# Stock Assessment Form

## Demersal species

Assessment of the Deep sea rose shrimp *Parapenaeus longirostris* of GSA 03.

**Reference year: 2019**

**Reporting year: 2021**

ABSTRACT: This document summarises the data used, methods adopted and the results of the stock assessment carried out during the GFCM working group on demersal species; this work is a new work carried out in 2021. The assessment was performed using catch, CPUE from 2003 to 2019 (global dynamic model: Biodyn). Current fishing mortality and exploitation pattern were assessed using length frequency distributions (LCA) of 2017 to 2019 as well as the average 2017-2019 catches and yield per recruit. Analyses were performed, raised to the total landings in the GSA 03. The results are discussed in the view of a new assessment, in order to provide some elements for scientific advice to the national fisheries exploiting *P. longirostris* in the GSA 03 area.

**Stock Assessment Form version 1.0 (January 2014)**

Uploader: *Said Benchoucha*

## Stock assessment form

## 1 Basic Identification Data

| Scientific name: | Common name: | ISCAAP Group: |
|---|---|---|
| Parapenaeus longirostris | Deep sea rose shrimp | 45 |
| **Geographical sub-area:** | **2th Geographical sub-area:** | **3th Geographical sub-area:** |
| [Southern Alboran Sea GSA_3] | | |
| **4th Geographical sub-area:** | **5th Geographical sub-area:** | **6th Geographical sub-area:** |
| | | |
| **Country** | **2nd Country** | **3rd Country** |
| [MOROCCO] | | |
| **4th Country** | **5th Country** | **6th Country** |
| | | |
| **Stock assessment method: (indirect)** | | |
| Biodyn - LCA and Y/R | | |
| **Authors:** | | |
| [Authors]<br><br>*BENCHOUCHA* Said[1], *SETTIH* Jamal[2] *and HERNÁNDEZ, Pilar*[3] | | |
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## 2 Stock identification and biological information

### *2.1 Stock unit*

The assessment covers the complete stock unit in the GSA03 (Southern Alboran Sea).

### *2.2 Growth and maturity*

Size at first maturity (Tableau 2.2.1), natural mortality (M) (table 2.2.2) calculated by INRH in 2019 and growth parameters (table 2.2.3) estimated by Garcia *et al* (2009), were used to run the stock assessment.

*Table 2.2-1: Maximum size, size at first maturity and size at recruitment.*

| **Somatic magnitude measured LC (mm)** | | | | **Units** | |
|---|---|---|---|---|---|
| **Sex** | **Fem** | **Mal** | **Combined** | **Reproduction season** | All year: with peak in winter and autumn. |
| **Maximum size observed** | 40 | 37 | 40 | **Recruitment season** | |
| **Size at first maturity** | 22,10 | | | **Spawning area** | Shelf and upper slope |
| **Recruitment size to the fishery** | | | 10 | **Nursery area** | Continental shelf |

Table 2.2.2. M used (Combined Males-Females).

M = 0.8 (**)

**Natural mortality (Thomson and Bell, in FAO 1988)

Table 2-3: Growth and length weight model parameters

| | | | Sex | | | |
|---|---|---|---|---|---|---|
| | | **Units** | **female** | **male** | **Combined** | **Years** |
| **Growth model** | **$L_\infty$** | mm | | | 45 | |
| | **K** | $Y^{-1}$ | | | 0.39 | |
| | **$t_0$** | $Y^1$ | | | -0.1019 | |
| | **Data source** | García et *al*. 2009 GSA-01 | | | | |
| **Length weight relationship** | **a** | | | | 0.0019* | |
| | **b** | | | | 2.6113* | |
| | **M** (scalar) | | | | 0.8 (Thomson and Bell, in FAO 1988) | |
| | **sex ratio** (% females/total) | 0.46 (Fem/Mal+Fem) | | | | |

## 3 Fisheries information

### *3.1 Description of the fleet*

**. Description of the fleet**

- **Morroco (GSA 03)**

The trawl fishing fleet in Moroccan GSA 03 is heterogeneous. *Parapenaeus longirostris* in GSA 03 is found at depths ranging from 100 to 360 m. In the period 2017-2019, the mean annual *Parapenaeus longirostris* production was 326 tons and the mean fishing effort was 8118 fd.

Commented [A1]: Please, Said, update this value to 2017 and also in the paragraph below

In 2019, the number of trawlers targeting *Parapenaeus longirostris* in GSA 03 was 83 with an average engine power of 230 HP and a mean GRT of 50 Tx (table 3.1).

Table 3-1. Segment fleet characteristics in Moroccan GSA 03. (Average (years))

| Mediterranean sea | Number of trawlers | Mean HP | Mean GRT |
|---|---|---|---|
| Total 2019 | 83 | 230 | 50 |

*Table 3-1: Description of operational units exploiting the stock*

| | Country | GSA | Fleet Segment | Fishing Gear Class | Group of Target Species | Species |
|---|---|---|---|---|---|---|
| **Operational Unit 1** | [MOR] | [GSA03] | [E-Trawl 12-24 m] | 03-Trawls | [34 – Demersal slope species] | DPS |
| **Operational Unit 2** | | | | | | |
| **Operational Unit 3** | | | | | | |

*Table 3.1-2: Catch, bycatch, discards and effort by operational unit in the reference year*

| Operational Units | Fleet (n° of boats Average 2017-2019) | Catch (T of the species assessed Average 2017-2019) | Other species caught (names and weight) | Discards (species assessed) | Discards (other species caught) | Effort (units) Average 2017-2019 |
|---|---|---|---|---|---|---|
| [03-Trawls-GSA04] | 90 | **326** | | | | 8118 |
| **Total** | | 326 | | | | |

Landings are made at 4 fishing ports: Beni Nsar (Nador), Al Hoceima, M'diq and Tangier.

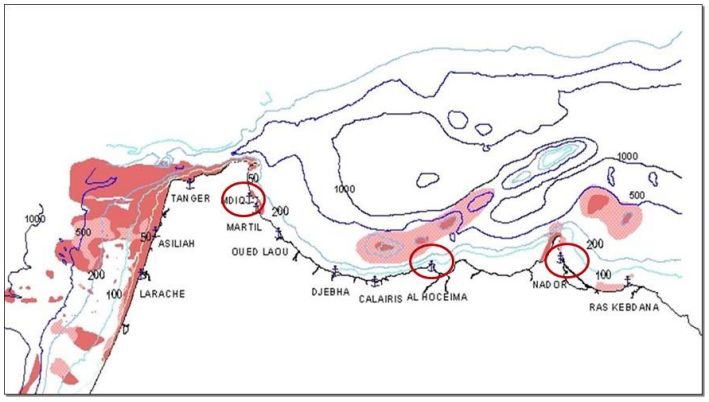



Figure 3-1-1: Main landing ports in the GSA 03.

The fishing areas for the trawlers operating since M'diq port are between Fnideq and Jebha, at depths between 70 and 360 m. For Nador trawlers, the operate between Saidia and Jebha, at depths from 68 to 470 meters. And for Al-Hoceima trawlers, the limits of their operating are from Sidi Hssaine in the Est to Jebha in the West at depths from 18 to 200 meters.

This fleet is a multi-specific and targets shrimps in association with other groups of fishes. The deep water pink shrimp represent only 5% of the total landing. All the units are in wood with a men length of 22 m and with a mode of a conservation withs glace.

This fleet use many types of trawls but the most common trawls are:

- 2 meters vertical open trawl, used to catch benthic species like soles, *octopus* and shrimps;

5 meters vertical open trawl, used to catch benthic and semi-pelagic species.

### *3.2 Historical trends*

**GSA 03**

Deep-water rose shrimp (*Parapenaeus longirostris*) is one of the main crustacean species for trawl fisheries in the GFCM geographical sub-area southern Alboran Sea (GSA03). It is an important component of landings. In 2019, the coastal trawlers landed 73 commercial species. *Parapenaeus longirostris* is the Tirth landed species after *Octopus vulgaris* and *Trachurus trachurus* (figure 3-2-1).

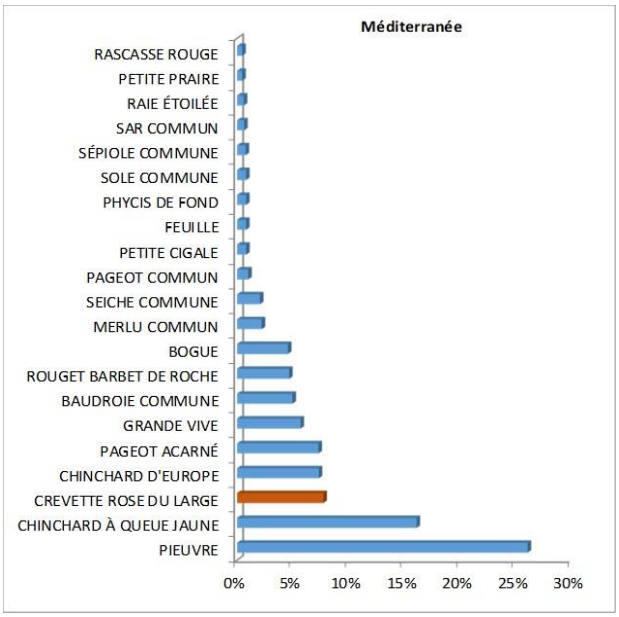



Figure 3-2-1: Main trawlers landing species in the GSA 03.

Trend in catch of deep-water rose shrimp (DPS) of the Moroccan trawl fleets since 2003 is shown in Figure 3-2-2. The catch in GSA 03 showed a sharp decrease from 2003 to 2007 followed by an increase until 2012. Since 2013, the catches showed a fluctuation with a decrease trend till 2015 followed by a small increase and stability for the last 3 years (figure 3-2-2).

The fishing effort followed the same trend: It showed a decrease from 2003 to 2006 followed by an increase until 2012. Since 2013, the fishing effort decreased with some fluctuations till 2014 followed by a small increase and stability for the last 3 years (figure 3-2-3).

The CPUE showed the same the same trend: It showed a decrease from 2003 to 2007 followed by an increase until 2012. Since 2013, the fishing effort decreased with some fluctuations till 2016 followed by a small increase and stability for the last 3 years (figure 3-2-4).

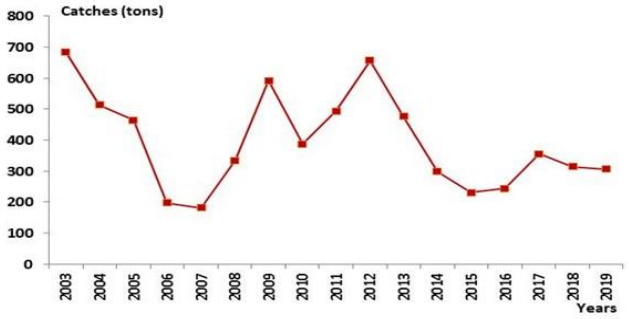



Figure 3-2-2: Trend of the landing of *Parapenaeus longirostris* of GSA 03.

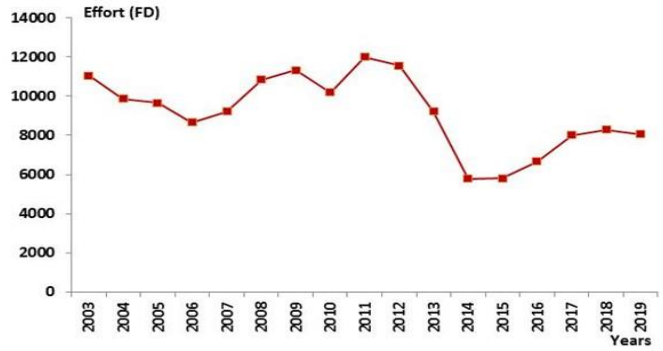



Figure 3-2-3: Trend of *Parapenaeus longirostris* fishing effort (Fd) in the GSA 03.

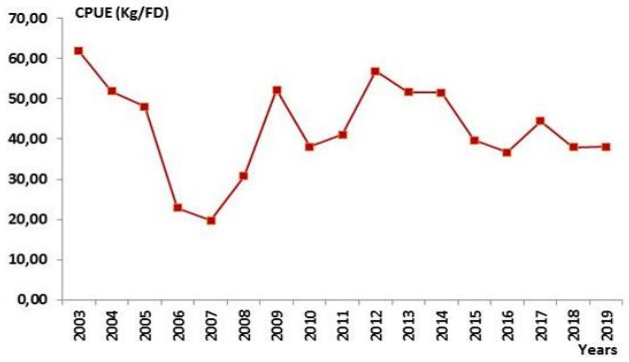



Figure 3-2-4: *Parapenaeus longirostris* CPUE in the GSA-03.

**Commented [A2]:** Please confirm the average number of trawlers for 2011-2017 . The map for MEDITS 2017 should be moved to page 15 when you talk about the surveys. in page

### *3.3 Management regulations*

**In GSA03**

The Regulations in force and degree of observance of regulations in GSA 03 are listed below:

- Fishing licence: Fully observed
- Trawl mesh size: ≥50 mm (mesh stretched).
- Minimum landing size = 20 mm.
- Interdiction of fishing under 1,5 nautical miles in the area between Tangier (Cap Spartel) and Al HOCEIMA.

**Commented [A3]:** Is this correct? Cmm or mm?

### *3.4 Reference points*

*Table 3.3-1: List of reference points and empirical reference values previously agreed (if any)*

| Indicator | Limit Reference point/empirical reference value | Value | Target Reference point/empirical reference value | Value | Comments |
|---|---|---|---|---|---|
| **B** | | | | | |
| **SSB** | | | | | |
| **F** | | | | | |
| **Y** | | | | | |
| **CPUE** | | | | | |
| **Index of Biomass at sea** | | | | | |

# 4 Fisheries independent information

## *4.1 National surveys*

### 4.1.1 Brief description of the direct method used

The Moroccan demersal surveys "CAI" are a trawl surveys carried out from 1983 to 2019 in the whole GSA 03. 05 stat are covered from 20 to 800 meters depth. The gear used is a national gear with a 40 mm cod-end mesh size (table 4-1-1). 10 shrimp species are catched during these surveys (figure 4-1-1). The spatial distribution of the abundance indexes (kg/h) for *Parapenaeus longirostris* showed a high variability following the seasons (figure 4-1-2).

***Direct methods: trawl-based abundance indices***

*Table 4.1-1: Trawl survey basic information in GSA 03*

| | | | |
|---|---|---|---|
| **Survey** | National | **Trawler** | |
| **Sampling season** | January, July and December 2019 | | |
| **Sampling design** | 05 strata: 20-50,51-100,101-200,201-500,500-800; | | |
| **Sampler (gear used)** | National trawl | | |
| **Cod-end mesh size as opening in mm** | 40 mm of mesh opening | | |
| **Investigated depth range (m)** | 20-800 | | |

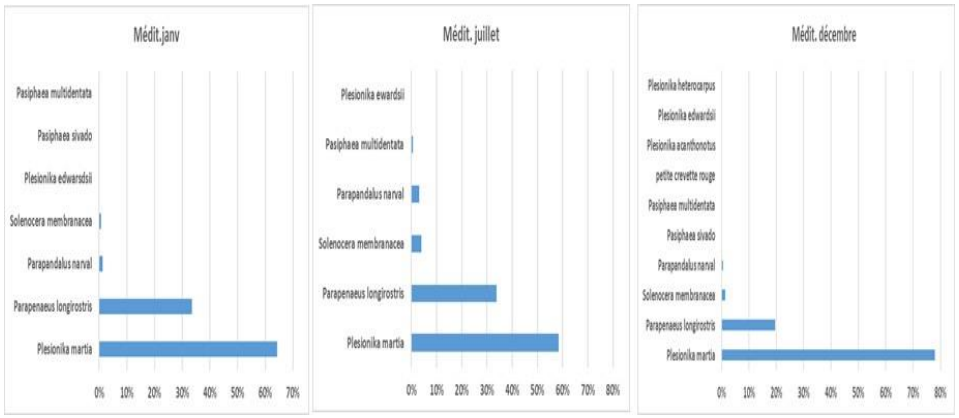



Figure 4-1-1: Shrimp species catched during the national surveys in the GSA 03 in 2019.

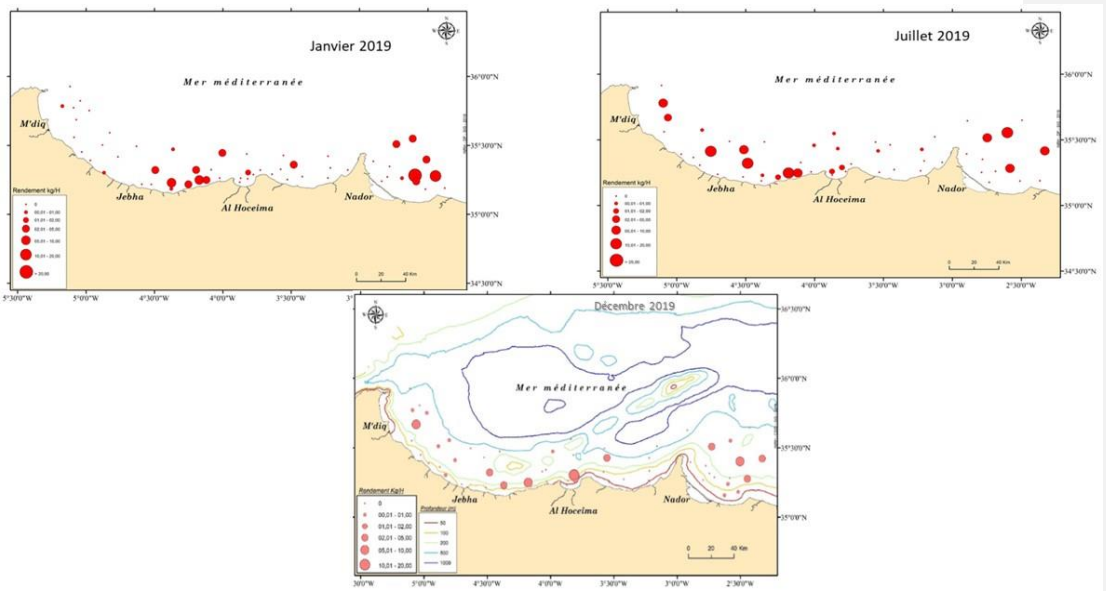



Figure 4-1-2: Abundance's index (Kg/h) of *Parapenaeus longirostris* from the 3 trawl surveys in the GSA 03 in 2019.

The abundance Indexes (kg/h) of *Parapenaeus longirostris* in GSA 03 showed some fluctuations from 2003 to 2019 with high value observed in 2011 followed by a sharp decrease till 2019 (figure 4-1-3).

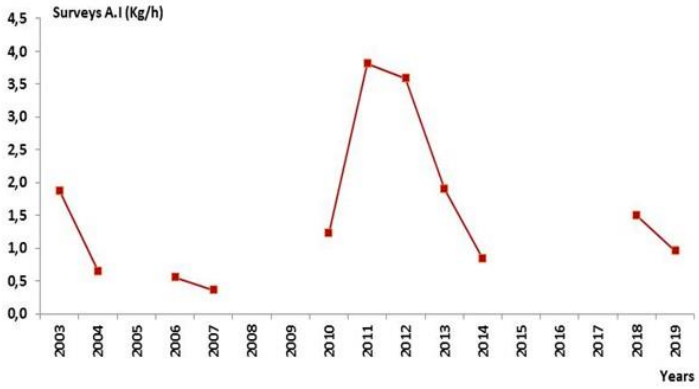



Figure 4-1-3: Trend of abundance Indexes (kg/h) of *Parapenaeus longirostris* in GSA 03.

## 5 Stock Assessment

### 5.1. Pseudo-cohort analyses by VIT 1.3

Regarding available data provided by the expert, the working group decided to run a stock assessment of the deep sea rose shrimp *Parapenaeus longirostris* of GSA 03 using a dynamic global model (Biodyn) and a pseudo-cohort analysis of three years (2017 to 2019) using LCA and yield per recruit both performed by Pedro De Barros (CECAF, 2017).

Biological input for the Biodyn are catches and CPUES for the Moroccan trawl coastal fleet for the period 2003-2019 and the average of the length landing frequencies from 2017 to 2019.

The natural mortality (M) and the length-weight relationship shown in table 4.1.1 were accepted by the working group.

**Model assumption**

For the pseudo-cohort analyses the data used are:

- For the Biodyn: Landings and CPUES time series 2003-2019 (official landings for Morocco).
- For LCA and Y/R: Catch at length data for the Moroccan trawl fleet for the tome series 2017-2019.
- M fixed value.

#### 5.1.1 Input data and Parameters

- Landings and CPUES time series 2003-2019 for the Biodyn.
- Catch at length data for the Moroccan trawl fleet for the tome series 2017-2019.
- M fixed value.
- Length-weight relationship $P= 0.0019 * L^{2.611}$
- For the LCA, the length frequencies series (2017-2019) were used for the LCA (Length Composition Analysis). The fishing mortality by size classes were done by the model and the yield per recruit (YPR) were used to define the biological reference points of the stock.

INPUT parameters

Table 4.1.1. Biological parameters used for deep water rose shrimp in GSA 03.

| | | | Sex | | | |
|---|---|---|---|---|---|---|
| | | Units | female | male | Combined | Years |
| Growth model | $L_\infty$ | | | | 45 | |
| | K | | | | 0.390 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | $t_0$ | | | | 0.101 | |
| | **Data source** | | | | | |
| **Length weight relationship** | **a** | | | | 0.0019 | |
| | **b** | | | | 2.611 | |
| | **M** (scalar) | | | | 0.8 | |
| | **sex ratio** (% females/total) | 0.46 (Fem/Mal+Fem) | | | | |

### 5.1.2 Results

**First model: Biodyn**.

| Stock | Méthode | B2019/Bmsy | B2019/B0.1 | F2019/Fmsy | F2019/F0.1 | F2019/Fsys2019 | Statut 2018 | Statut 2019 |
|---|---|---|---|---|---|---|---|---|
| Crevette rose de Méditerrannée (Parapenaeus longirostris) | Biodyn COPACE (CPUEs Chalutiers côtiers) | 92% | 84% | 41% | 45% | 38% | Pleinement exploité | Pleinement exploité |

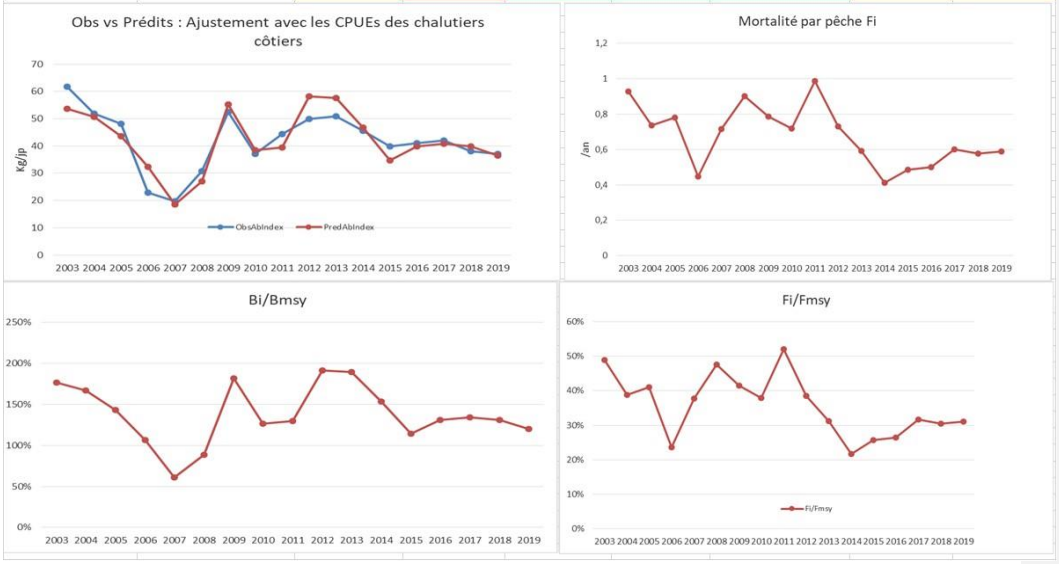
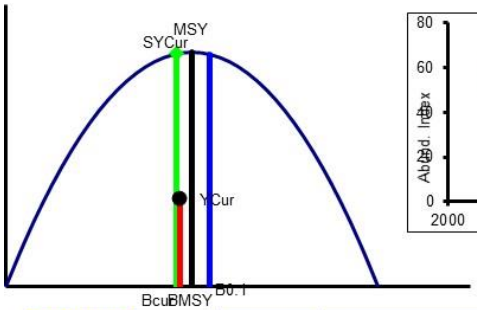
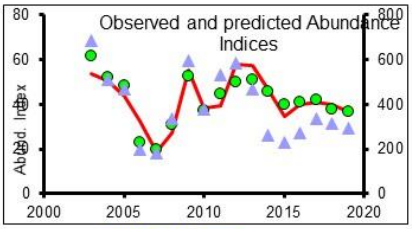



Figure 5-1-2-1: Adjustment of the model with the data used and some results of the Biodyn.




| Quality of fit | |
|---|---|
| Disagreement | 249261,4433 |
| RpearsonIndex | 0,901084547 |

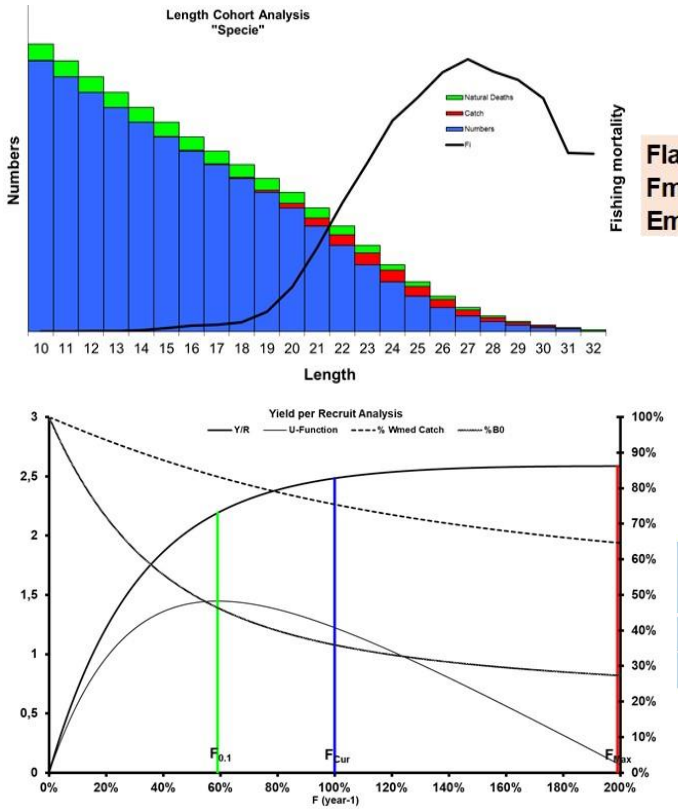
| Stock Parameters | |
|---|---|
| MSY | 790 |
| BMSY | 416 |
| B0.1 | 458 |
| Cur_Stock | 383 |
| B/BMSY | 92% |
| B/B0.1 | 84% |
| Cur_SustProd | 785 |
| Cur_PercProd | 99% |
| CurY | 295 |
| FMSY | 1,90 |
| F0.1 | 1,71 |
| FCur | 0,77 |
| Fcur/FMSY | 41% |
| Fcur/F0.1 | 45% |
| FSYCur | 2,05 |
| Fcur/FSYCur | 38% |
| DBCur | 490 |
| DBCur/Bcur | 128% |
| CurY/MSY | 37% |

| | Biodyn, 2019 | Biodyn, 2020 |
|---|---|---|
| Fcur | 0,78 | 0,77 |
| Fmsy | 1,88 | 1,90 |
| F0.1 | 1,69 | 1,71 |
| F/Fmsy | 42% | 41% |
| F/F0.1 | 46% | 45% |
| B0.1 | 4,54E+02 | 4,58E+02 |
| B/Bmsy | 98% | 92% |
| B/B0.1 | 89% | 84% |

Figure 5-1-2-2: Results of the Biodyn.

The ratio $B_{current}/B_{0.1}$ is 92% $B_{current}/B_{0.1}$ is 84% showing a situation of fully exploitation observed also in 2019 assessment.

**Second model: LCA and Y/R.**




| | |
|---|---|
| Flast | 1,362162 |
| Fmean | 1,345651 |
| Emean | 0,627153 |

| Points de référence | % |
|---|---|
| $F_{cur}/F_{0.1}$ | 169% |
| $F_{cur}/(F_{cur}+M)$ | 63% |

Figure 5-1-2-3: Results of the LCA and Yield per recruit of GSA 03 analysis.

The current fishing mortality ratio level ($F_{current}/F_{0.1}$) is 169%.

The analysis indicates that the diagramme of the exploitation generate a fishing mortality targeting sizes more than 23 mm carapace length corresponding to the adults. Thomson and Bell considering a natural mortality of 0.8 an-1. The results show a Fcurrent exceeding the F0.1 by 69% (Fcur/F0.1=169%). The situation of the surexploitation observed in 2018 is still persisting. The current fishing mortality $F_{current}$ is greater than the target fishing mortality $F_{0.1}$. The exploitation rate value is 0,63. These both values are showing that the stock status of the deep rose shrimp *Parapenaeus longirostris* in the GSA 03 is currently overfished (Figure 5-1-2-3).

***Explanation of codes***

**Trend categories**

1) N - No trend
2) I - Increasing
3) D – Decreasing
4) C - Cyclic

**Stock Status**

**Based on Fishing mortality related indicators**

1) **N - Not known or uncertain** – Not much information is available to make a judgment;
2) **U - undeveloped or new fishery** - Believed to have a significant potential for expansion in total production;
3) **S - Sustainable exploitation**- fishing mortality or effort below an agreed fishing mortality or effort-based Reference Point;
4) **IO –In Overfishing status**– fishing mortality or effort above the value of the agreed fishing mortality or effort-based Reference Point. An agreed range of overfishing levels is provided;

    **Range of Overfishing levels based on fishery reference points**

    In order to assess the level of overfishing status when $F_{0.1}$ from a Y/R model is used as LRP, the following operational approach is proposed:

    - If $Fc^*/F_{0.1}$ is below or equal to 1.33 the stock is in **($O_L$): Low overfishing**
    - If the $Fc/F_{0.1}$ is between 1.33 and 1.66 the stock is in **($O_I$): Iintermediate overfishing**
    - If the $Fc/F_{0.1}$ is equal or above to 1.66 the stock is in **($O_H$): High overfishing**

    *Fc is current level of F

5) **C- Collapsed**- no or very few catches;

**Based on Stock related indicators**

1) **N - Not known or uncertain:** Not much information is available to make a judgment
2) **S - Sustainably exploited:** Standing stock above an agreed biomass-based Reference Point;
3) **O - Overexploited**: Standing stock below the value of the agreed biomass-based Reference Point. An agreed range of overexploited status is provided;

    **Empirical Reference framework for the relative level of stock biomass index**

- **Relative low biomass:** Values lower than or equal to 33rd percentile of biomass index in the time series **($O_L$)**
- **Relative intermediate biomass:** Values falling within this limit and 66th percentile **($O_I$)**
- **Relative high biomass:** Values higher than the 66th percentile **($O_H$)**

4) **D – Depleted**: Standing stock is at lowest historical levels, irrespective of the amount of fishing effort exerted;
5) **R –Recovering:** Biomass are increasing after having been depleted from a previous period;

***Agreed definitions as per SAC Glossary***

***Overfished (or overexploited)*** *- A stock is considered to be overfished when its abundance is below an agreed biomass-based reference target point, like B0.1 or BMSY. To apply this denomination, it should be assumed that the current state of the stock (in biomass) arises from the application of excessive fishing pressure in previous years. This classification is independent of the current level of fishing mortality.*

***Stock subjected to overfishing (or overexploitation)*** *- A stock is subjected to overfishing if the fishing mortality applied to it exceeds the one it can sustainably stand, for a longer period. In other words, the current fishing mortality exceeds the fishing mortality that, if applied during a long period, under stable conditions, would lead the stock abundance to the reference point of the target abundance (either in terms of biomass or numbers)*