

## Fishery Report: *Chamsocephalus gunnari* Heard Island (Division 58.5.2)

### 1. Details of the fishery

#### 1.1 Reported catch

5.243 The trawl fishery for *C. gunnari* in Division 58.5.2 has caught 51 tonnes from a catch limit of 292 tonnes in the 2003/04 fishing season (Conservation Measure 42-02). Historical reported catches along with the respective catch limits and number of vessels active in the fishery are shown in Table 5.55.

Table 5.55: Catch history for *Chamsocephalus gunnari* in Division 58.5.2 (source: STATLANT data available from 1972 to 2003; 2004 from catch and effort reports).

| Fishing season | Reported catch (tonnes) | Catch limit (tonnes) | Number vessels |
|----------------|-------------------------|----------------------|----------------|
| 1971/72        | 5 860                   |                      | *              |
| 1973/74        | 7 525                   |                      | *              |
| 1974/75        | 9 710                   |                      | *              |
| 1976/77        | 15 201                  |                      | *              |
| 1977/78        | 5 166                   |                      | *              |
| 1989/90        | 2                       |                      | *              |
| 1991/92        | 5                       |                      | *              |
| 1992/93        | 3                       |                      | *              |
| 1993/94        | 0                       |                      | *              |
| 1994/95        | 0                       | 311                  | *              |
| 1995/96        | 0                       | 311                  | *              |
| 1996/97        | 227                     | 311                  | 1              |
| 1997/98        | 115                     | 900                  | 3              |
| 1998/99        | 2                       | 1 160                | 1              |
| 1999/00        | 137                     | 916                  | 2              |
| 2000/01        | 1 136                   | 1 150                | 2              |
| 2001/02        | 865                     | 885                  | 2              |
| 2002/03        | 2 345                   | 2 980                | 2              |
| 2003/04        | 51                      | 292                  | 2              |

\* No information

#### 1.2 IUU catch

5.244 There was no evidence of IUU activity in this fishery.

#### 1.3 Size distribution of the catches

5.245 Catch-weighted length frequencies from observer, fine-scale and STATLANT data are presented in Figure 5.22 for 1996/97 to 2003/04. These plots include data from both the commercial fishery and research trawl surveys.

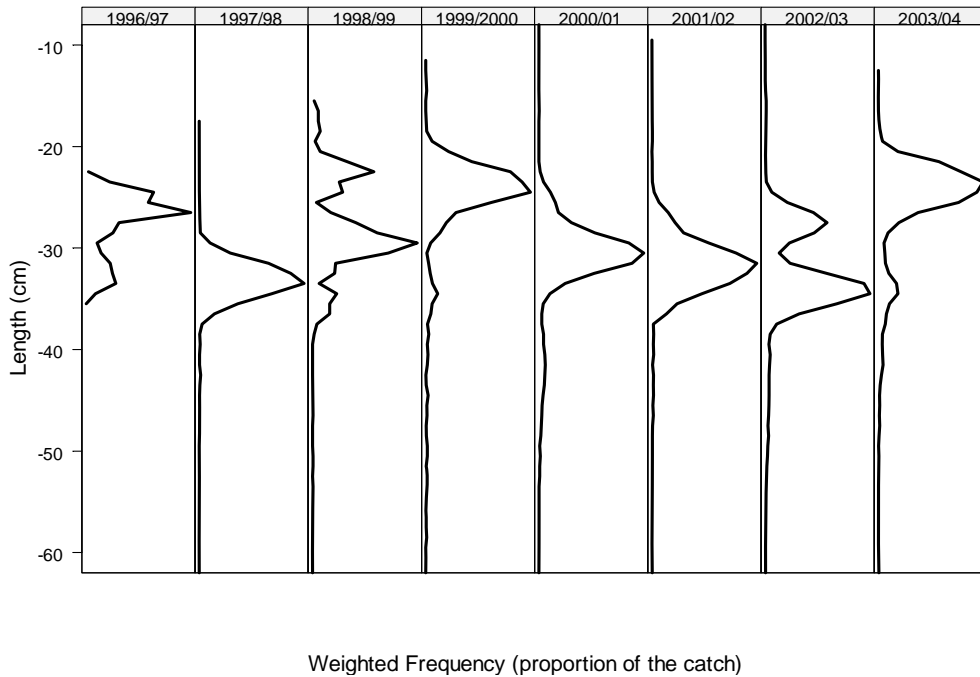


Figure 5.22: Catch-weighted length frequencies for *Champsocephalus gunnari* in Division 58.5.2 derived from observer, fine-scale and STATLANT data reported by 6 October 2004.

## 2. Stocks and areas

5.246 Within Division 58.5.2 this species is restricted to the shelf area in the vicinity of Heard Island in water generally shallower than 500 m. Previous analyses indicate that stocks on the Heard Plateau and Shell Bank have different size structure and recruitment patterns. The Working Group agreed that in light of this the two areas should be treated as separate stocks for assessment purposes (WG-FSA-97). *C. gunnari* have been absent or present in very low abundances on Shell Bank over recent years. Due to their low abundance observed in the current year, no assessment has been conducted for the Shell Bank stock for the 2004/05 season.

## 3. Parameter estimation

### 3.1 Estimation methods

#### Standing stock

5.247 The results of a bottom trawl survey were briefly summarised in WG-FSA-04/77. This had been undertaken according to the same design as in previous surveys for this region. Estimates of standing stock biomass were made using the bootstrap procedure.

### Population structure

5.248 The distribution of densities at age was derived using the CMIX program and fixing the mean length for ages 4 and 5 (Table 5.56). The Working Group noted that the 2004 Australian bottom trawl survey had sampled a large cohort corresponding to age 2+ fish. It is evident that the very strong year class present in the 2003 survey as 1+ fish and in the 2002 juvenile *C. gunnari* survey, has now entered the fishery and dominates the population structure in 2004 (Figure 5.23). This is consistent with the prediction from the 2003 assessment. Details of the fit are presented in Table 5.57.

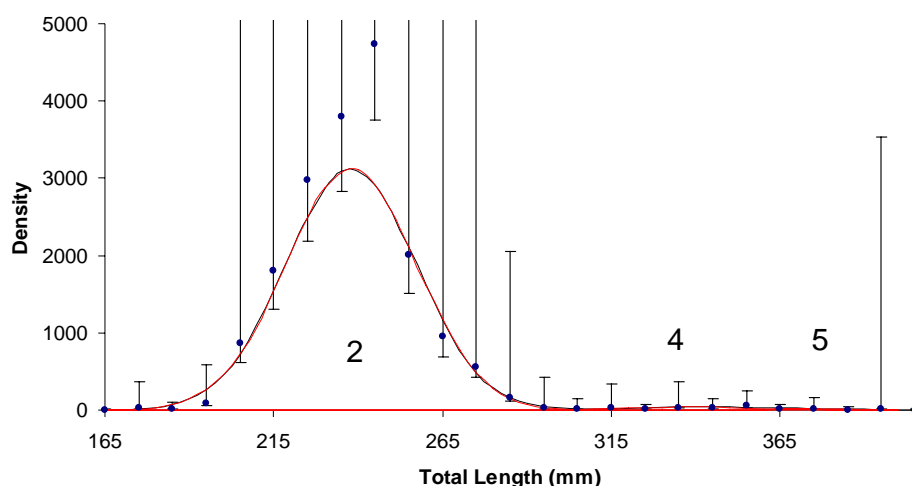


Figure 5.23: Size distribution of *Champsocephalus gunnari* from the 2004 bottom trawl survey in Division 58.5.2 with 95% confidence interval.

Table 5.56: Input parameters for the CMIX analysis of *Champsocephalus gunnari* length density in Division 58.5.2.

| Parameter  | Value   |
|--|---|
| Size range included                              | 160–410 mm  |
| Means (no VBGF)                                  | Age 2: (214–251 mm)<br>Age 4: 339 mm (fixed)<br>Age 5: 372 mm (fixed) |
| Standard deviations related linearly to the mean | Yes   |
| Bounds on intercept (start, step)                | 1, 50 (15, 1.0)   |
| Bounds on slope (start, step)                    | 0.0, 0.4 (0.07, 0.01)   |
| No. function calls                               | 1 000   |
| Reporting frequency                              | 100   |
| Stopping criteria                                | 1E-6  |
| Freq. for convergence testing                    | 5   |
| Simplex expansion coefficient                    | 1   |

Table 5.57: Results generated from CMIX analyses for *Champocephalus gunnari* in Division 58.5.2.

|   | Comp. 1  | Comp. 2 | Comp. 3 |
|---|----------|---------|---------|
| Mean length (mm)                          | 238      | 339     | 372     |
| Standard deviations (mm)                  | 19.0     | 19.0    | 19.0    |
| Total density (numbers km <sup>-2</sup> ) | 15 072   | 185     | 42      |
| SD of component density                   | 6 027    | 87      | 42      |
| Sum of observed densities =               | 18 242.7 |         |         |
| Sum of expected densities =               | 15 298.1 |         |         |
| Intercept =                               | 18.99    |         |         |
| Slope =                                   | 0.0      |         |         |

5.249 The Working Group raised a point of concern over the large size distribution of age 2+ fish (200–280 mm), and the complete lack of age 3+ fish within the population. The observed distribution was consistent with previous analyses of cohort structure that indicated few age 2+ in the population during 2003 (WG-FSA-03/32).

#### Other parameters

5.250 There were no changes to other parameter values.

### **3.2 Parameter values**

#### Fixed parameters

5.251 The fixed parameters remain unchanged from previous assessments (Table 5.58).

Table 5.58: Fixed parameters used in the 2004 assessment of *Champocephalus gunnari* in Division 58.5.2.

| Component         | Parameter             | Value     | Units           |
|-------------------|-----------------------|-----------|-----------------|
| Natural mortality | <i>M</i>              | 0.4       | y <sup>-1</sup> |
| VBGF              | <i>K</i>              | 0.323     | y <sup>-1</sup> |
| VBGF              | <i>t</i> <sub>0</sub> | 0.275     | y               |
| VBGF              | <i>L</i> <sub>∞</sub> | 457       | mm              |
| Length to mass    | ' <i>a</i> '          | 2.629E-10 | kg/mm           |
| Length to mass    | ' <i>b</i> '          | 3.515     |                 |

#### Standing stock

5.252 Similar to last year, an estimate of standing stock biomass was calculated using the bootstrap procedure. The area of seabed sampled, and an estimate of the one-sided lower 95% CI of biomass was calculated (Table 5.59).

Table 5.59: Seabed areas within three geographic strata used to bootstrap estimates of biomass.

| Nominal date of survey – 12 May 2004 |                           |                                |                  |                                 |
|--------------------------------------|---------------------------|--------------------------------|------------------|---------------------------------|
| Survey strata                        | Locality and depth range  | Seabed area (km <sup>2</sup> ) | Biomass (tonnes) | One-sided lower 95% CI (tonnes) |
| 1                                    | Gunnari Ridge             | 520.7                          | 17 270           | 5 956                           |
| 2                                    | Plateau southeast         | 10 620                         | 6 327            | 331                             |
| 3                                    | Plateau west              | 10 440                         | 250              | 108                             |
| <b>Totals</b>                        | Plateau and Gunnari Ridge | 21 581                         | 23 847           | <b>8 982*</b>                   |

\* This value is not the sum of the strata values but is a separate stratified estimate of the total biomass and was used in the assessment.

### Removals

5.253 No *C. gunnari* were caught following the survey (5 to 25 May 2004).

### Initial age structure

5.254 The proportion of density-at-age was derived from the CMIX program for ages 2+ to 5+. VBGF parameters were selected to calculate mean length-at-age (Table 5.60).

### Selectivity

5.255 A linear selectivity vector was used for *C. gunnari*, starting at 2.5 years and fully selected at age 3.

### Recruitment

5.256 The short-term projection of *C. gunnari* does not include recruitment data.

### Proportion of biomass-at-age

5.257 An estimate of the proportion of biomass-at-age was calculated and presented in Table 5.60. This demonstrates that the age 2+ cohort contributes to both the highest number and biomass of animals within the population.

Table 5.60: Calculation of the proportion of biomass-at-age derived for the truncated length-density distribution.

| Age | Density % | Mean length (mm)* | Mean weight (kg) | Density (number/km <sup>2</sup> ) | Prop. biomass |
|-----|-----------|-------------------|------------------|-----------------------------------|---------------|
| 2   | 98.5      | 195               | 0.029            | 15 072                            | 0.91          |
| 3   | 0.0       | 268               | 0.090            | 0                                 | 0.00          |
| 4   | 1.2       | 320               | 0.168            | 185                               | 0.06          |
| 5   | 0.3       | 358               | 0.249            | 42                                | 0.02          |

\* Obtained from VBGF

## 4. Stock assessment

### 4.1 Model structure and assumptions

5.258 The GYM, used routinely for the assessment of long-term yield of other species in the CCAMLR Convention Area, configured to perform the short-term projection, was used.

#### Model configuration

Table 5.61: GYM model configuration for the assessment of *Champscephalus gunnari* in Division 58.5.2.

| Category                        | Parameter  | Value         |
|---------------------------------|--|---------------|
| Recruitment age                 | Start  | 2.5 years     |
|                                 | Fully selected   | 3 years       |
| Plus class accumulation         |  | 10 years      |
| Oldest age in initial structure |  | 10 years      |
| Maturity                        | $L_{m50}$  | 0 mm***       |
|                                 | Range: 0 to full maturity  | 0 mm          |
| Spawning season                 | Set so that the status of the stock is determined at the start of each year. | 30 Nov–30 Nov |
| Simulation specification        | Number of runs   | 1             |
| Individual trial specifications | Years to remove initial age structure*                                       | 1             |
|                                 | Year prior to projection**   | 2003          |
|                                 | Reference start date   | 01/12         |
|                                 | Years to project stock in simulation   | 2             |
|                                 | Reasonable upper bound for annual $F$  | 5.0           |
|                                 | Tolerance for finding $F$ in each year                                       | 0.000001      |

\* Set to 1 since no catches were made after the survey, else set to 0.

\*\* GYM requires first year of 2003/04 split-year.

\*\*\* Maturity is not used in the short-term projection. It is set to 0 to allow the GYM to monitor the whole population.

### Decision rules

5.259 To assess a catch level such that fishing should not, without any substantial risk, specified in this instance as no more than 5% probability:

reduce the spawning stock biomass to below 75% of the level that would occur in the absence of fishing within the two years following an abundance biomass estimate provided by a survey.

5.260 To achieve this, the one-sided lower 95% confidence bound of the biomass estimate is used as the starting point for the projection.

### **4.2 Model results**

5.261 A single deterministic short-term projection of yield in 2004/05 (Year 1) was calculated for the Heard Plateau and Gunnari Ridge. Yield estimates derived from the short-term projections of 2+ fish for the 2004/05 season are:

|                                     | 2+ fish      |
|-------------------------------------|--------------|
| Actual yield in Year 1 (2004/05)    | 1 864 tonnes |
| Estimated yield in Year 2 (2005/06) | 1 766 tonnes |

### **4.3 Sensitivity analyses**

5.262 No specific sensitivity analyses were undertaken at the meeting.

### **4.4 Discussion of model results**

5.263 The projection of age 2+ fish from 2003/04 gives a projected yield of 1 864 tonnes in the 2004/05 season. The Working Group agreed to recommend this catch limit.

### **4.5 Future research requirements**

5.264 The Working Group recommended that outputs from the age determination workshop for *C. gunnari* in 2005 may benefit future assessments in Division 58.5.2 (paragraphs 9.8 to 9.12).

## 5. By-catch of fish and invertebrates

### 5.1 By-catch removals

5.265 The total reported by-catch (tonnes) of fish taken in recent years is indicated in Table 5.62.

Table 5.62: Total reported by-catch (tonnes) for four species between 1995/96 and 2003/04. LIC – *Channichthys rhinocerus*, NOS – *Lepidonotothen squamifrons*, GRV – *Macrourus* spp., SRX – rajids.

| Fishing season | LIC | Limit | NOS | Limit | GRV | Limit | SRX | Limit | Other | Limit |
|----------------|-----|-------|-----|-------|-----|-------|-----|-------|-------|-------|
| 1995/96        | 0   |       | 0   |       | 0   |       | 0   |       | 0     | 5%*   |
| 1996/97        | 2   |       | 0   |       | 0   |       | 1   |       | 2     | 50**  |
| 1997/98        | 5   | 80    | 4   | 325   | 0   |       | 0   | 120   | 2     | 50    |
| 1998/99        | 4   | 150   | 0   | 80    | 0   |       | 0   |       | 0     | 50    |
| 1999/00        | 4   | 150   | 0   | 80    | 0   |       | 0   |       | 1     | 50    |
| 2000/01        | 1   | 150   | 0   | 80    | 0   | 50    | 0   | 50    | 0     | 50    |
| 2001/02        | 3   | 150   | 0   | 80    | 0   | 50    | 1   | 50    | 0     | 50    |
| 2002/03        | 22  | 150   | 0   | 80    | 0   | 465   | 20  | 120   | 1     | 50    |
| 2003/04        | 6   | 150   | 0   | 80    | 1   | 360   | 3   | 120   | 1     | 50    |

\* 5% move-on rule if individual haul exceeds 5%, limit not specified.

\*\* Move-on rule if catch of any by-catch species exceeds 5% of target species.

### 5.2 Mitigation measures

5.266 Conservation Measure 33-02 currently applies to this fishery. Move-on rules are included in the annual conservation measure established for this fishery (e.g. Conservation Measure 42-02).

## 6. By-catch of birds and mammals

5.267 In the trawl fishery in Division 58.5.2 six seabirds were killed in 2003. Seabirds were released alive in 2002 (1), 2003 (11) and 2004 (7) (Table 7.18). The provisions of Conservation Measure 25-03 apply to this fishery.

## 7. Ecosystem implications/effects

5.268 Bottom trawl gear is used to target both *C. gunnari* and *D. eleginoides* in Division 58.5.2. The potential impacts of fishing gear on benthic communities are limited by the small size and number of commercial trawl grounds, a strategy of fishing trawling gear lightly or just off the bottom, and the protection of large areas sensitive to the effects of bottom trawling (see also paragraph 5.211).



## 8. Harvest controls for the 2003/04 season and advice for 2004/05

### 8.1 Conservation measures

Table 5.63: Summary of provisions of Conservation Measure 42-02 for *Champocephalus gunnari* in Division 58.5.2 and advice to the Scientific Committee for the 2004/05 season.

| Paragraph and topic        | Summary of CM 42-02   | Advice for 2004/05     | Paragraph reference |
|----------------------------|---|------------------------|---------------------|
| 1. Access (gear)           | Trawling only   |                        |                     |
| 2. Access (area)           | Definition of area open for fishing   |                        |                     |
| 3.                         | Chart illustrating area open (Annex 42-02/A)  |                        |                     |
| 4. Catch limit             | 292 tonnes  | Revise to 1 864 tonnes | 5.262               |
| 5. Move-on rule            | Move on if >100 kg caught of which >10% by number are less than minimum size (1 Dec–30 April = 24 cm, 1 May–30 Nov = 29 cm).            |                        |                     |
| 6. Season                  | 1 December 2003 to 30 November 2004   |                        |                     |
| 7. By-catch                | By-catch rates as in CM 33-02 to apply.   |                        |                     |
| 8. Mitigation              | In accordance with CM 25-03.  |                        |                     |
| 9. Observers               | Each vessel to carry at least one scientific observer and may include one additional CCAMLR scientific observer.                        |                        |                     |
| 10. Data: catch and effort | (i) Ten-day reporting system as in Annex 42-02/B<br>(ii) Monthly fine-scale reporting system as in Annex 42-02/B on haul-by-haul basis. |                        |                     |
| 11. Target species         | <i>Champocephalus gunnari</i><br>By-catch is any species other than <i>C. gunnari</i> .   |                        |                     |
| 12. Data: biological       | Fine-scale reporting system as in Annex 42-02/B.<br>Reported in accordance with the Scheme of International Scientific Observation.     |                        |                     |