



GENERAL FISHERIES COMMISSION FOR  
THE MEDITERRANEAN  
COMMISSION GÉNÉRALE DES PÊCHES  
POUR LA MÉDITERRANÉE



**SAC GFCM**  
**Subcommittee of Stock Assessment**

**SCSA Assessment Forms**



Tool designer  
(GFCM consultant)

**Federico De Rossi** 

FAO backstopping officer for SCSA

**Jordi Leonart** 

SCSA coordinator

**Constantina Karlou-Riga**

GFCM Deputy Executive Secretary /  
Adviser fisheries management

**Abdellah Srouer** 



## SAC GFCM

### Subcommittee of Stock Assessment

#### SCSA Assessment Forms Release 2 (2007) beta version

Since the SAC, and SCSA, inception (1999) a set of assessment forms were made available to scientists in order to provide a common framework to present assessments.

It has been decided to present a new release of these forms to facilitate their use. We took advantage of these upgrade to modify and amend some aspects. We would like to receive comments and suggestions from the users in order to improve the forms.

The structure of this new release is basically the same. The differences are:

- Migration from Word to Excel
- Some fields (yellow) are filled automatically
- Some sheets have been added
  - o A cover sheet with title, authors, species and GSAs
  - o A new sheet "other" allowing to include assessments based on methodologies other than the usual ones.
  - o An abstract sheet to be included (copy/paste) in the SCSA report
- It is more clear what sheets or fields are compulsory to fill
- The sheets for direct methods have not been yet upgraded

#### Excerpts from the presentation of 1st version of the assessment forms (1999), however the sheet "other" can be used in such a case

Each assessment consists of several sheets. Each assessment will take, at least, one sheet of paper numbered "0" (Sheet #0) and will also include no less than one copy of sheets "B", "P1" and "P2a" (now using the current "operational units" terminology). It is not compulsory to fill out any of the other sheets that make up this assessment form, but the person in charge is supposed to fill out some of them: otherwise no assessment is actually made. There may be more than one copy in several cases. Sheets "D" (diagnosis) and "Z" (conclusions and recommendations) should be considered as essential too.

| Sheet | Title                                    | Contents  | # of sheets                           | Priority                  |
|-------|--|---|---------------------------------------|---------------------------|
| 0     | Preliminary basic data on the assessment | Species, person in charge, date and code. All the sheets that belong to the same assessment share this code.        | 1                                     | Indispensable             |
| B     | Biology of the species                   | Biological parameters used in the analyses (it is assumed that only one set of parameters is used).                 | 1                                     | Indispensable             |
| P1    | General information about the fishery    | Catches by gear and associated fleet.   | 1 or more                             | Indispensable             |
| P2a   | Fishery by Operational Unit              | Time series for the operational in question, including structure by size (or age).                                  | At least as many as the OU numbers    | Indispensable             |
| P2b   | Fishery by Operational Unit              | Accompanying species and regulations applicable to operational unit.  | At least as many as the OU numbers    | If available              |
| G     | Indirect methods: global model           | Description of model, data, parameters and results of each analysis.  | As many as used in the analysis       | If available              |
| A1    | Indirect methods: VPA, LCA               | Description of model used and of general results of an analysis.  | As many as used in the analysis       | If available              |
| A2    | Indirect methods: data                   | Description of data used by gear for the analysis in A1.  | As many as used in the analysis by OU | If available, requires A1 |
| A3    | Indirect methods: results of VPA         | Detailed description of results by gear, structured by size or age.   | As many as used in the analysis by OU | If available, requires A1 |
| Y     | Indirect methods: Y/R                    | Description of model, data, parameters and results.   | As many as used in the analysis       | If available              |
| Other | Other assessment methods                 | Description of model, data, parameters and results of other assessment methods not included in the previous sheets. | 1                                     | If available              |
| D     | Diagnosis                                | Synthesis of results of analyses and diagnosis on the state of resources.   | 1                                     | Indispensable             |
| Z     | Objectives and recommendations           | Set the objectives to be attained and recommendations for their attainment.   | 1                                     | Indispensable             |
| C     | Comments                                 | At the option of the person in charge.  | Unspecified                           | If available              |

# SAC GFCM

## Subcommittee of Stock Assessment

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Date\* 

|    |      |      |
|----|------|------|
| 26 | July | 2007 |
|----|------|------|

 Code\* 

|            |
|------------|
| HKE0607Gar |
|------------|

Authors\* 

|   |
|---|
| García-Rodríguez* M., J. L. Pérez-Gil** and A. Esteban Acón** |
|---|

Affiliation\* 

|  |
|--|
| Instituto Español de Oceanografía: *Servicios Centrales (Madrid); ** Centro Oceanográfico de Murcia. |
|--|

Species Scientific name\* 

|                                    |
|------------------------------------|
| <i>Merluccius merluccius</i> - HKE |
|------------------------------------|

  
Source: GFCM Priority Species

Geographical area\* 

|                          |
|--------------------------|
| Mediterranean 37.1.1 FAO |
|--------------------------|

Geographical Sub-Area (GSA)\* 

|                     |
|---------------------|
| 06 - Northern Spain |
|---------------------|

  
Combination of GSAs 

|   |
|---|
| 1 |
| 2 |
| 3 |

| SAC GFCM - Subcommittee of Stock Assessment |  |  |  |  |  |  |  |          |  |
|---|--|--|--|--|--|--|--|----------|--|
| Assessment form                             |  |  |  |  |  |  |  | Sheet #0 |  |
| Basic data on the assessment                |  |  |  |  |  |  |  |          |  |

Code: HKE0607Gar

|       |    |     |      |          |   |  |  |  |  |
|-------|----|-----|------|----------|---|--|--|--|--|
| Date* | 26 | Jul | 2007 | Authors* | García-Rodríguez* M., J. L. Pérez-Gil** and A. Esteban Acón** |  |  |  |  |
|-------|----|-----|------|----------|---|--|--|--|--|

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

### Data Source

|      |                     |                 |           |
|------|---------------------|-----------------|-----------|
| GSA* | 06 - Northern Spain | Period of time* | 1992-2006 |
|------|---------------------|-----------------|-----------|

### Description of the analysis

|                       |   |                |                                |
|-----------------------|---|----------------|--------------------------------|
| Type of data*         | size composition of commercial landings | Data source*   | I.E.O. SGPM                    |
| Method of assessment* | Extended survivor Analysis (XSA)        | Software used* | VIT ; Lowestof VPA suite ; FLR |

### Sheets filled out

| B | P1 | P2a   | P2b   | G     | A1 | A2 | A3 | Y | Other | D | Z | C     |
|---|----|-------|-------|-------|----|----|----|---|-------|---|---|-------|
| 1 | 1  | #REF! | #REF! | #REF! | 1  | 1  | 4  | 1 | 1     | 1 | 1 | #REF! |

### Comments, bibliography, etc.

García-Rodríguez M. And Esteban A. Algunos aspectos sobre la biología y pesca de la merluza mediterránea *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-Rodríguez 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.

Leonart 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. Leonart 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.

Pérez Gil J.L, Fernández. A, Baro, J., González, M., Massutí, E. Quetglas, A. and Quintanilla, L. (2004). Stock assessment of hake (*Merluccius merluccius*) from the trawl fishery off the geographical sub-area 6 (Northern Spain). Working document to the G.F.C.M. SAC working group on the assessment of demersal stocks. Málaga 6-7 may 2004.

Sartor P., L. Recasens, C. Viva and J. Leonart (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.

The general results are similar to previous assessments. Exploitation is based mainly on classes 0 and 1, with immature fraction dominating the landings. On observe a decreasing trend, both in landings and yields along the studied period. On the contrary,  $Z$  shows an increasing trend, as well as  $F_{bar}$ , with this last decreasing from 2003 onwards. Current  $Y/R$  represents 83% of  $Y/R_{max}$ , meanwhile  $B/R$  represents 30 % of the  $B/R_{max}$ . Total biomass of the stock decreases slowly, being stabilised at around the 8 000 t. SSB- $R$  relationship shows a decreasing trend. Recruitments showing a slight

# SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet B

Biology of the species

Code: HKE0607Gar

## 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                   | B   |  |  |  |  |  |  |  |
|-----------------------|---|--|--|--|--|--|--|--|
| Growth model          | VBGF  |  |  |  |  |  |  |  |
| Data source           | Otoliths readings PN 2003-2006; INBIO, n=1000 |  |  |  |  |  |  |  |
| $L_{\infty}$ (growth) | 85.0 cm                                       |  |  |  |  |  |  |  |
| K (growth)            | 172 cm year-1                                 |  |  |  |  |  |  |  |
| $t_0$ (growth)        | -0,177  |  |  |  |  |  |  |  |
| length-weight         | García-Rodríguez & Esteban, 1995              |  |  |  |  |  |  |  |
| a (length-weight)     | 0,0048  |  |  |  |  |  |  |  |
| b (length-weight)     | 3,12  |  |  |  |  |  |  |  |
| sex ratio             | 0,77  |  |  |  |  |  |  |  |
| M                     | 0,54  |  |  |  |  |  |  |  |

## Comments





# SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet P1

General information about the fishery

Code: HKE0607Gar

|  |  |           |           |
|--|--|-----------|-----------|
| Data source*   | IEO: size composition of trawl catches. SGPM | Year (s)* | 1992-2006 |
| Data aggregation (by year, average figures between years, etc.)* | By Year                                      |           |           |

## Fleet and catches (please state units)

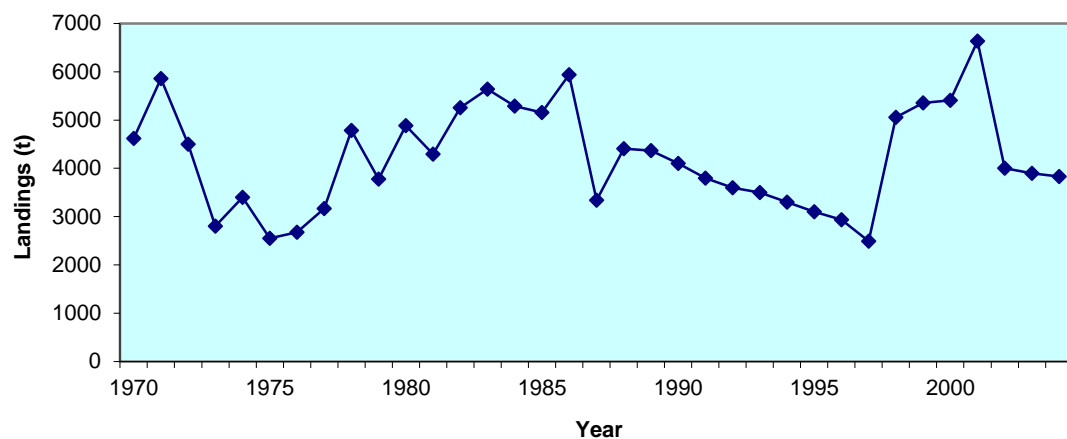
|                     | Country | GSA | Fleet Segment            | Gear Class  |
|---------------------|---------|-----|--------------------------|-------------|
| Operational Unit 1* | ESP     | 06  | E - Trawl (12-24 metres) | 03 - Trawls |
| Operational Unit 2  |         |     |                          |             |
| Operational Unit 3  |         |     |                          |             |
| Operational Unit 4  |         |     |                          |             |
| Operational Unit 5  |         |     |                          |             |

| Operational Units* | Fleet (n° of boats)* | Catch (species assessed) | Other species caught | Discards (species assessed) | Discards (other species caught) | Effort units |
|--------------------|----------------------|--------------------------|----------------------|-----------------------------|---------------------------------|--------------|
| ESP 06 E 03        | 647                  | 3800                     |                      |                             |                                 | boat/day     |
|                    |                      |                          |                      |                             |                                 |              |
|                    |                      |                          |                      |                             |                                 |              |
|                    |                      |                          |                      |                             |                                 |              |
|                    |                      |                          |                      |                             |                                 |              |
| Total              | 647                  | 3800                     |                      |                             |                                 |              |

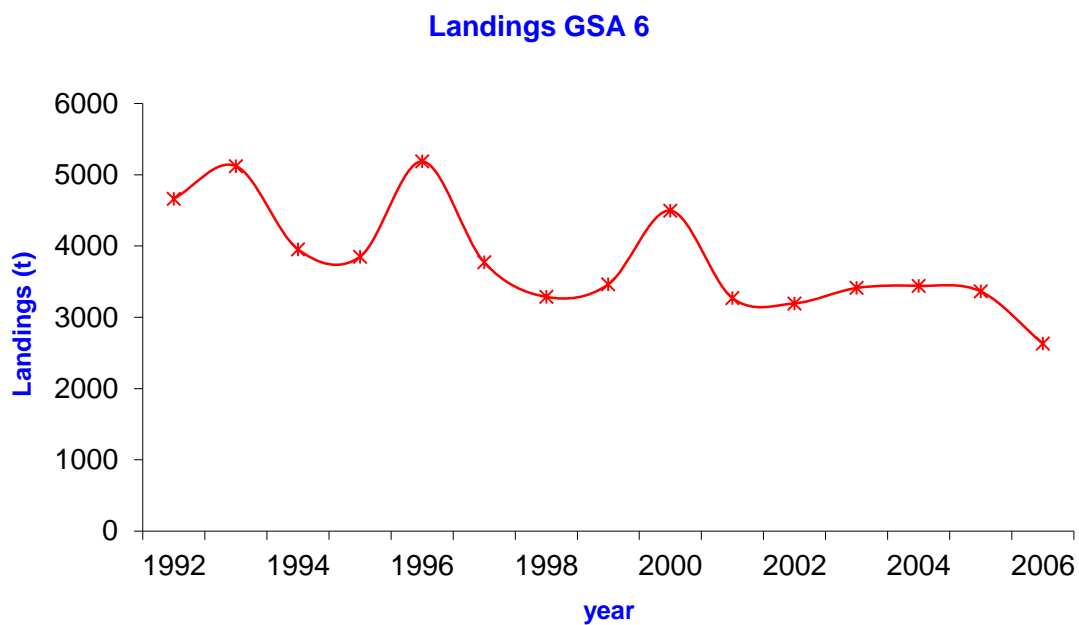
|                    |                    |
|--------------------|--------------------|
| Legal minimum size | 20 cm total length |
|--------------------|--------------------|

## Comments

From official data, the total trawl fleet of the whole geographical sub-area 06 (Northern Spain) is made up by 647 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.



Estimated landings (FAO data) of *Merluccius merluccius* in the Balearic area for the period 1970 – 2004.



Evolution of *Merluccius merluccius* landings in the GSA 6 (Northern Spain) for the period 1992 – 2006.

# SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet P2a

Fishery by Operational Unit

Code: HKE0607Gar

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|              |   |           |             |
|--------------|---|-----------|-------------|
| Data source* | IEO: size composition of trawl catches. SGPM (M | OpUnit 1* | ESP 06 E 03 |
|--------------|---|-----------|-------------|

## Time series

|                    |      |      |      |      |      |      |
|--------------------|------|------|------|------|------|------|
| Year*              | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 |
| Catch              | 4664 | 5122 | 3953 | 3850 | 5187 | 3770 |
| Minimum size       | 4    | 4    | 4    | 4    | 4    | 4    |
| Average size $L_c$ | 12   | 12,9 | 10,7 | 12   | 9,2  | 10,5 |
| Maximum size       | 68   | 68   | 68   | 68   | 74   | 78   |
| Fleet              | 647  | 647  | 647  | 647  | 647  | 647  |

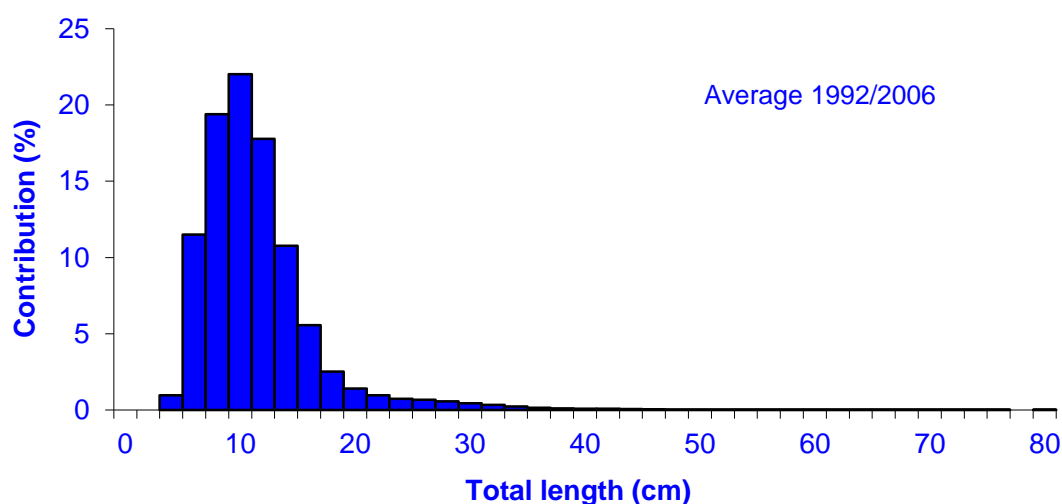
|                    |      |      |      |      |      |      |
|--------------------|------|------|------|------|------|------|
| Year               | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
| Catch              | 3462 | 4497 | 3269 | 3195 | 3411 | 3441 |
| Minimum size       | 4    | 4    | 4    | 4    | 4    | 4    |
| Average size $L_c$ | 10,9 | 11,6 | 11,4 | 11   | 12,4 | 12,6 |
| Maximum size       | 80   | 76   | 70   | 60   | 66   | 70   |
| Fleet              | 647  | 647  | 647  | 647  | 647  | 647  |

## Selectivity

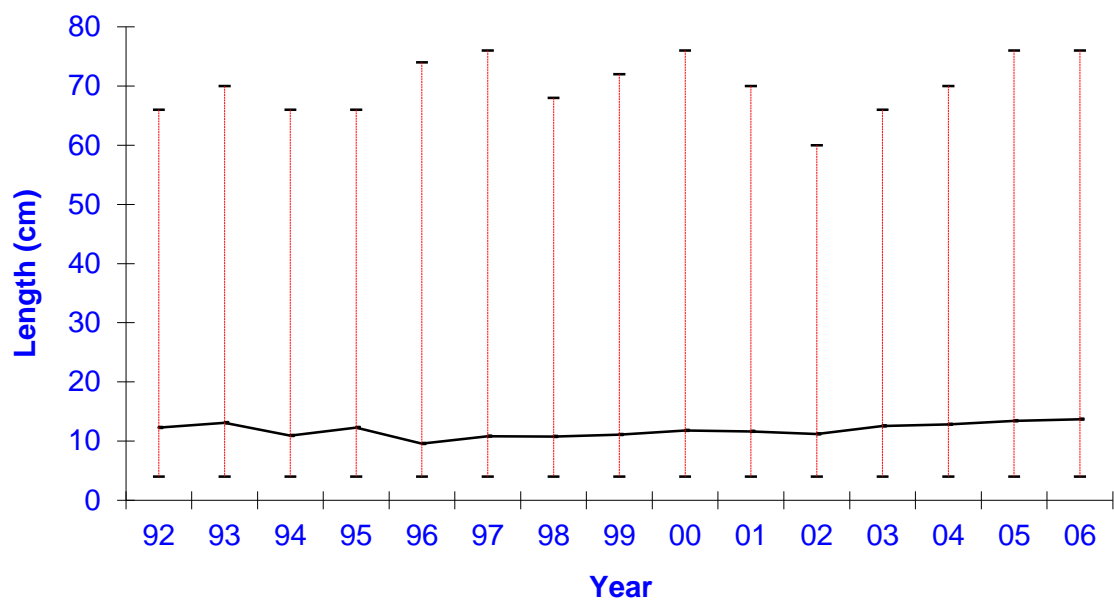
## Remarks

|                  |         |  |
|------------------|---------|--|
| $L_{25}$         | 8.8 cm  | It corresponds to 40 mm diamond mesh in the codend.<br>Data source: García-Rodríguez M. and Fernández A.M. 2005. Influencia de la geometría de la malla del copo en las captura,selectividad y rendimientos de algunas especies de peces comerciales en el Golfo de Alicante (SE de la península Ibérica). Inf.Tec.Ins.Esp.Oceanogr. nº 185. |
| $L_{50}$         | 10.3 cm |  |
| $L_{75}$         | 11.9 cm |  |
| Selection factor | 2,57    |  |

## Structure by size or age



Size class distribution of the landings. Average contribution for the 1992-2006 period



.Yearly maximum, minimum ad average length observed in the 1992-2006 landings

| SAC GFCM - Subcommittee of Stock Assessment |  |
|---|--|
| Assessment form                             | Sheet P2b<br>Fishery by Operational Unit |

Code: HKE0607Gar  
####

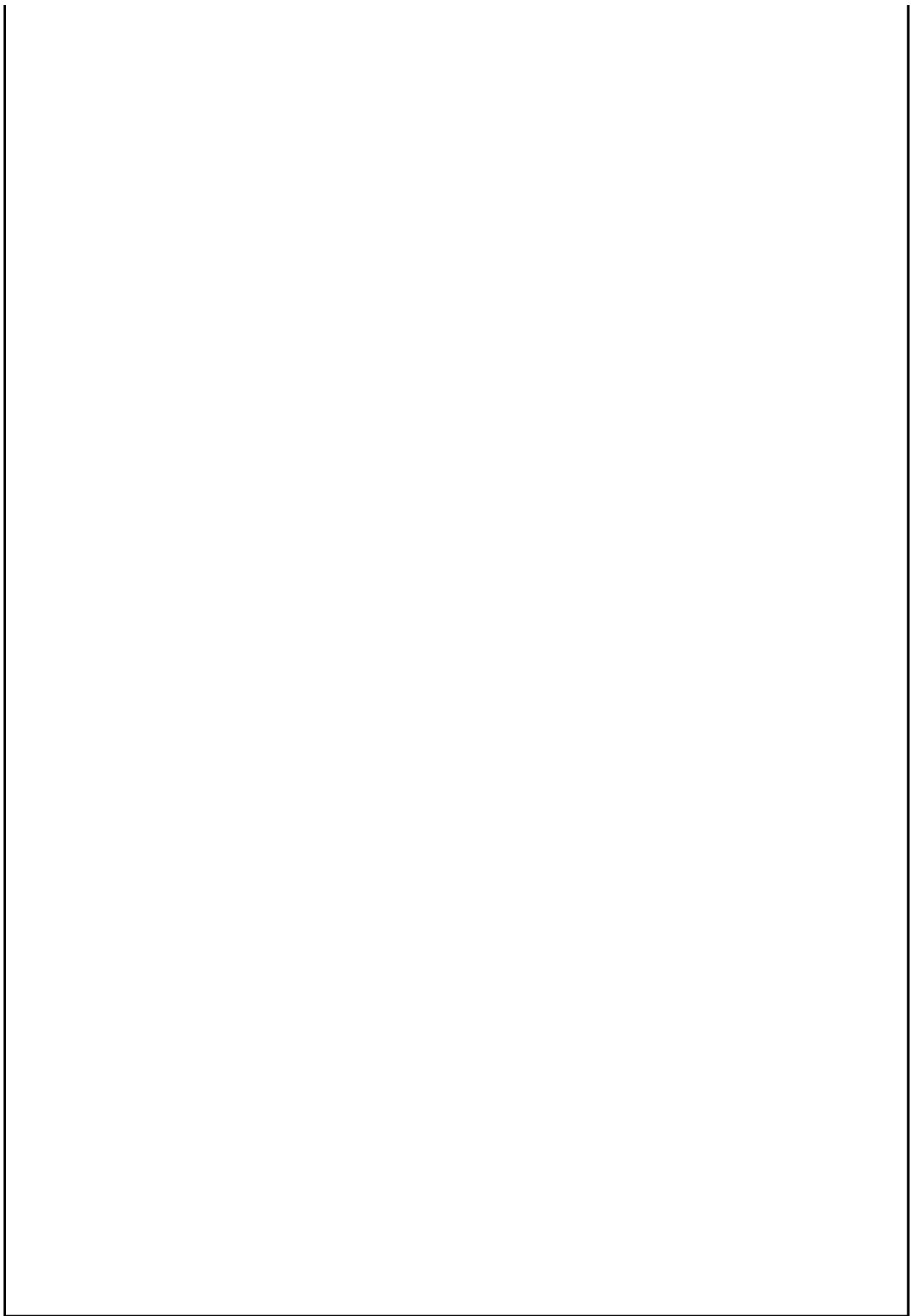
|              |   |           |             |
|--------------|---|-----------|-------------|
| Data source* | IEO: size composition of landings. SGPM: official landings ar | OpUnit 1* | ESP 06 E 03 |
|--------------|---|-----------|-------------|

### 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 -  
 Scylliorhinus canicula -  
 .Scorpaena spp -  
 Trisopterus minutus capellanus -



# SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet A1

Indirect methods: VPA, LCA

Code: HKE0607Gar

Sex\* B

Analysis # \* VPA

## Time series

| Data          | Size | Age |
|---------------|------|-----|
| (mark with X) |      | X   |

| Model         | Cohorts | Pseudocohorts |
|---------------|---------|---------------|
| (mark with X) | X       |               |

|                       |                |               |                          |
|-----------------------|----------------|---------------|--------------------------|
| Equation used         | Catch equation | Tuning method | XSA                      |
| # of gears            | one (trawl)    | Software      | Lowest of VPA suite; FLR |
| $F_{\text{terminal}}$ | 0,68           |               |                          |

## Population results (please state units)

|          | Sizes | Ages |                    | Amount      | Biomass |
|----------|-------|------|--------------------|-------------|---------|
| Minimum  | 4     | 0    | Recruitment        | 163661431,2 | 59,38   |
| Average  | 8,74  | 0,65 | Average population | 4E+07       | 698,8   |
| Maximum  | 76    | 19   | Virgin population  |             | 9781,5  |
| Critical | 12    | 0,85 | Turnover           |             | 162,11% |
|          |       |      |                    |             |         |
|          |       |      |                    |             |         |

## Average mortality

|       | Total | Trawl     |  |  |  |  |  |
|-------|-------|-----------|--|--|--|--|--|
| $F_1$ | 0,83  | Fbar 2-4  |  |  |  |  |  |
| $F_2$ | 0,97  | F bar 0-3 |  |  |  |  |  |
| Z     | 1,24  |           |  |  |  |  |  |

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

## Comments



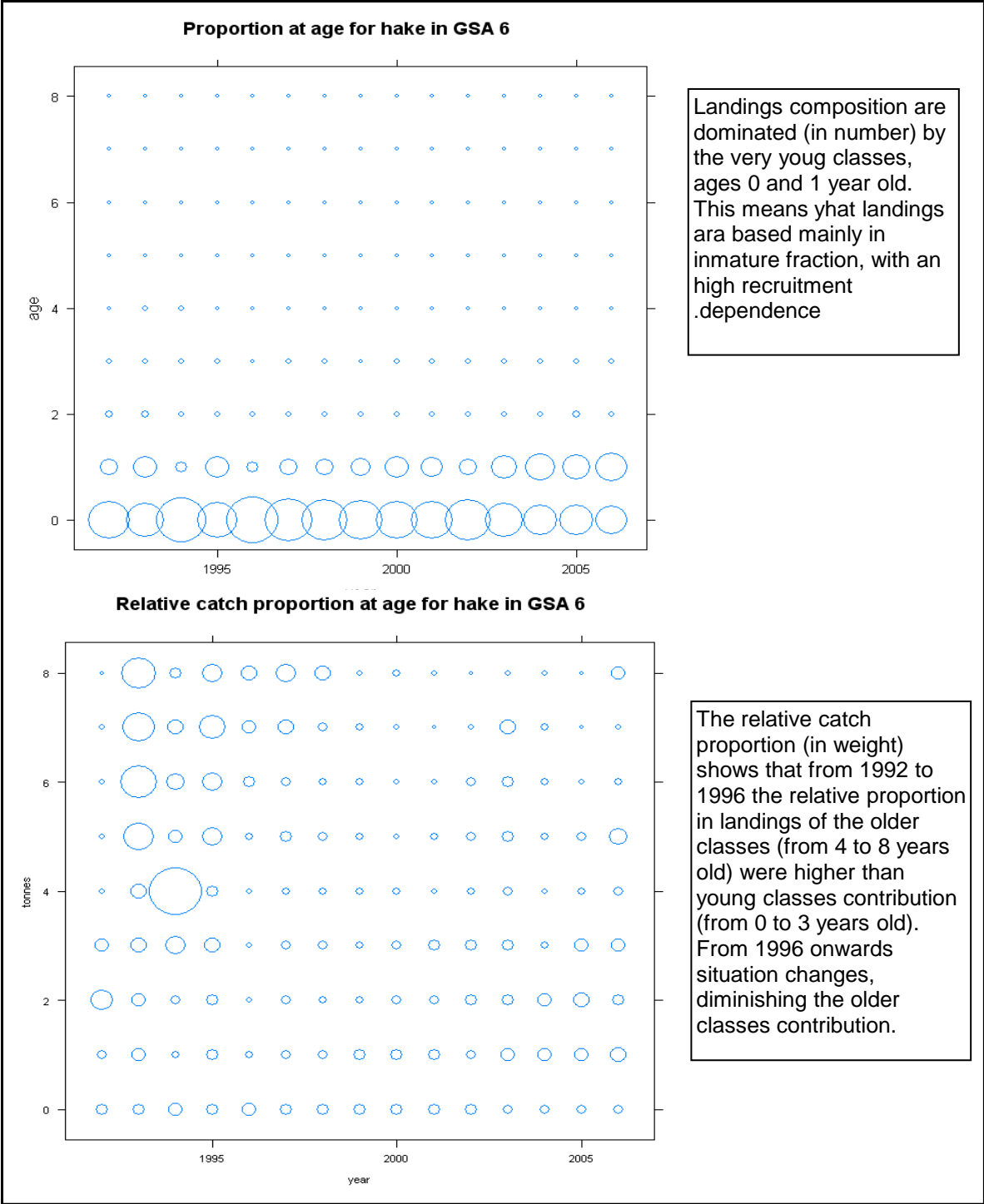
| SAC GFCM - Subcommittee of Stock Assessment |                                    |
|---|------------------------------------|
| Assessment fo                               | Sheet A2<br>Indirect methods: data |

Code: HKE0607Gar

|      |   |       |       |              |     |
|------|---|-------|-------|--------------|-----|
| Sex* | B | Gear* | Trawl | Analysis # * | XSA |
|------|---|-------|-------|--------------|-----|

|      |                     |
|------|---------------------|
| Data | Catch number by age |
|------|---------------------|

### Data

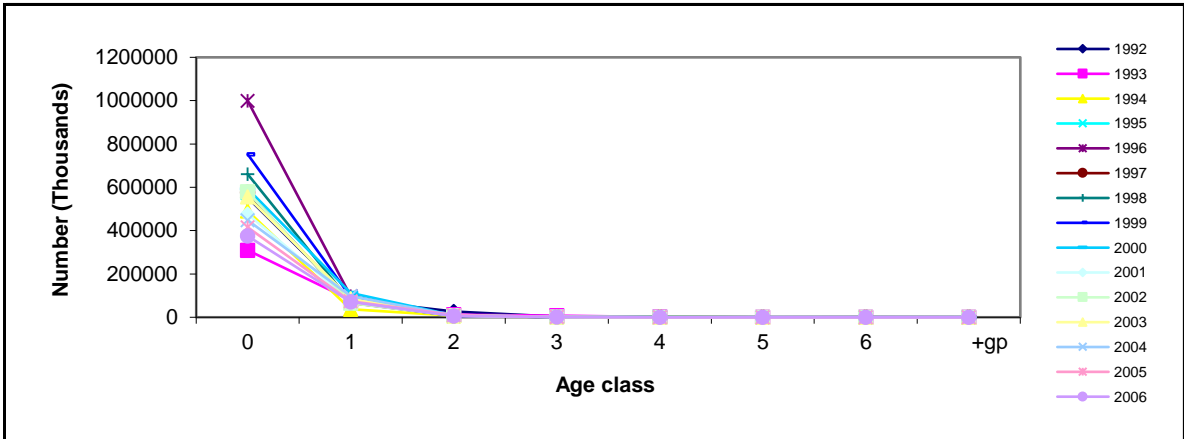


Code: HKE0607Gar

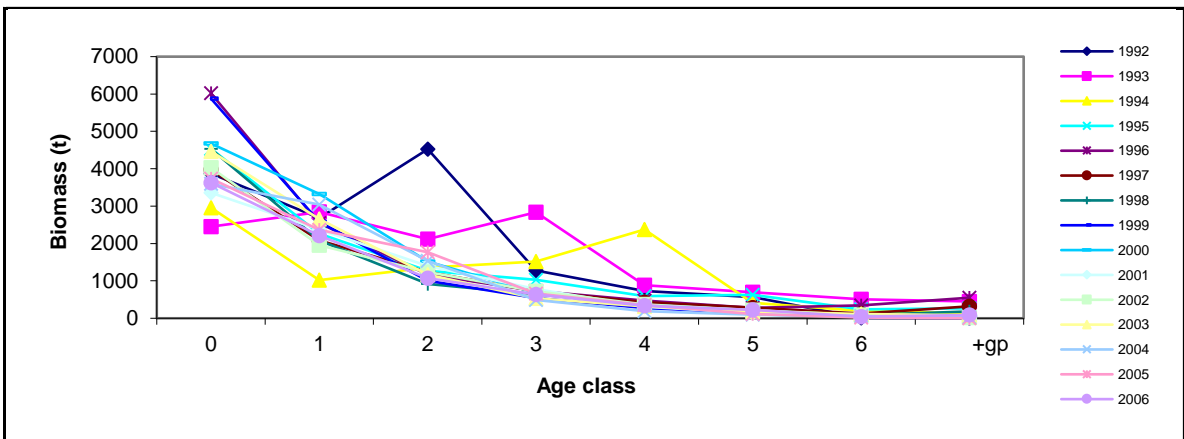
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|      |   |       |       |             |     |
|------|---|-------|-------|-------------|-----|
| Sex* | B | Gear* | Trawl | Analysis #* | XSA |
|------|---|-------|-------|-------------|-----|

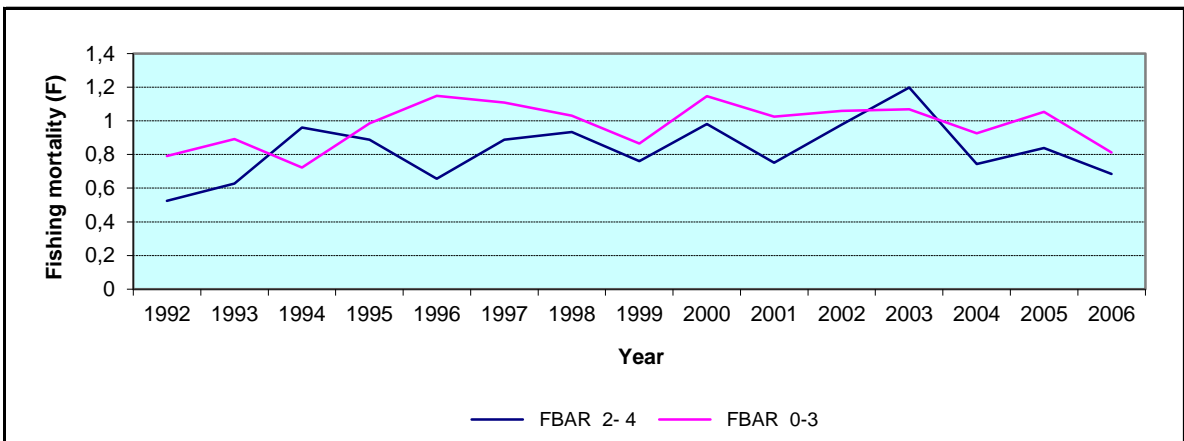
### Population in figures



### Population in biomass

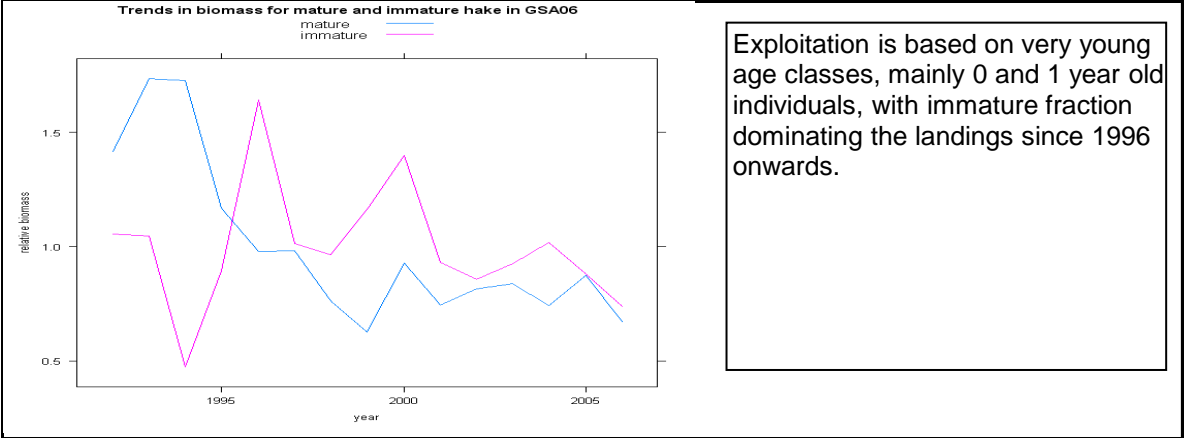


### Fishing mortality rates

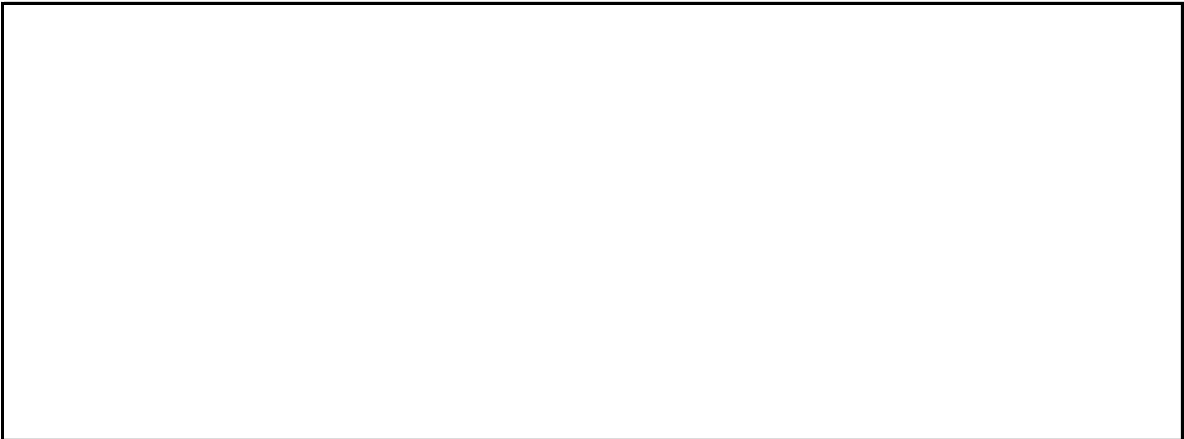


|      |   |       |       |             |     |
|------|---|-------|-------|-------------|-----|
| Sex* | B | Gear* | Trawl | Analysis #* | XSA |
|------|---|-------|-------|-------------|-----|

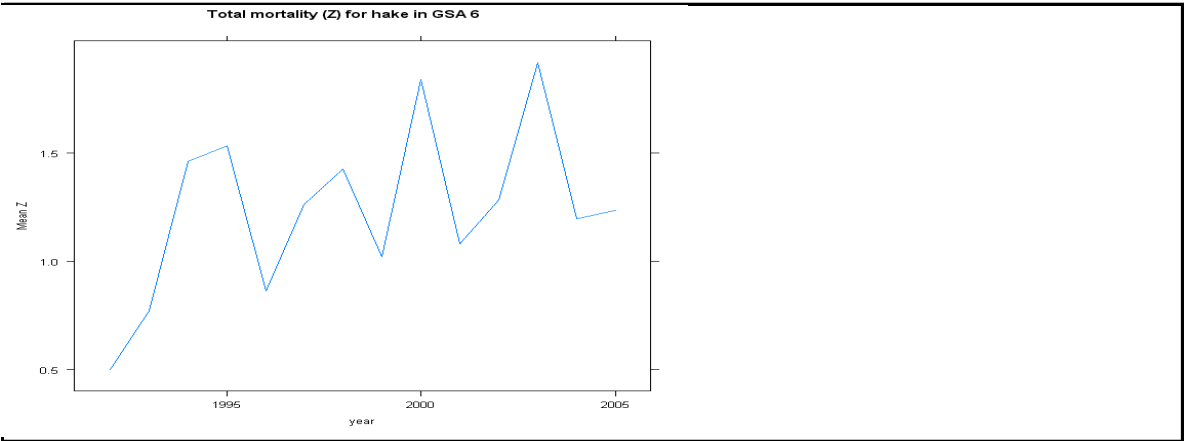
Population in figures



Population in biomass



Fishing mortality rates

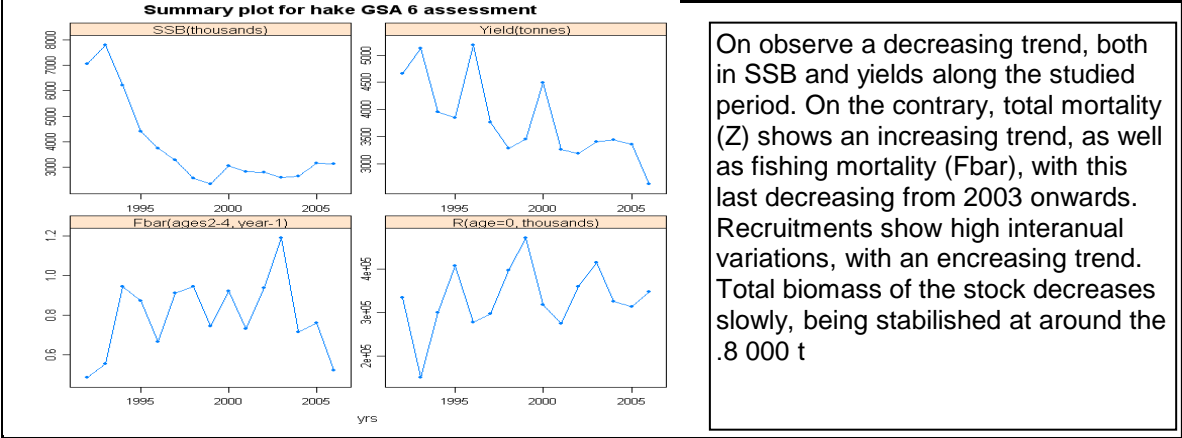


Code: HKE0607Gar

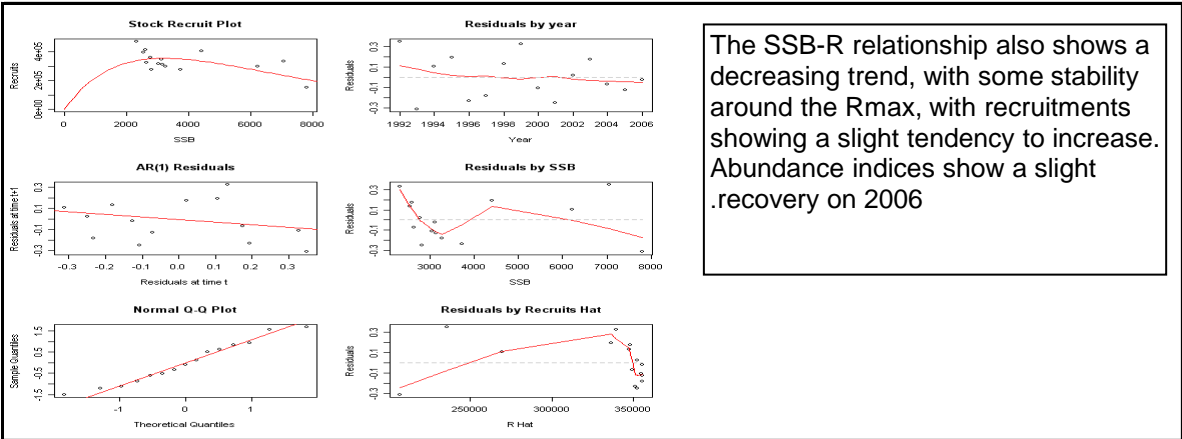
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|      |   |       |       |             |     |
|------|---|-------|-------|-------------|-----|
| Sex* | B | Gear* | Trawl | Analysis #* | XSA |
|------|---|-------|-------|-------------|-----|

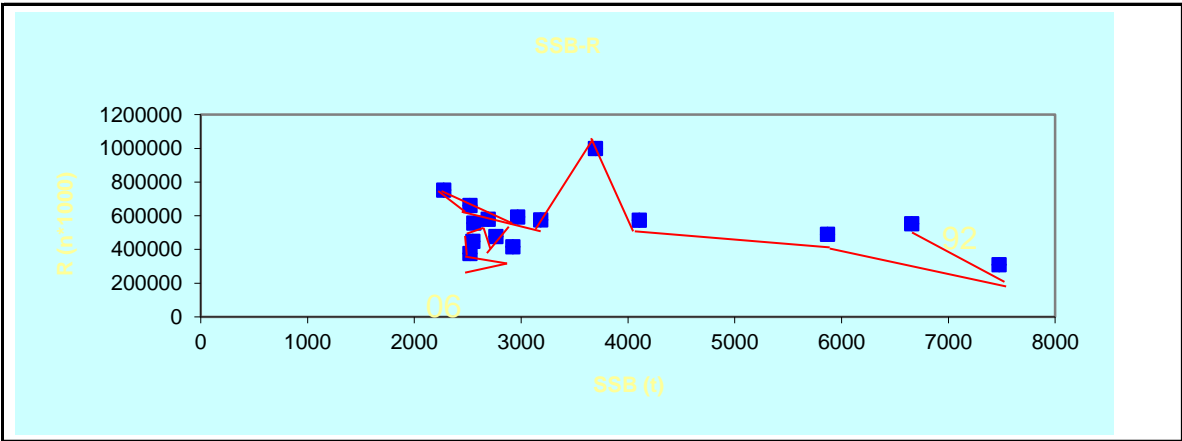
### Population in figures



### Population in biomass

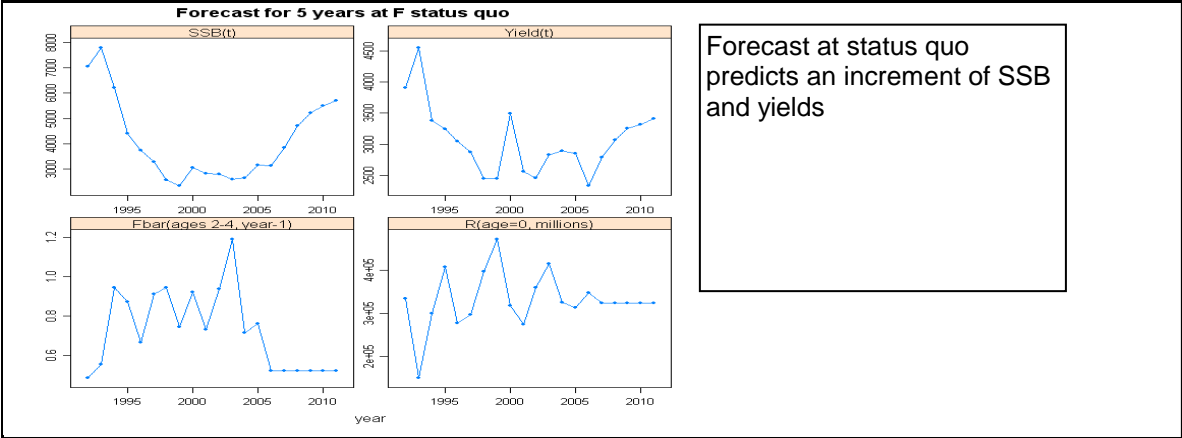


### Fishing mortality rates

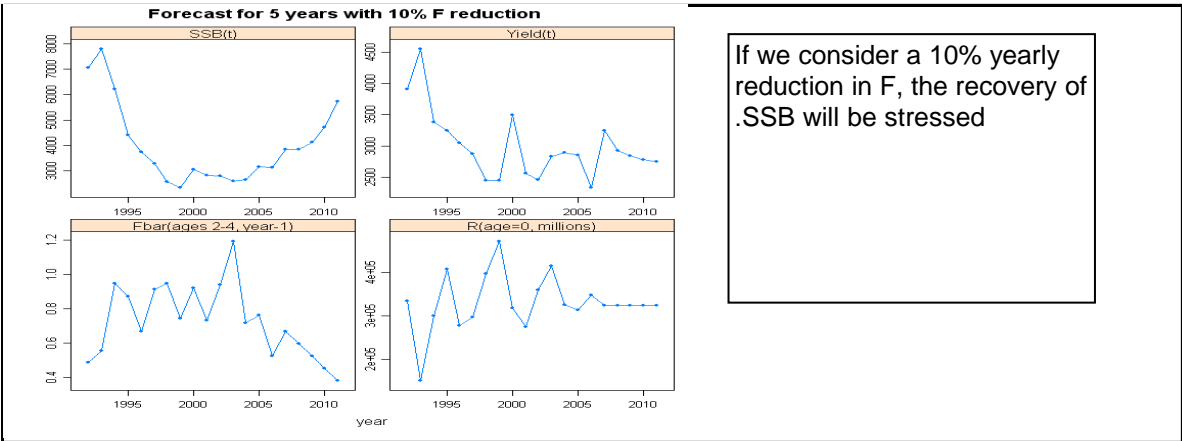


|      |   |       |       |             |     |
|------|---|-------|-------|-------------|-----|
| Sex* | B | Gear* | Trawl | Analysis #* | XSA |
|------|---|-------|-------|-------------|-----|

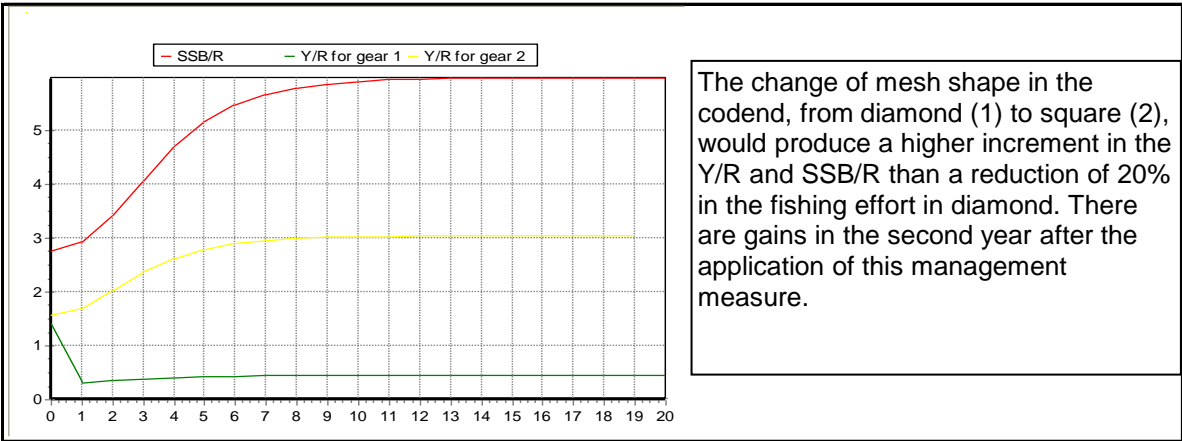
Population in figures



Population in biomass



Fishing mortality rates



| SAC GFCM - Subcommittee of Stock Assessment |                                   |
|---|-----------------------------------|
| Assessment form                             | Sheet A1<br>Indirect methods: Y/R |

|     |   |                  |            |     |
|-----|---|------------------|------------|-----|
| Sex | B | Code: HKE0607Gar | Analysis # | Y/R |
|-----|---|------------------|------------|-----|

|            |                      |          |     |
|------------|----------------------|----------|-----|
| # of gears | 2; Trawl and gillnet | Software | VIT |
|------------|----------------------|----------|-----|

### Parameters used

|          |  |
|----------|--|
| Vector F |  |
| Vector M |  |
| Vector N |  |
|          |  |
|          |  |

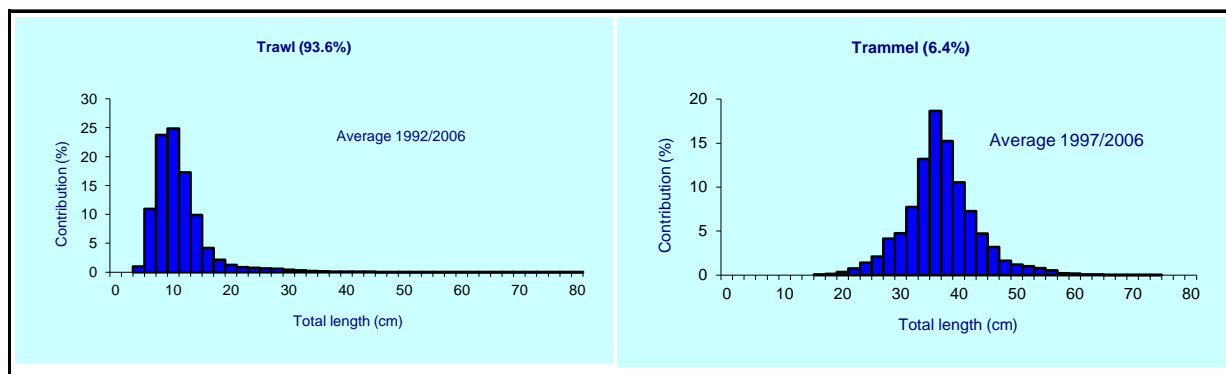
### Model characteristics

|                         |
|-------------------------|
| Calculated mean weights |
|-------------------------|

### Results

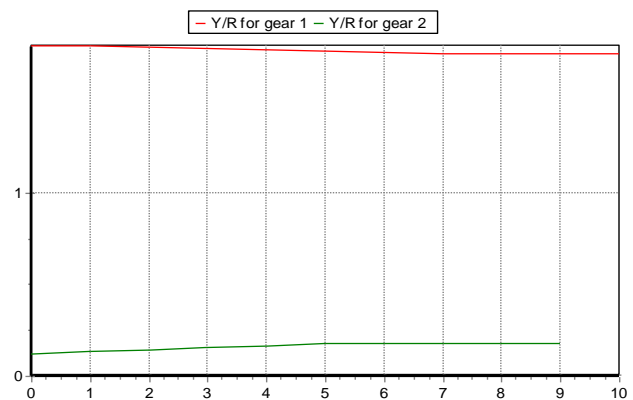
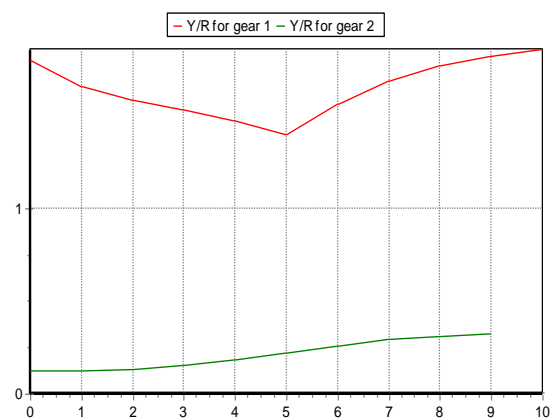
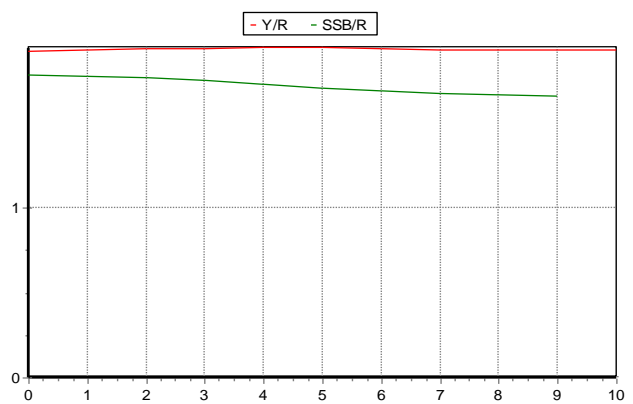
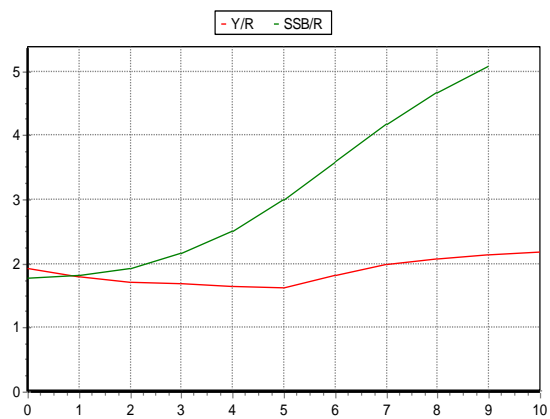
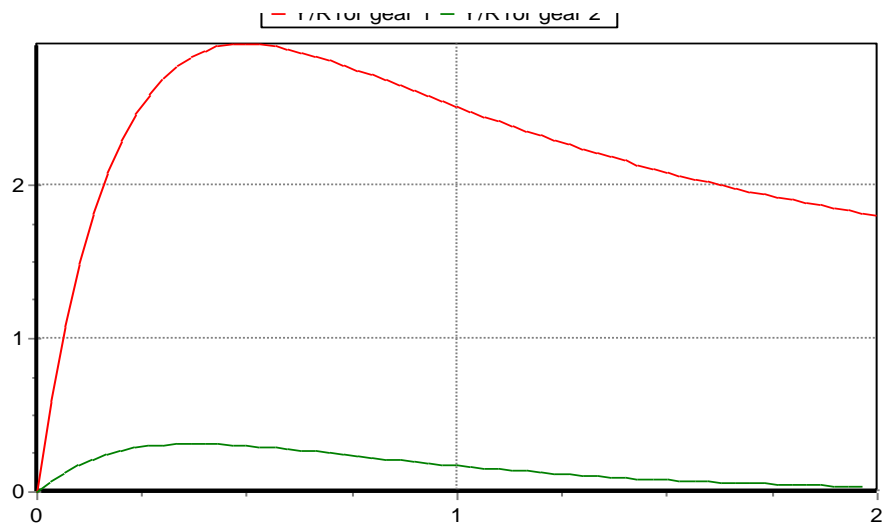
|                  | Total   | Gear  |         |  |  |
|------------------|---------|-------|---------|--|--|
|                  |         | Trawl | Gillnet |  |  |
| Current YR       | 2,684 g | 2,51  | 0,171   |  |  |
| Maximum Y/R      | 3,223 g | 2,915 | 0,308   |  |  |
| Y/R 0.1          | 3,106   | 2,793 | 0,313   |  |  |
| F <sub>max</sub> | 0,49    | 0,5   | 0,39    |  |  |
| F <sub>0.1</sub> | 0,34    |       |         |  |  |
| Current B/R      | 4,27    |       |         |  |  |
| Maximum B/R      | 14,18   |       |         |  |  |
| B/R 0.1          | 20,215  |       |         |  |  |
|                  |         |       |         |  |  |
|                  |         |       |         |  |  |
|                  |         |       |         |  |  |

### Comments



|  |  |
|--|--|
|  |  |
|--|--|

— Y/R for gear 1 — Y/R for gear 2



Transition analysis with 10% reduction of F in "trawl, with gillnet in "status quo"  
Increase of SSB from the second year. Yield

Transition analysis with 10% of increase of F in gillnet, with trawl in "status quo". Slight decrease of SSB, with no increase of Yields

# SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet other

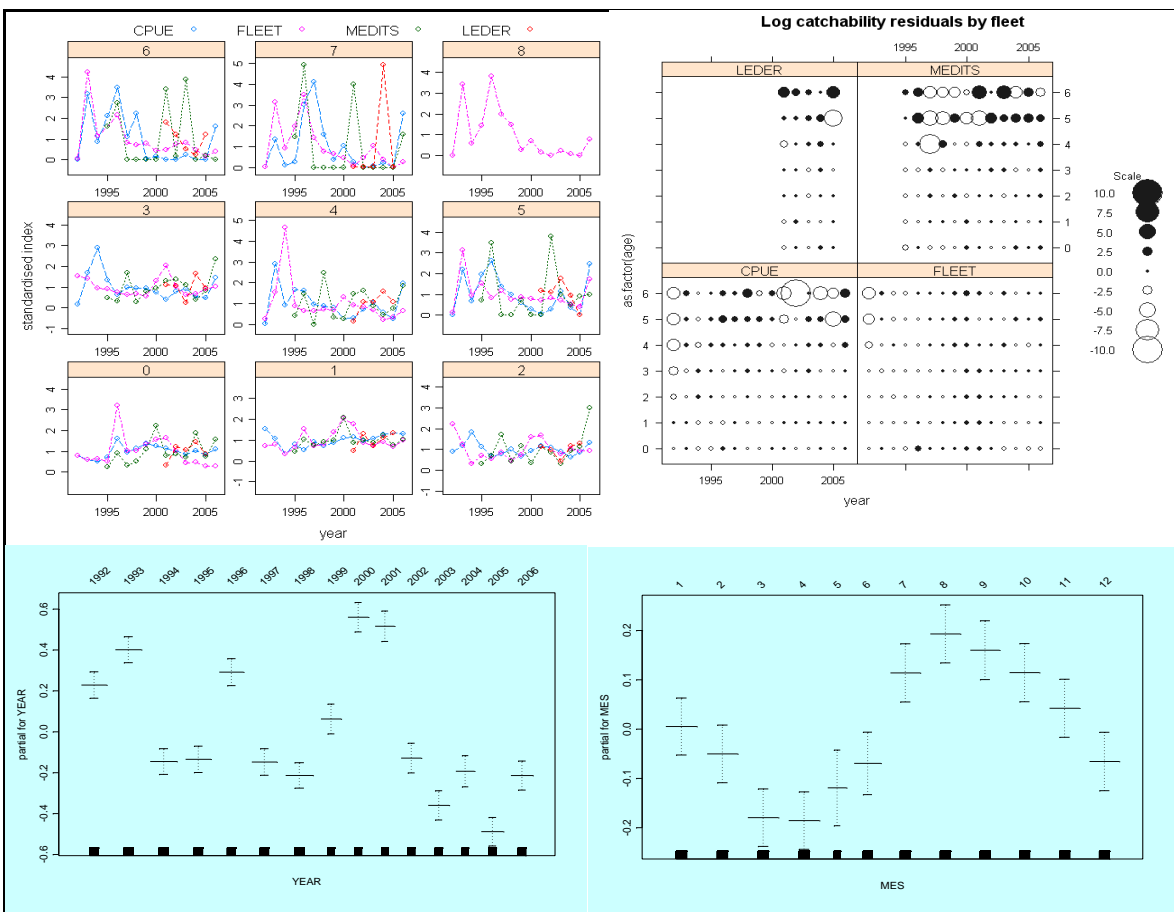
Code: HKE0607Gar

## Other assessment methods

Abundance Indices evolution:

Form left to right and from up to down:

- 1- Abundance indices by age and year of the four series used to calibrate VPA.
- 2- Log catchability by age and year.
- 3- Relative abundance by year: Standardised CPUEs from Santa Pola Fleet.
- 4- Relative abundance by month: Standardised CPUEs from Santa Pola Fleet.





# SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet D  
Diagnosis

Code: HKE0607Gar

## Reference points

| Criterion | Current value | Units  | Reference Point | Trend     | Comments   |
|-----------|---------------|--------|-----------------|-----------|--|
| B         | 8245          | t      | Bmean           | Decreasi  | Bnow is below Bmean (10116 t), ad is the actual Bloss                |
| SSB       | 2522          | t      | SSBmean         | Decreasi  | SSB now is below the SSBmean (3650 t), but over the SSBloss (2276 t) |
| F         | 0,81          |        | Fbar0-3         | increasin | Fnow is below Fmean (0.97) and over the Floss (0.72)                 |
| Y         | 2630          | t      | Ymean           | Decreasi  | Ynow is below Ymean (3807 t), ad is the actual Yloss                 |
| CPUE      | 34,64         | kg/day | CPUEmean        | Stable    | CPUEnow is similar to the CPUEmean (34.71 kg/day), and over the CPI  |
|           |               |        |                 |           |  |
|           |               |        |                 |           |  |
|           |               |        |                 |           |  |
|           |               |        |                 |           |  |

**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 | <b>Exploitation rate</b>         |                          | <b>Stock abundance</b>           |                          |
|               | <input type="radio"/>            | No or low fishing        | <input type="radio"/>            | Virgin or high abundance |
|               | <input type="radio"/>            | Moderate fishing         | <input type="radio"/>            | Depleted                 |
|               | <input checked="" type="radio"/> | High fishing mortality   | <input type="radio"/>            | Intermediate abundance   |
|               | <input type="radio"/>            | Uncertain / Not assessed | <input checked="" type="radio"/> | Low abundance            |

## Comments

The general results are similar to previous assessments. Exploitation is based mainly on classes 0 and 1, with immature fraction dominating the landings. On observe a decreasing trend, both in landings and yields along the studied period. On the contrary, Z shows an increasing trend, as well as Fbar, with this last decreasing from 2003 onwards. Current Y/R represents 83% of Y/Rmax, meanwhile B/R represents 30 % of the B/Rmax. Total biomass of the stock decreases slowly, being stabilised at around the 8 000 t. SSB-R relationship shows a decreasing trend. Recruitments showing a slight tendency to increase.

Abundance indices show a slight recovery on 2006. Forecast at status quo predicts an increment of SSB and yields. If we consider a 10% yearly reduction in F, the recovery of SSB will be stressed.

Consider a 10% yearly reduction in effort, the recovery of SSB will be achieved.

Changes in cod end mesh geometry, result effectiveness than effort reductions. Only a change of mesh shape in the cod end would result in a significant increment in the Y/R and SSB/R. If this management measure were 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.

It can be concluded that the resource is over-exploited (growth over-fishing), with a risk of recruitment over-exploitation, that seems to be prevent in the forecast. 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 not to increase fishing mortality at all, both for trawl as well as for artisanal, being accompanied by a change in the cod end mesh type, being recommended a yearly 10% reduction of effort to ensure the forecasted increment in SSB.

## SAC GFCM - Subcommittee of Stock Assessment

Assessment form

Sheet Z

Objectives and recommendations

Code: HKE0607Gar

### Management advice and recommendations\*

- Reduce 20% effort of trawl
- Improve fishing exploitation pattern using the 40 mm square mesh for bottom trawls
- Not to increase the effort in the small-scale fishery

**Abstract for SCSA reporting**

|                                |  |             |      |
|--------------------------------|--|-------------|------|
| <b>Authors</b>                 | García-Rodríguez* M., J. L.                                  | <b>Year</b> | 2007 |
| <b>Species Scientific name</b> | Merluccius merluccius - HKE<br>Source: GFCM Priority Species |             |      |
| <b>Geographical Sub-Area</b>   | 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 647 vessels along the GFCM geographical sub-area Northern SPAIN (GSA-06). In last years, the annual landings of this species, which are mainly composed by juveniles living on the continental shelf, were situated around 3800 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 1992-2006 by means of a VPA Separable, tuned with standardised CPUE from commercial fleet and abundance indices from two trawl surveys. Analysis was carried out applying the Extended Survivor Analysis (XSA) method (Lowestoft suite; Darby and Flatman, 1994; Fisheries Library in R) over the period 1992-2006. In addition, a yield-per-recruit (Y/R) analysis (VIT program; Leonart and Salat, 1992) was applied on the mean pseudo-cohort 1992-2006 for the GFCM geographical sub-area Northern Spain (GSA-06).

Both methods 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). Transition analysis was also made to simulate different management strategies for the improvement of the state of this resource. In this assessment, a new set of parameters (fast growth hypothesis) 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

High fishing mortality

#### Stock abundance

Low abundance

#### Comments

The general results are similar to previous assessments. Exploitation is based mainly on classes 0 and 1, with immature fraction dominating the landings. On observe a decreasing trend, both in landings and yields along the studied period. On the contrary, Z shows an increasing trend, as well as Fbar, with this last decreasing from 2003 onwards. Current Y/R represents 83% of Y/Rmax, meanwhile B/R represents 30 % of the B/Rmax. Total biomass of the stock decreases slowly, being stabilised at around the 8 000 t. SSB-R relationship shows a decreasing trend. Recruitments showing a slight tendency to increase.

### Management advice and recommendations\*

- Reduce 20% effort of trawl
- Improve fishing exploitation pattern using the 40 mm square mesh for bottom trawls
- Not to increase the effort in the small-scale fishery