanus











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

Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: HKE0610Gar

Sex*	B

Analysis # *	VPA

Time series

Data	Size	Age
(mark with X)		X

Model	Cohorts	Pseudocohorts
(mark with X)	X	

Equation used	Catch ecuation	Tunig method	XSA
# of gears	1	Software	Lowestof VPA suite
$F_{terminal}$	1.5 at age 2		

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum	4	0	Recruitment		
Average	7.671	0.392	Average population		
Maximum	76	19	Virgin population		
Critical	15.635	1	Turnover		

Average mortality

		Gear					
	Total	Trawl					
F_1	1.62	Fbar 0-2					
F_2	1.72	F bar 2-4					
Z	2.14						

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

Comments

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

Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: HKE0610Gar

Sex*	

Analysis # *	Y/R

Time series

Data	Size	Age
(mark with X)		

Model	Cohorts	Pseudocohorts
(mark with X)		X

Equation used		Tunig method	
# of gears		Software	Lleonart & Salat,
$F_{terminal}$			

Population results (please state units)

	Sizes	Ages		Amount	Biomass
Minimum	4	0	Recruitment	41.3	
Average			Average population		
Maximum	76	7	Virgin population		171000
Critical	16	0.8	Turnover		
				millions	tons

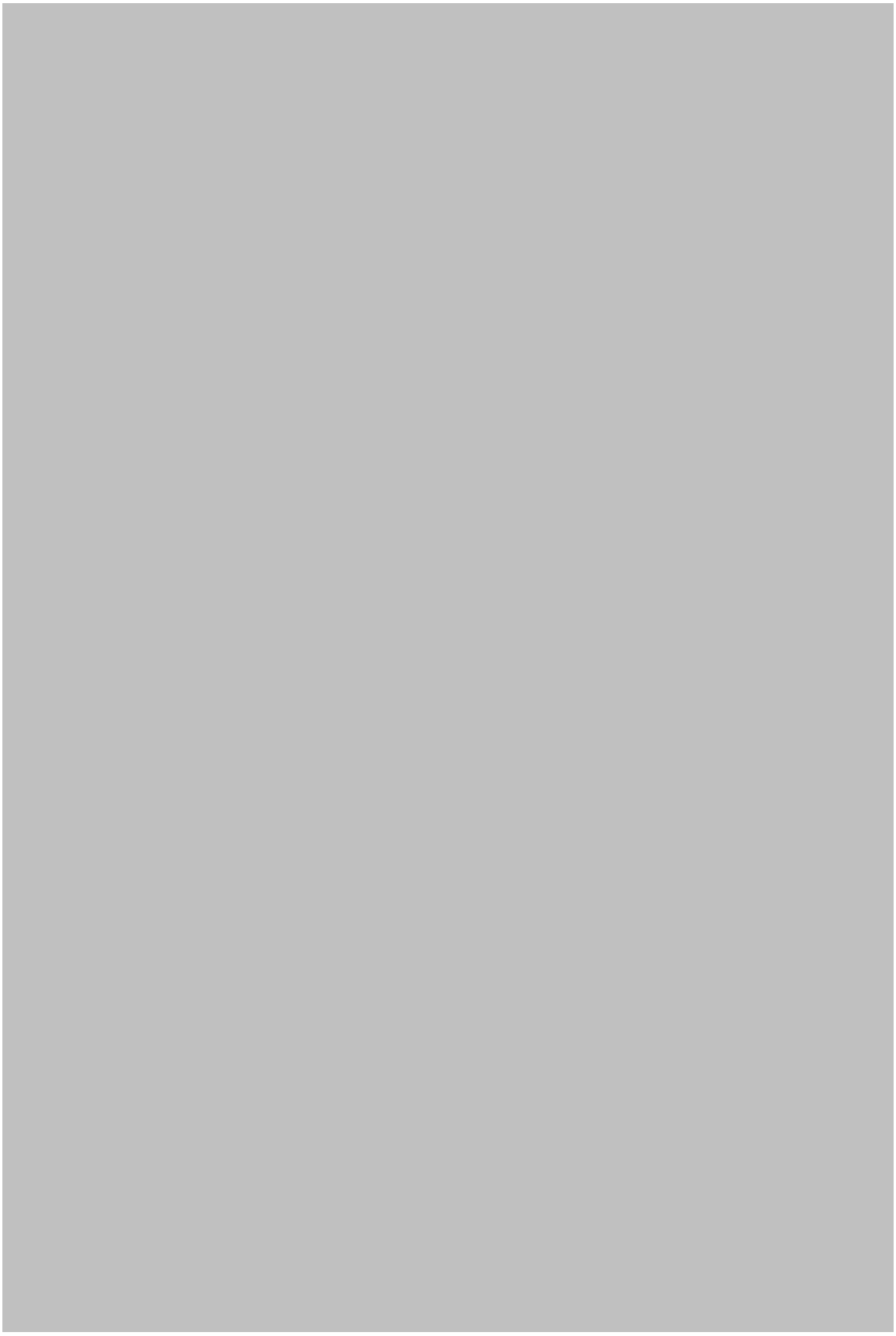
Average mortality

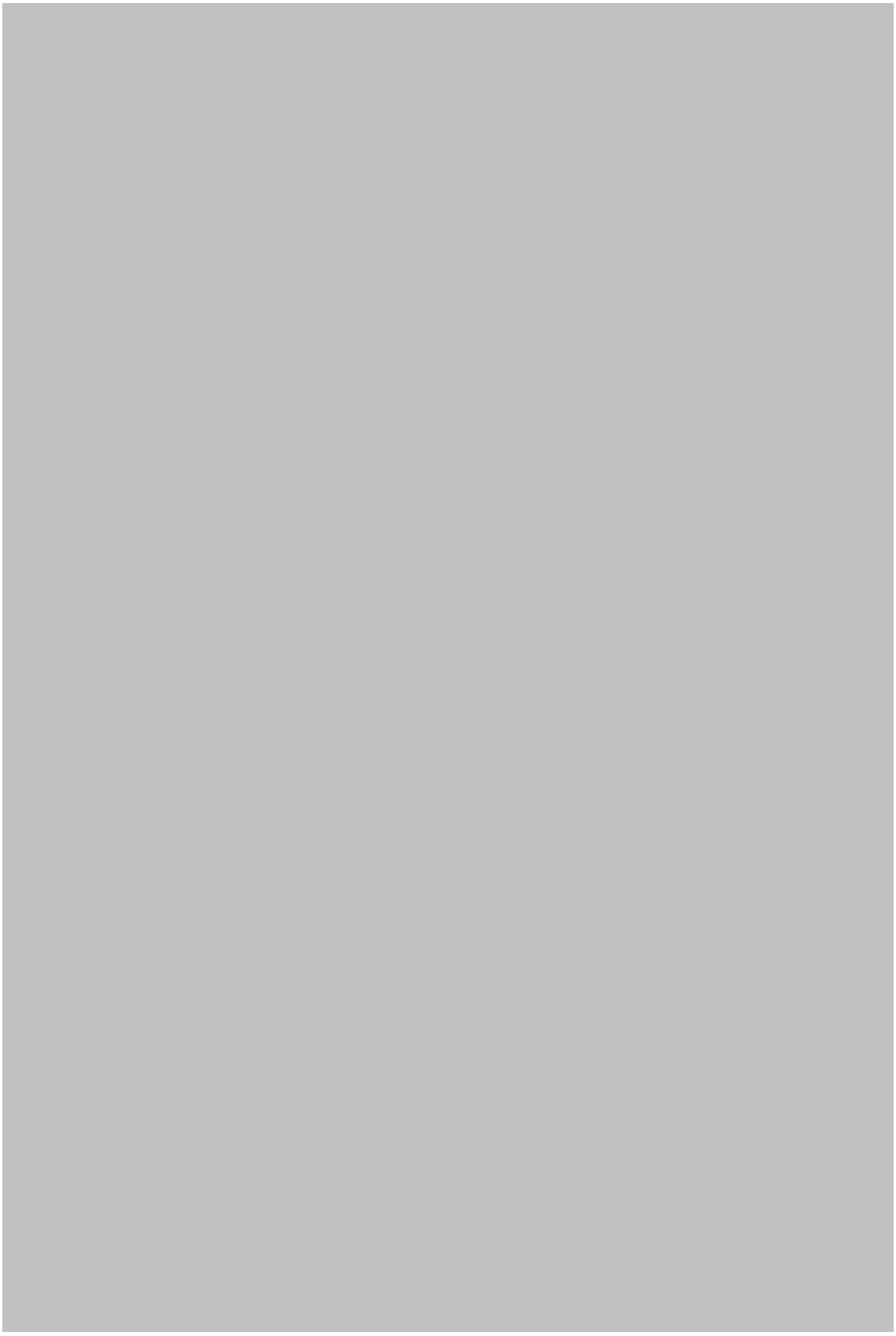
		Gear					
	Total						
F_1	1.058						
F_2							
Z							

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

Comments

F1 is the arithmetic mean of F calculated along the different size classes





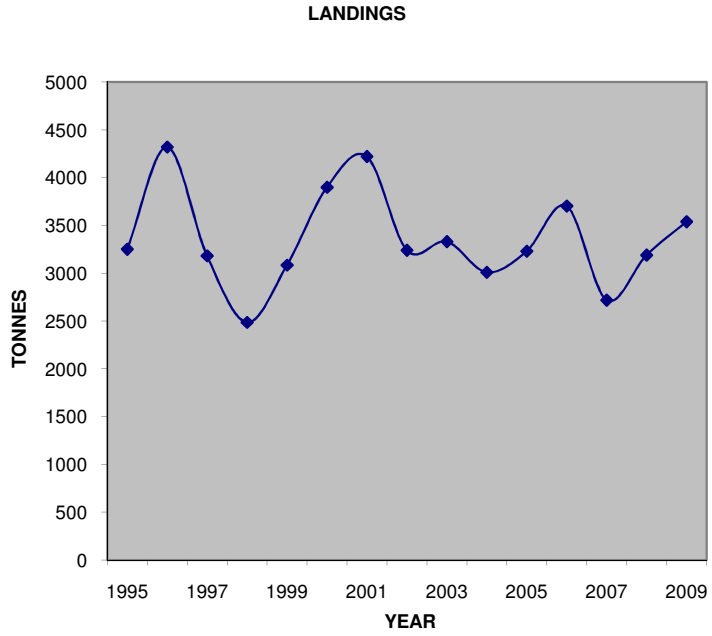
SAC GFCM - Sub-Committee on Stock Assessment (SCSA)	
Assessment form	**Sheet A2** **Indirect methods: data**

Code: HKE0610Gar

Sex*	B	Gear*	Trawl	Analysis # *	VPA

Data	Catch number by age

Data



Landings fluctuates around the average (3 350 t) showing a slight decreasing trend. Landings composition are dominated (in number) by the very youg classes, ages 0 and 1 year old. This means yhat landings ara based mainly in inmature fraction, with an high recruitment dependence.

Landings are mainly composed by immature individuals along the studied period.

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

Assessment form

Sheet A3

Indirect methods: VPA results

Code: HKE0610Gar

Sex*	B	Gear*	Trawl	Analysis #*	XSA

Population in figures

YEAI	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AGE												
0	295034	909736	397380	400072	470591	473779	341028	355581	314196	324662	264932	241127
1	17893	13781	18504	12234	14199	21204	17797	14819	16407	19761	20700	17701
2	2545	1670	1584	1539	914	1412	1561	1617	1368	743	1468	1557
3	724	426	371	220	183	108	95	227	210	141	102	268
4	191	200	97	59	27	17	4	16	44	13	20	10
5	19	56	26	18	7	5	3	1	2	3	1	13
6	1	8	15	0	0	5	0	0	0	0	1	1
+gp	0	0	0	0	0	0	0	0	0	0	0	12
TOTA	316405	925876	417977	414143	485922	496529	360489	372262	332227	345323	287224	260688

Population in biomass

YEAI	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AGE												
0	3835	7278	3974	4401	5647	6159	4092	3911	4713	5195	4239	4099
1	1915	1530	1998	1285	1434	2248	1975	1808	1739	2193	2505	1806
2	1198	786	752	740	451	675	673	749	662	317	633	696
3	799	511	403	241	198	111	103	246	233	154	109	272
4	357	375	180	115	47	31	6	27	79	23	39	18
5	46	146	78	45	20	15	8	3	5	8	3	32
6	2	27	54	2	2	17	2	2	2	2	2	2
+gp	1	1	1	1	1	1	1	1	1	1	1	50
TOTALI	8154	10655	7440	6829	7799	9257	6860	6747	7433	7892	7530	6975

Fishing mortality rates

YEAI	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
AGE												
0	1.631	2.4624	2.0479	1.9057	1.667	1.8489	1.7033	1.6433	1.3336	1.3199	1.2731	0.973
1	1.6892	1.4807	1.8042	1.9113	1.6256	1.926	1.7158	1.7002	2.4117	1.9171	1.905	1.2482
2	1.3163	1.0319	1.5015	1.6556	1.6679	2.2229	1.4556	1.57	1.7984	1.5111	1.229	0.9187
3	0.8708	1.0572	1.4242	1.6897	1.9436	2.9642	1.3629	1.2154	2.3385	1.5455	1.9063	1.441
4	0.8401	1.6534	1.3166	1.7117	1.328	1.4503	0.8316	1.6513	2.4205	2.0035	0.0248	1.8885
5	0.4911	0.9638	3.7682	3.2166	0.0693	1.9098	1.3669	0.5917	1.1764	1.276	0.503	0.2373
6	1.0835	1.2739	1.9995	2.0589	1.3297	2.1211	1.3191	1.3654	2.0702	1.6574	1.2005	1.2302
+gp	1.0835	1.2739	1.9995	2.0589	1.3297	2.1211	1.3191	1.3654	2.0702	1.6574	1.2005	1.2302
FBAR 0	1.5455	1.6583	1.7845	1.8242	1.6535	1.9993	1.6249	1.6378	1.8479	1.5827	1.469	1.0466
FBAR 2	1.0091	1.2475	1.4141	1.6857	1.6465	2.2125	1.2167	1.4789	2.1858	1.6867	1.0534	1.4161

Sex*	B	Gear*	Trawl	Analysis #*	VPA

Population in figures

2007	2008	2009
271378	214750	240303
21748	28030	24092
2567	2009	1522
387	235	187
42	48	1
1	5	1
7	0	0
3	0	0
296134	245078	266107

Population in biomass

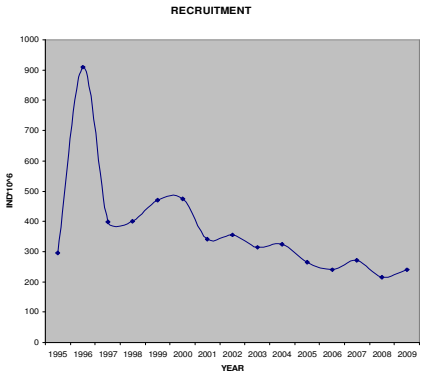
2007	2008	2009
4613	4295	4566
2371	3223	2409
1171	892	740
419	264	208
74	84	1
3	13	2
28	1	2
13	0	1
8692	8773	7928

Fishing mortality rates

2007	2008	2009
0.8375	0.7548	1.1099
1.6993	2.2307	2.0154
1.9187	1.8997	1.5075
1.6652	5.6078	2.4768
1.8156	3.7316	1.9308
0.6332	1.9857	0.9539
1.6441	3.1383	1.7415
1.6441	3.1383	1.7415
1.4852	1.6284	1.5443
1.7998	3.7463	1.9717

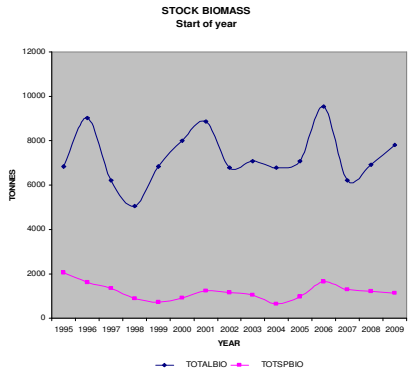
Sex*	B	Gear*	Trawl	Analysis #*	VPA

Population in figures



Some variability in recruitment, declining continuously since 1996 onwards.

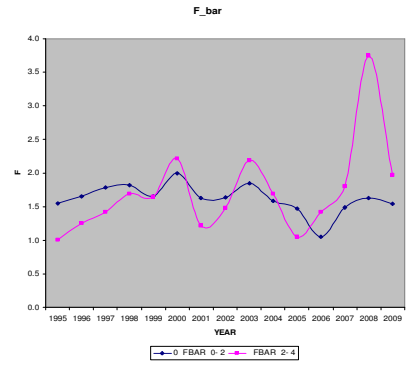
Population in biomass



Low levels of total biomass, with fluctuations around the average (7 300 t).

Low levels of SSB, showing a decreasing trend fluctuating around the average (1 200 t).

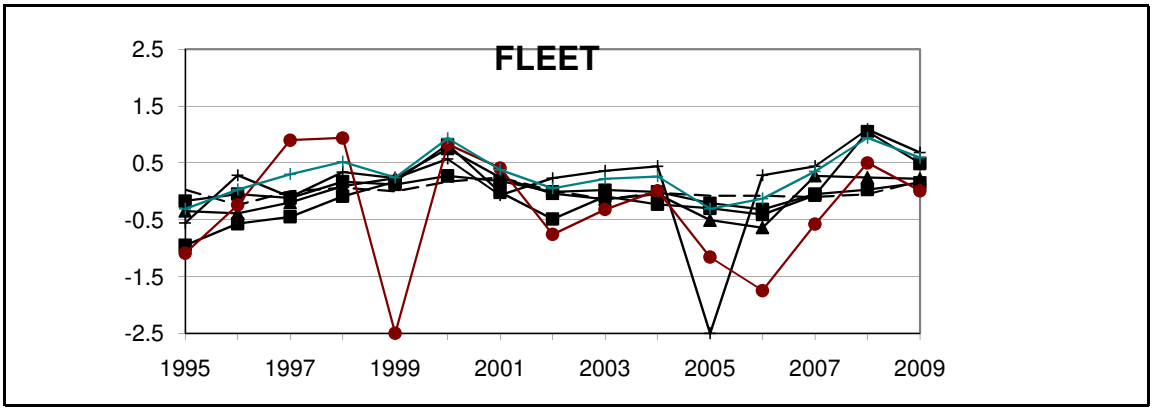
Fishing mortality rates



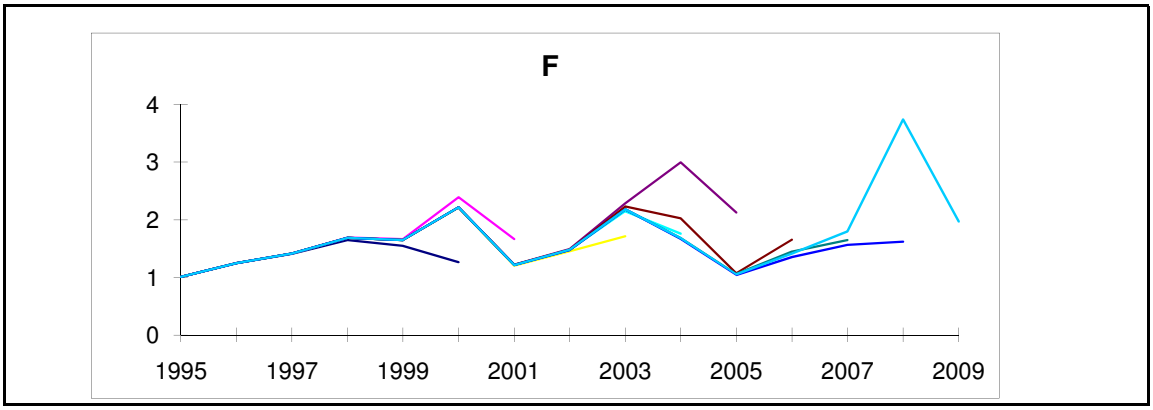
Oscillations in F, increasing in the last three years specially for the 2- 4 age classes.

Sex*		Gear*		Analysis #*	

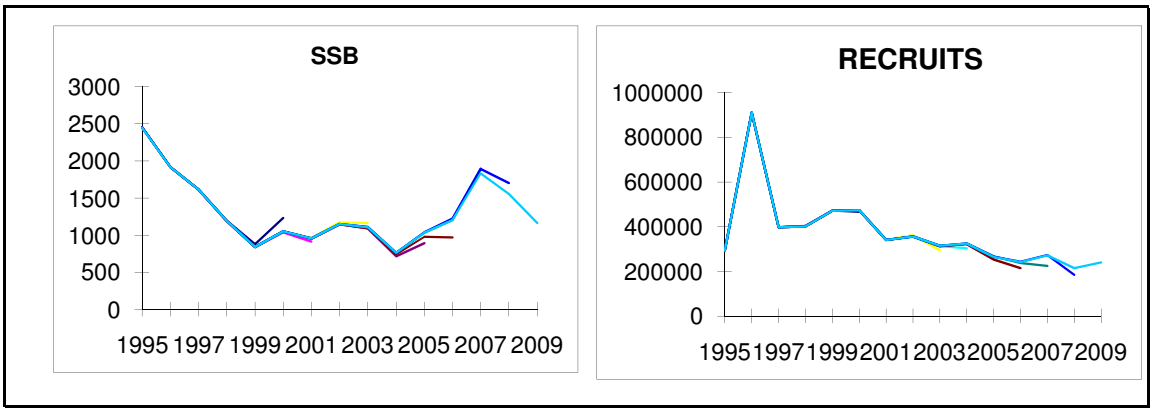
Population in figures



Population in biomass



Fishing mortality rates



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

Code: HKE0610Gar

Sex	B	Analysis #	Y/R

# of gears	1	Software	

Parameters used

Vector F	
Vector M	
Vector N	

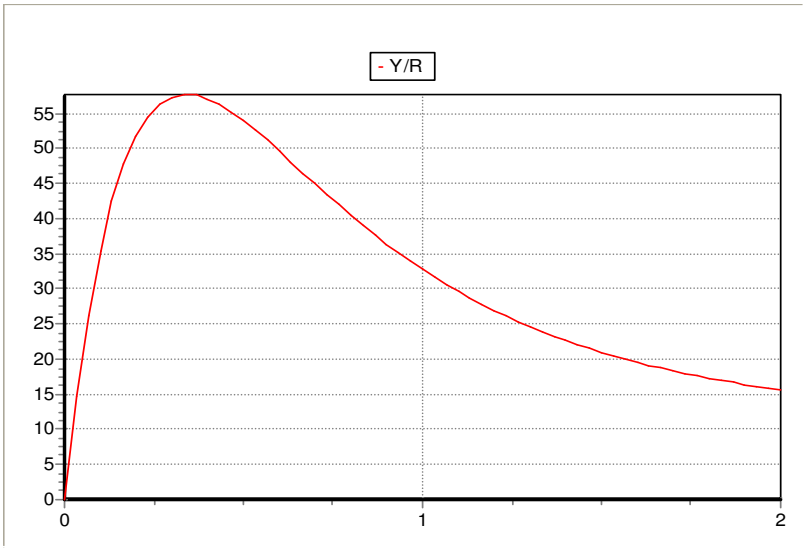
Model characteristics

Results

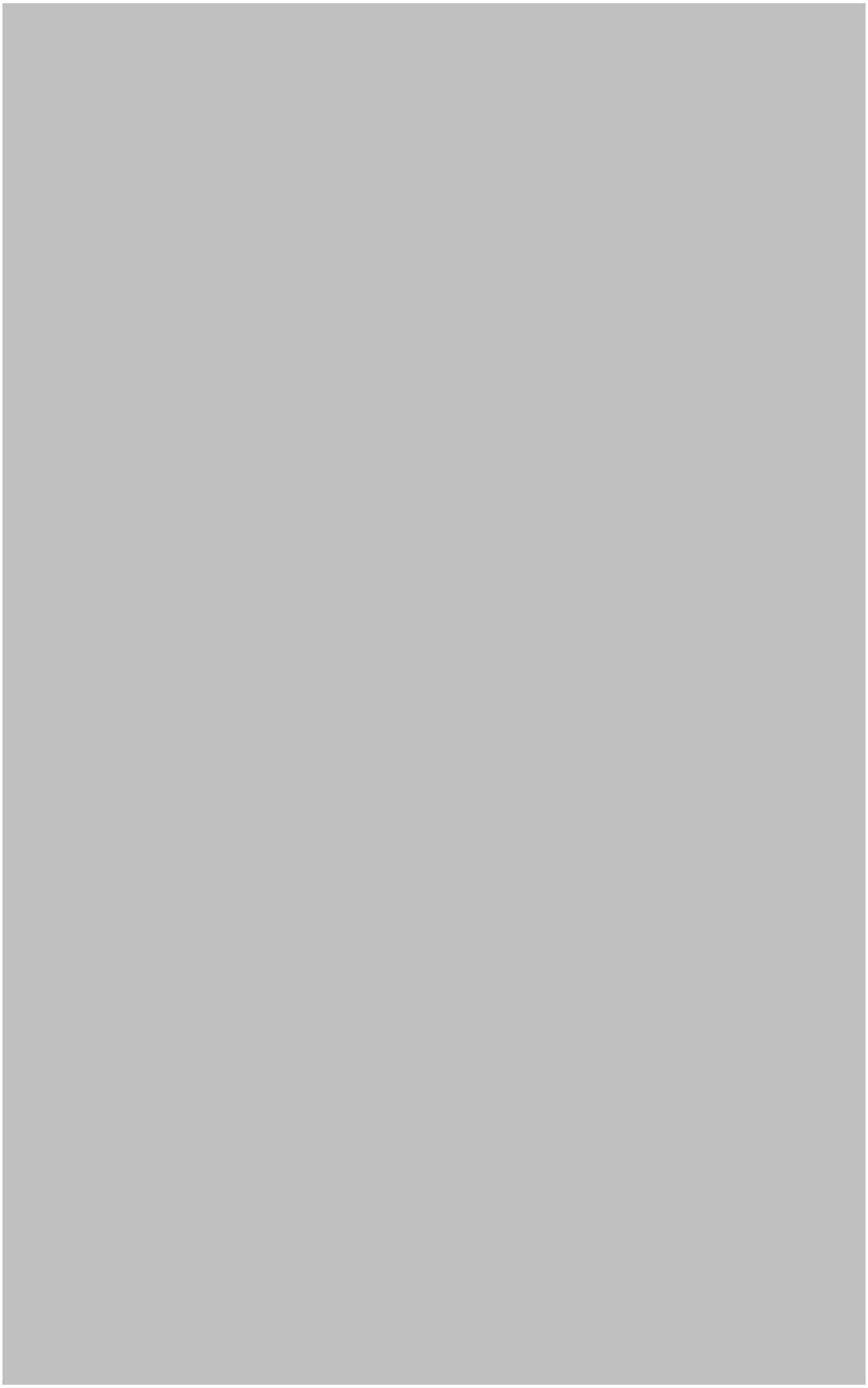
	Total	Gear			
Current YR	32.8				
Maximum Y/R	57.7				
Y/R 0.1	56				
F_{max}	0.35	factor	0.37	fishing mortality	
$F_{0.1}$	0.26	factor	0.28	fishing mortality	
Current B/R	34.4				
Maximum B/R	388.7				
B/R 0.1	526.8				

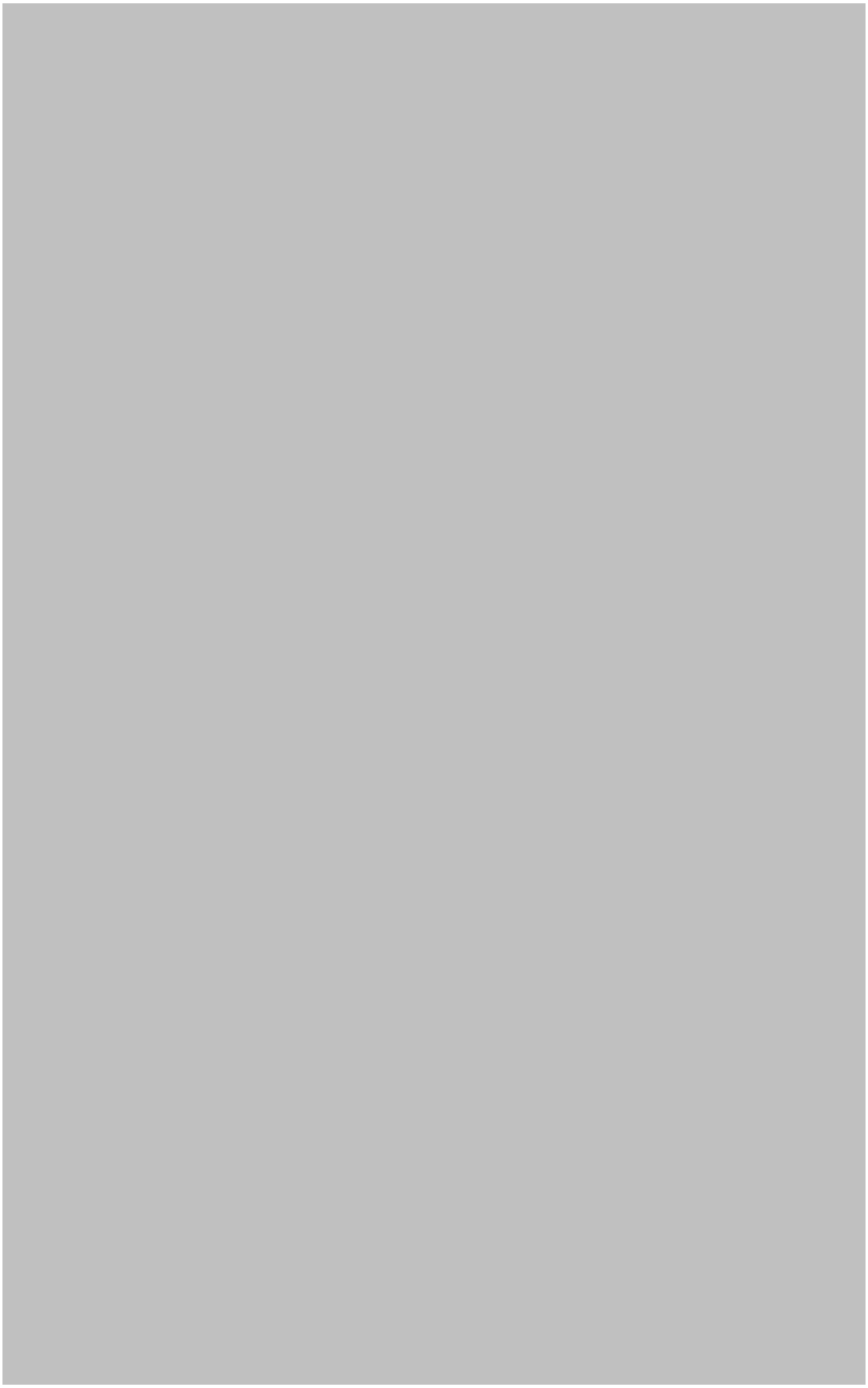
Comments

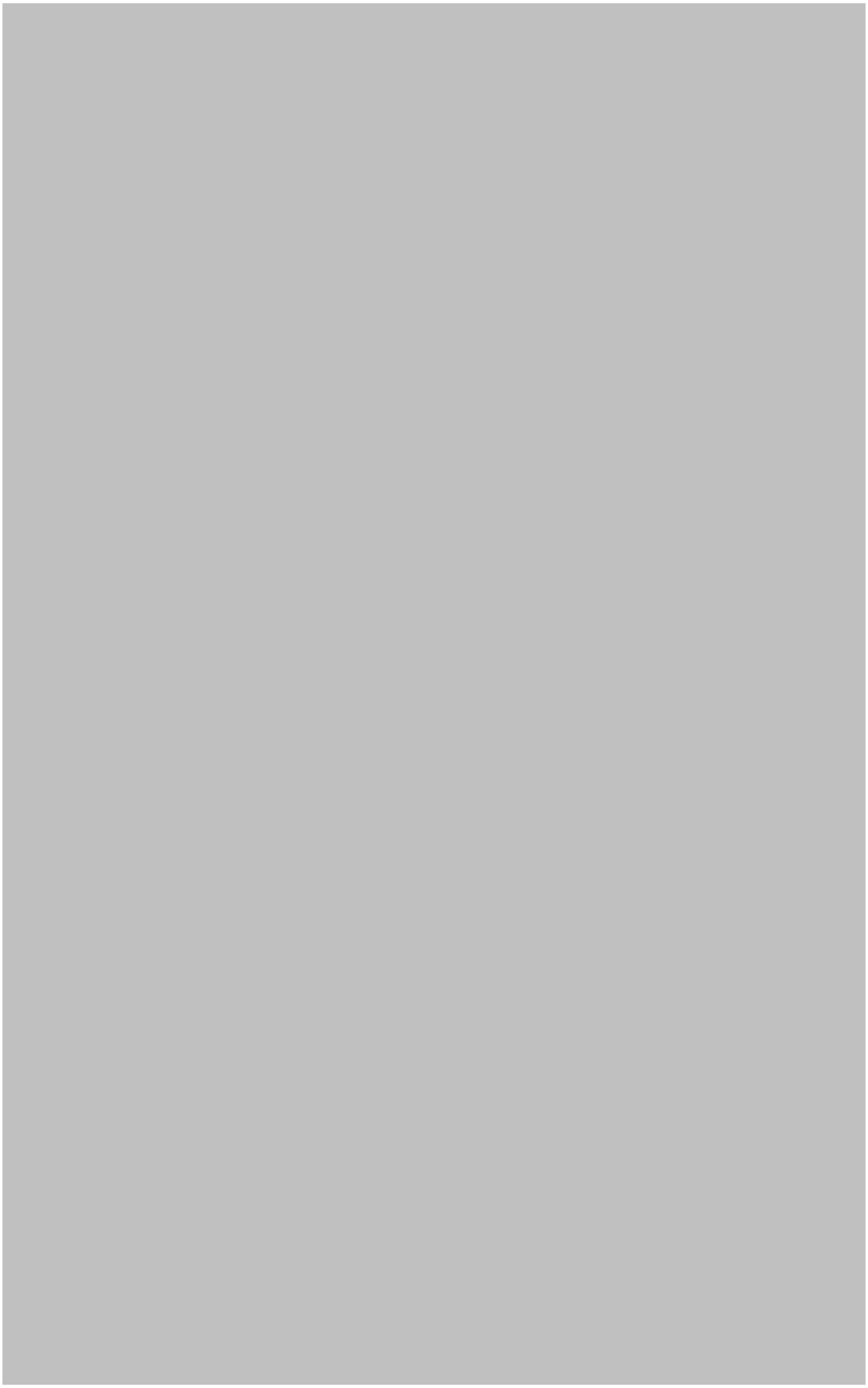
Comments



Other assessment methods







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

Code: HKE0610Gar

Indicators and reference points

Criterion	Current value	Units	Reference Point	Trend	Comments
B	7 808	t	Bmean	+	Bnow is over Bmean (7 269 t)
SSB	1 447	t	SSBmean	=	SSB now is similar the SSBmean (1 197 t)
F	1.97		Fbar2-4	+	Fnow is higher than Fmean (1.71)
Y	3.08	g	Y/SSB	=	Ynow is similar Ymean (3.01 g)
CPUE					

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

The general results are similar to those obtained in previous assessments. Exploitation is based on very young age classes, mainly 0 and 1 year old individuals, with immature fraction dominating the landings. On observe a decreasing trend, both in landings and yields along the studied period, with a small recovery since 2007. Total biomass of the stock decreases slowly, being fluctuating at around the 7 300 t. The SSB represents only a 16 % of the total biomass in average, showing a decreasing trend along the period. Recruitments are declining since 1996 onwards, meanwhile F increasing in the last three years especially for the 2- 4 age classes.

It can be concluded that the resource is over-exploited (growth over-fishing), with a risk of recruitment over-exploitation because of the low levels observed in the Spawning Stock Biomass and low levels and declining trend in recruitment. The use of 40 mm square mesh in the cod-end could improve yields and the state of the stock. The resource should be considered object of a special surveillance. The first step must be to reduce fishing mortality accompanied by a change in the cod end mesh type, being recommended a yearly 10% reduction of effort to ensure the increment in SSB *.

Changes in cod end mesh geometry, result more effective than effort reductions. The change of mesh shape in the cod end would result in a significant increment in the Y/R and SSB/R. This management measure is applied, there would be gains in the second year. The influence of the interaction between trawl and artisanal fishery, mainly gill net, can endanger the forecasted SSB increase, due to the expansion since 1996 of this fishery *.

* García-Rodríguez M., J. L. Pérez-Gil, A. Esteban, E. Barcala and N. Carrasco. 2008. Assessment of hake (Merluccius merluccius) in the GFCM -GSA06 (Northern Spain). Scientific Advisory Commitee of GFCM. Working Document nº 6 (Izmir, Turkey, September 2008).

Code: HKE0610Gar

Management advice and recommendations*

The general results are similar to those obtained in previous assessments (García-Rodríguez M., J. L. Pérez-Gil, A. Esteban, E. Barcala and N. Carrasco. 2008. Assessment of hake (Merluccius merluccius) in the GFCM -GSA06 (Northern Spain). Scientific Advisory Committee del GFCM. Working Document nº 6 (Izmir, Turkey, September 2008)). The following objectives and recommendations are based on the results of the present assessment, as well as in the previous assessment done.

OBJETIVES
To reduce growth overfishing:
- Reduce the effort of trawl.
- Improve the fishing pattern of the trawl to arise the minimum length of catches equal the minimum legal landing size.

To avoid recruitment overfishing:

RECOMMENDATIONS

- To reduce effort in trawl 70%
- Especial surveillance in the use of 40 mm square mesh size in the cod end in trawl gears.
- Encourage studies to allocate area closures to fishing (Fishing Reserves)

Advice for scientific research*

Abstract for SCSA reporting

Authors García-Rodriguez*1 M., A. Fernández2, J. L. Pérez-Gil3 and A. Esteban2.

Year 2010

Species Scientific name Merluccius merluccius - HKE

Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area 06 - Northern Spain

Fisheries (brief description of the fishery)*

Hake (Merluccius merluccius) is one of the most important target species for the trawl fisheries developed by around 650 vessels along the GFCM geographical sub-area Northern SPAIN (GSA-06). In last years, the average of the annual landings of this species, which are mainly composed by juveniles living on the continental shelf, were situated around 3 350 tons in the whole area.

Source of management advice*

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

The state of exploitation was assessed for the period 1995-2009 by means of a VPA Separable, tunned with CPUE from commercial fleet and abundance indices from trawl survey (MEDITS). Analysis was carried out applying the Extended Survivor Analysis (XSA) method (Lowestoft suite; Darby and Flatman, 1994) over the period 1995-2009. Analysis were performed from size composition of trawl catches (obtained from on board and on port monthly sampling) and official landings, transforming length data to age data by slicing (L2AGE program). In this assessment, a new set of parameters (fast growth hypothesis; García Rodriguez, 2002) were considered and a natural mortality vector (PROBIOM, Caddy and Abella, 1999) was applied.

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	**Stock abundance**
High fishing mortality	Low abundance

Comments

The general results are similar to those obtained in previous assessments. Exploitation is based on very young age classes, mainly 0 and 1 year old individuals, with immature fraction dominating the landings. On observe a decreasing trend, both in landings and yields along the studied period, with a small recovery since 2007. Total biomass of the stock decreases slowly, being fluctuating at around the 7 300 t. The SSB represents only a 16 % of the total biomass in average, showing a decreasing trend along the period. Recruitments are declining since 1996 onwards, meanwhile F increasing in the last three years especially for the 2- 4 age classes.

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