

SAC GFCM Sub-Committee on Stock Assessment

Date*

| | | |
|----|---------|------|
| 24 | October | 2011 |
|----|---------|------|

Code*

| |
|------------|
| MUR0911Sbr |
|------------|

Authors*

| |
|--|
| Sbrana M., Abella A., Colloca F., Ligas A., Mannini A. |
|--|

Affiliation*

| |
|---|
| CIBM Livorno, ARPAT, Livorno; Univ.Roma La Sapienza, Univ. Genova |
|---|

Species Scientific name*

| | |
|----------|-------------------------------|
| 1 | Source: GFCM Priority Species |
| 2 | Source: - |
| 3 | Source: - |

Geographical area*

| |
|------------------------------|
| Ligurian and Tyrrhenian Seas |
|------------------------------|

Geographical Sub-Area (GSA)*

| |
|---------------------------------------|
| 09 - Ligurian and North Tirrenian Sea |
|---------------------------------------|

Combination of GSAs

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

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

Assessment form

Sheet #0

Basic data on the assessment

Code: MUR0911Sbr

| | | | | | |
|-------|----|-----|------|----------|--|
| Date* | 24 | Oct | 2011 | Authors* | Sbrana M., Abella A., Colloca F., Ligas A., Mannini A. |
|-------|----|-----|------|----------|--|

| | | | |
|--------------------------|-----------------------------|----------------------|--------------------|
| Species Scientific name* | Mullus surmuletus - MUR , , | Species common name* | striped red mullet |
|--------------------------|-----------------------------|----------------------|--------------------|

Data Source

| | | | |
|------|---------------------------------------|-----------------|-----------|
| GSA* | 09 - Ligurian and North Tirrenian Sea | Period of time* | 1994-2010 |
|------|---------------------------------------|-----------------|-----------|

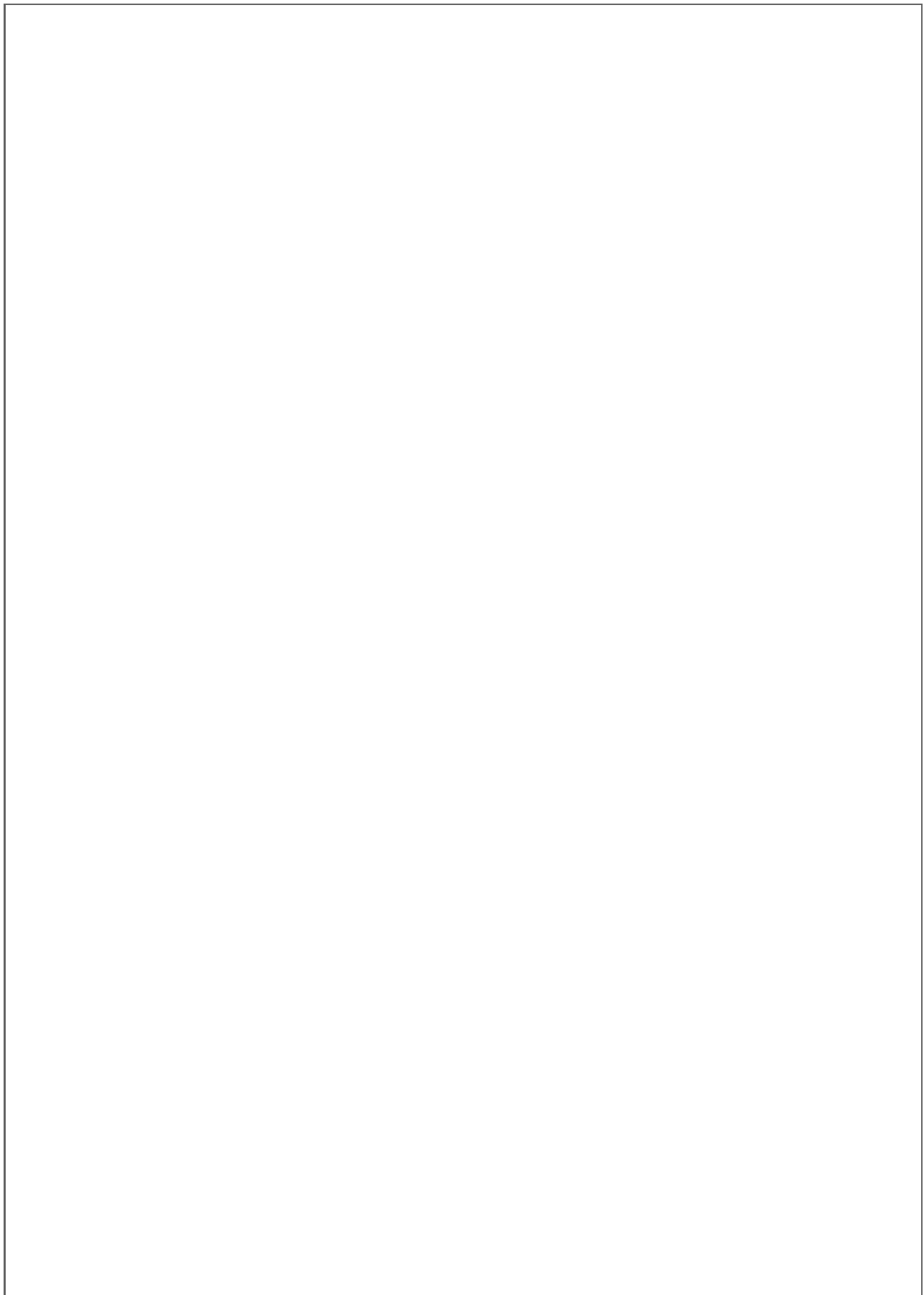
Description of the analysis

| | | | |
|-----------------------|---|----------------|--|
| Type of data* | catch, effort, abundance indexes, biological parameters | Data source* | catch assessment survey, trawl surveys |
| Method of assessment* | LCA, Yield per recruit | Software used* | YR NOAA toolbox, VIT |

Sheets filled out

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

Comments, bibliography, etc.



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

Assessment form

Sheet B
Biology of the species

Code: MUR0911Sbr

Biology

| | | | | | |
|---|-----|-----|------|---------|-------------------------|
| Somatic magnitude measured (LH, LC, etc)* | 5 | | | Units* | 1 |
| Sex | Fem | Mal | Both | Unsexed | |
| Maximum size observed | 40 | | | | Reproduction season may |
| Size at first maturity | 14 | 12 | | | Reproduction areas yes |
| Recruitment size | 8 | 8 | | | Nursery areas yes |

Parameters used (state units and information sources)

| | | | | | | | |
|----------------------------|---------------|-----------|-----------|-----------|-----------|------------|--|
| Sex | both | | | | | | |
| Growth model | onBertalanffy | | | | | | |
| Data source | rawl surveys | | | | | | |
| L [∞] (growth) | 32 | | | | | | |
| K (growth) | 0.43 | | | | | | |
| t0 (growth) | -0.7 | | | | | | |
| length-weight relationship | | | | | | | |
| a (length-weight) | 0.01 | | | | | | |
| b (length-weight) | 3.103 | | | | | | |
| sex ratio | 00:00 | | | | | | |
| M | vector | age1=0.49 | age2=0.26 | age3=0.22 | age4=0.20 | age>4=0.18 | |

Comments

A large empty rectangular box intended for handwritten or typed comments.

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Assessment form

Sheet P1

General information about the fishery

Code: MUR0911Sbr

| | | | |
|--|--------------------------------|-----------|-----------|
| Data source* | commercial catch+trawl surveys | Year (s)* | 1994-2009 |
| Data aggregation (by year, average figures between years, etc.)* | year | | |

Fleet and catches (please state units)

| | Country | GSA | Fleet Segment | Fishing Gear Class | Group of Target Species | Species |
|---------------------|---------|-----|--|----------------------------------|-----------------------------|---------|
| Operational Unit 1* | ITA | 09 | D - Trawl (6-12 metres) | 03 - Trawls | 33 - Demersal shelf species | MUR |
| Operational Unit 2 | ITA | 09 | E - Trawl (12-24 metres) | 03 - Trawls | 33 - Demersal shelf species | MUR |
| Operational Unit 3 | ITA | 09 | B - Minor gear with engine (<6 metres) | 9 - Gillnets and Entangling Nets | 33 - Demersal shelf species | MUR |
| Operational Unit 4 | | | | | | |
| Operational Unit 5 | | | | | | |

| Operational Units* | Fleet (n° of boats)* | Kilos or Tons | Catch (species assessed) | Other species caught | Discards (species assessed) | Discards (other species caught) | Effort units |
|----------------------|----------------------|---------------|--------------------------|----------------------|-----------------------------|---------------------------------|--------------|
| ITA 09 D 03 33 - MUR | | Kg | | | | | |
| ITA 09 E 03 33 - MUR | | Kg | | | | | |
| ITA 09 B 9 33 - MUR | | Kg | | | | | |
| | | | | | | | |
| Total | | | | | | | |

| | |
|--------------------|----|
| Legal minimum size | 10 |
|--------------------|----|

Comments

Tab. 6.7.2.3.1.1 Landings (in tons) of striped red mullet as reported through the official 2011 DCF data

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|-------|------|------|------|------|------|------|------|
| Otter | 94 | 143 | 78 | 60 | 58 | 78 | 51 |
| Gilln | 142 | 139 | 143 | 188 | 80 | 76 | 68 |
| Tram | 136 | 122 | 152 | 74 | 86 | 96 | 159 |
| Total | 372 | 404 | 373 | 322 | 224 | 250 | 278 |

Comments

The species is exploited by different types of gears. The annual landing for 2009 was due for 3
About 200 bottom trawlers exploit this resource all year round in the coastal area, some of the
As concerns artisanal fisheries, *M. Surmuletus* is caught by gillnet and trammel net. In some p

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Assessment form

Sheet P2a
Fishery by Operational Unit

Code: MUR0911Sbr

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| | | | |
|--------------|---------------|-----------|----------------------|
| Data source* | Official data | OpUnit 1* | ITA 09.D.03.33 - MUR |
|--------------|---------------|-----------|----------------------|

Time series

| | | | | | | |
|-----------------|------|------|------|------|------|------|
| Year* | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| Catch | 372 | 404 | 373 | 322 | 224 | 250 |
| Minimum size | | | | | | |
| Average size Lc | | | | | | |
| Maximum size | | | | | | |
| Fleet | | | | | | |

| | | | | | | |
|-----------------|------|--|--|--|--|--|
| Year | 2010 | | | | | |
| Catch | 278 | | | | | |
| Minimum size | | | | | | |
| Average size Lc | | | | | | |
| Maximum size | | | | | | |
| Fleet | | | | | | |

Selectivity

Remarks

| | | |
|------------------|-----|--|
| L25 | 6 | |
| L50 | 7.4 | |
| L75 | 9 | |
| Selection factor | | |
| | | |

Structure by size or age

| | 372 | 404 | 373 | 322 | 224 | 250 | 278 |
|-------|-------------|-------------|-------------|-------------|--------------|-----|-----|
| | 2009 (g) | | trawlers | gillnets | trammel nets | | |
| Class | Total catch | OTB | GNS | GTR | | | |
| 0 | 40024722.45 | 28223723.65 | 1691621.68 | 10109377.12 | | | |
| 1 | 146523296.4 | 33519114.22 | 63764871.34 | 49239310.83 | | | |
| 2 | 34370442.59 | 9334097.93 | 9322518.39 | 15713826.27 | | | |
| 3 | 8993108.04 | 3014059.06 | 0 | 5979048.99 | | | |
| 4 | 1842672.36 | 249005.44 | 283194.62 | 1310472.3 | | | |
| 5 | 4563904.09 | 0 | 1755793.91 | 2808110.18 | | | |
| 6 | 8617281.54 | 0 | 0 | 8617281.54 | | | |
| 7 | 2864572.85 | 0 | 0 | 2864572.85 | | | |

Structure by size or age

| 2010 (kg) | | trawlers | gillnets | trammelnets | |
|-----------------|-------------|-----------------|-----------------|-----------------|--------|
| Class | Total catch | Catch of gear 1 | Catch of gear 2 | Catch of gear 3 | |
| 1 | 31749.4 | 1379.9 | 17316.7 | 13052.8 | |
| 2 | 148801.3 | 41206.5 | 83818.6 | 23776.2 | |
| 3 | 45796.7 | 12076.6 | 22731.8 | 10988.3 | |
| 4 | 20063.8 | 8718.7 | 10710.7 | 634.4 | |
| 5 | 4816.7 | 2637.9 | 1875.2 | 303.5 | |
| 6 | 3203.5 | 511.0 | 2557.3 | 135.3 | |
| 7 | 10473.9 | 626.1 | 9847.7 | 0.0 | |
| 8 | 3479.5 | 208.0 | 3271.5 | 0.0 | |
| Total | 268384.7 | 67364.8 | 152129.5 | 48890.5 | |
| 2010 | | | | | |
| Catch in Weight | | | | | |
| Class | Total catch | Catch of gear 1 | Catch of gear 2 | Catch of gear 3 | (tons) |
| 1 | 31.7493623 | 1.37991894 | 17.31668196 | 13.0527614 | |
| 2 | 148.8012614 | 41.20650022 | 83.81856788 | 23.77619328 | |
| 3 | 45.79672477 | 12.07662708 | 22.73183407 | 10.98826363 | |
| 4 | 20.0637895 | 8.71869072 | 10.71066834 | 0.63443044 | |
| 5 | 4.81670479 | 2.63794577 | 1.8752467 | 0.30351232 | |
| 6 | 3.20349203 | 0.51098146 | 2.55725225 | 0.13525833 | |
| 7 | 10.4738647 | 0.62614362 | 9.84769224 | 0.00002884 | |
| 8 | 3.47954181 | 0.20801232 | 3.27151992 | 0.00000958 | |
| Total | 268.3847413 | 67.36482013 | 152.1294633 | 48.89045782 | |
| Percentage | --- | 0.0000251 | 0.00005668 | 0.00001822 | |

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Sheet P2b
Fishery by Operational Unit

Code: MUR0911Sbr

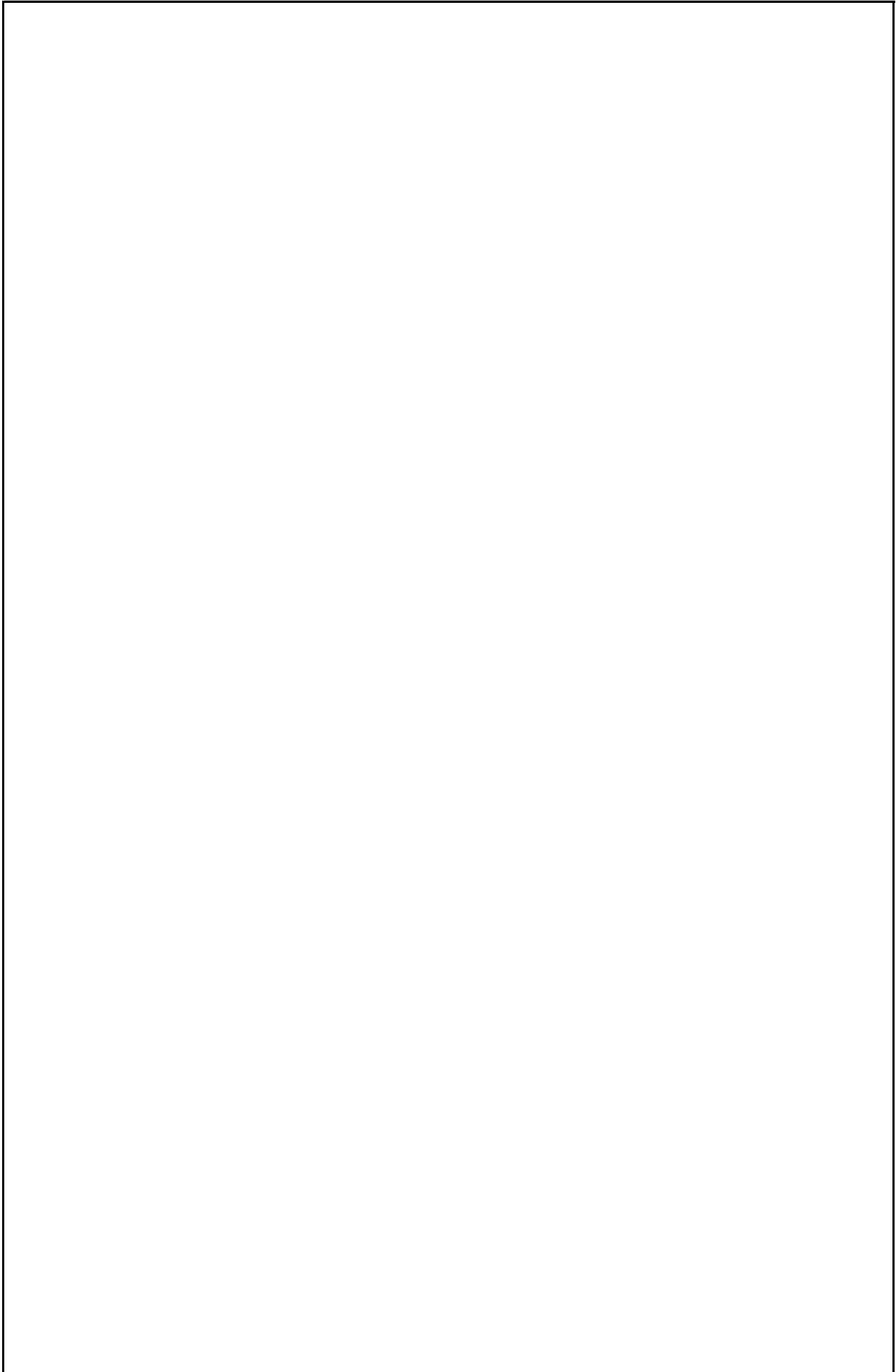
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| | | | |
|--------------|---------------|-----------|----------------------|
| Data source* | Official data | OpUnit 1* | ITA 09 D 03 33 - MUR |
|--------------|---------------|-----------|----------------------|

Regulations in force and degree of observance of regulations

- Fishing closure for trawling: 45 days in late summer
- 12 cm TL as minimum legal landed size
- Legal cod end mesh size 40mm stretched up to June 2010, 40 mm square mesh in
- Trawling not allowed within three nautical miles from the coast or at depths less than

Accompanying species



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Assessment form

Sheet A1
Indirect methods: VPA, LCA

Code: MUR0911Sbr

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Sex* merged

Analysis # * 1

Time series

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

| | | |
|---------------|---------|---------------|
| Model | Cohorts | Pseudocohorts |
| (mark with X) | | 2009 and 2010 |

| | | | |
|-----------------------|--|--------------|-----|
| Equation used | classical survival and catch equations | Tunig method | |
| # of gears | 3 | Software | VIT |
| F _{terminal} | 0.5 | | |

Population results (please state units)

| | Sizes | Ages | | Amount | Biomass |
|----------|-------|------|--------------------|--------|---------|
| Minimum | | | Recruitment | | |
| Average | | | Average population | | |
| Maximum | | | Virgin population | | |
| Critical | 16.6 | 1 | Turnover | | |
| | | | | | |
| | | | | | |

Average mortality

| | Total | Gear | | | | |
|----------------|-------|------|---------|--|--|--|
| | | year | | | | |
| F ₁ | 0.71 | 2009 | average | | | |
| F ₂ | 0.56 | 2010 | average | | | |
| Z | | | | | | |

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

Comments

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Assessment form

Sheet A2
Indirect methods: data

Code: MUR0911Sbr

| | | | | | |
|------|------|-------|---------|--------------|---|
| Sex* | both | Gear* | 3 gears | Analysis # * | 1 |
|------|------|-------|---------|--------------|---|

| | |
|------|--|
| Data | |
|------|--|

Data

| <p>2009</p> <p>VPA Results--Mortalities</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>Class</th> <th>Z</th> <th>Total</th> <th>OTB</th> <th>GNS</th> <th>GTR</th> </tr> </thead> <tbody> <tr><td>0</td><td>0.899</td><td>0.409</td><td>0.288</td><td>0.017</td><td>0.103</td></tr> <tr><td>1</td><td>1.744</td><td>1.484</td><td>0.339</td><td>0.646</td><td>0.499</td></tr> <tr><td>2</td><td>0.921</td><td>0.701</td><td>0.19</td><td>0.19</td><td>0.321</td></tr> <tr><td>3</td><td>0.457</td><td>0.257</td><td>0.086</td><td>0</td><td>0.171</td></tr> <tr><td>4</td><td>0.251</td><td>0.061</td><td>0.008</td><td>0.009</td><td>0.043</td></tr> <tr><td>5</td><td>0.359</td><td>0.179</td><td>0</td><td>0.069</td><td>0.11</td></tr> <tr><td>6</td><td>0.707</td><td>0.527</td><td>0</td><td>0</td><td>0.527</td></tr> <tr><td>7</td><td>0.47</td><td>0.3</td><td>0</td><td>0</td><td>0.3</td></tr> <tr><td>Mean Mort</td><td>0.726</td><td>0.49</td><td>0.114</td><td>0.116</td><td>0.259</td></tr> <tr><td>Global Fs</td><td>---</td><td>0.609</td><td>0.27</td><td>0.147</td><td>0.192</td></tr> </tbody> </table> <p>--- Critical age Critical length</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <tr><td>Current sto</td><td>1</td><td>16.594</td></tr> <tr><td>Virgin sto</td><td>4</td><td>27.759</td></tr> </table> <p>Total Biomass balance (D): 363273271.22</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>---</th> <th>Biomass</th> <th>Percentage</th> </tr> </thead> <tbody> <tr><td>Recruitme</td><td>41874699</td><td>11.53</td></tr> <tr><td>Growth</td><td>3.21E+08</td><td>88.47</td></tr> <tr><td>Natural de</td><td>1.09E+08</td><td>29.93</td></tr> <tr><td>Fishing</td><td>2.55E+08</td><td>70.07</td></tr> <tr><td>R/B(mean)</td><td>11.33</td><td></td></tr> <tr><td>D/B(mean)</td><td>98.3</td><td></td></tr> <tr><td>B(max)/B(r</td><td>39.32</td><td></td></tr> <tr><td>B(max)/D</td><td>40</td><td></td></tr> </tbody> </table> | Class | Z | Total | OTB | GNS | GTR | 0 | 0.899 | 0.409 | 0.288 | 0.017 | 0.103 | 1 | 1.744 | 1.484 | 0.339 | 0.646 | 0.499 | 2 | 0.921 | 0.701 | 0.19 | 0.19 | 0.321 | 3 | 0.457 | 0.257 | 0.086 | 0 | 0.171 | 4 | 0.251 | 0.061 | 0.008 | 0.009 | 0.043 | 5 | 0.359 | 0.179 | 0 | 0.069 | 0.11 | 6 | 0.707 | 0.527 | 0 | 0 | 0.527 | 7 | 0.47 | 0.3 | 0 | 0 | 0.3 | Mean Mort | 0.726 | 0.49 | 0.114 | 0.116 | 0.259 | Global Fs | --- | 0.609 | 0.27 | 0.147 | 0.192 | Current sto | 1 | 16.594 | Virgin sto | 4 | 27.759 | --- | Biomass | Percentage | Recruitme | 41874699 | 11.53 | Growth | 3.21E+08 | 88.47 | Natural de | 1.09E+08 | 29.93 | Fishing | 2.55E+08 | 70.07 | R/B(mean) | 11.33 | | D/B(mean) | 98.3 | | B(max)/B(r | 39.32 | | B(max)/D | 40 | | <p>2010</p> <p>VPA Results--Mortalities</p> <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>Class</th> <th>Z</th> <th>Total F</th> <th>F of gear 1</th> <th>F of gear 2</th> <th>F of gear 3</th> </tr> </thead> <tbody> <tr><td>1</td><td>0,79</td><td>0,3</td><td>0,01</td><td>0,16</td><td>0,12</td></tr> <tr><td>2</td><td>1,38</td><td>1,12</td><td>0,31</td><td>0,63</td><td>0,18</td></tr> <tr><td>3</td><td>0,75</td><td>0,53</td><td>0,14</td><td>0,26</td><td>0,13</td></tr> <tr><td>4</td><td>0,5</td><td>0,3</td><td>0,13</td><td>0,16</td><td>0,01</td></tr> <tr><td>5</td><td>0,28</td><td>0,09</td><td>0,05</td><td>0,03</td><td>0,01</td></tr> <tr><td>6</td><td>0,25</td><td>0,07</td><td>0,01</td><td>0,05</td><td>0</td></tr> <tr><td>7</td><td>0,46</td><td>0,28</td><td>0,02</td><td>0,26</td><td>0</td></tr> <tr><td>8</td><td>0,3</td><td>0,13</td><td>0,01</td><td>0,12</td><td>0</td></tr> <tr><td>Mean Mor</td><td>0,59</td><td>0,35</td><td>0,08</td><td>0,21</td><td>0,06</td></tr> <tr><td>Global Fs</td><td>---</td><td>0,47</td><td>0,09</td><td>0,26</td><td>0,12</td></tr> </tbody> </table> <p>--- Critical age Critical length</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <tr><td>Current str</td><td>1</td><td>17,11</td></tr> <tr><td>Virgin stoc</td><td>4</td><td>28,63</td></tr> </table> <p>Total Biomass balance (D): 426212357.00</p> <table style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>---</th> <th>Biomass</th> <th>Percentage</th> </tr> </thead> <tbody> <tr><td>Recruitme</td><td>###</td><td>9,98</td></tr> <tr><td>Growth</td><td>###</td><td>90,02</td></tr> <tr><td>Natural de</td><td>###</td><td>35,75</td></tr> <tr><td>Fishing</td><td>###</td><td>64,25</td></tr> <tr><td>R/B(mean)</td><td>7,47</td><td></td></tr> <tr><td>D/B(mean)</td><td>74,83</td><td></td></tr> <tr><td>B(max)/B(</td><td>28,98</td><td></td></tr> <tr><td>B(max)/D</td><td>38,73</td><td></td></tr> </tbody> </table> | Class | Z | Total F | F of gear 1 | F of gear 2 | F of gear 3 | 1 | 0,79 | 0,3 | 0,01 | 0,16 | 0,12 | 2 | 1,38 | 1,12 | 0,31 | 0,63 | 0,18 | 3 | 0,75 | 0,53 | 0,14 | 0,26 | 0,13 | 4 | 0,5 | 0,3 | 0,13 | 0,16 | 0,01 | 5 | 0,28 | 0,09 | 0,05 | 0,03 | 0,01 | 6 | 0,25 | 0,07 | 0,01 | 0,05 | 0 | 7 | 0,46 | 0,28 | 0,02 | 0,26 | 0 | 8 | 0,3 | 0,13 | 0,01 | 0,12 | 0 | Mean Mor | 0,59 | 0,35 | 0,08 | 0,21 | 0,06 | Global Fs | --- | 0,47 | 0,09 | 0,26 | 0,12 | Current str | 1 | 17,11 | Virgin stoc | 4 | 28,63 | --- | Biomass | Percentage | Recruitme | ### | 9,98 | Growth | ### | 90,02 | Natural de | ### | 35,75 | Fishing | ### | 64,25 | R/B(mean) | 7,47 | | D/B(mean) | 74,83 | | B(max)/B(| 28,98 | | B(max)/D | 38,73 | |
|--|----------|------------|-------------|-------------|-------------|-----|---|-------|-------|-------|-------|-------|---|-------|-------|-------|-------|-------|---|-------|-------|------|------|-------|---|-------|-------|-------|---|-------|---|-------|-------|-------|-------|-------|---|-------|-------|---|-------|------|---|-------|-------|---|---|-------|---|------|-----|---|---|-----|-----------|-------|------|-------|-------|-------|-----------|-----|-------|------|-------|-------|-------------|---|--------|------------|---|--------|-----|---------|------------|-----------|----------|-------|--------|----------|-------|------------|----------|-------|---------|----------|-------|-----------|-------|--|-----------|------|--|------------|-------|--|----------|----|--|---|-------|---|---------|-------------|-------------|-------------|---|------|-----|------|------|------|---|------|------|------|------|------|---|------|------|------|------|------|---|-----|-----|------|------|------|---|------|------|------|------|------|---|------|------|------|------|---|---|------|------|------|------|---|---|-----|------|------|------|---|----------|------|------|------|------|------|-----------|-----|------|------|------|------|-------------|---|-------|-------------|---|-------|-----|---------|------------|-----------|-----|------|--------|-----|-------|------------|-----|-------|---------|-----|-------|-----------|------|--|-----------|-------|--|-----------|-------|--|----------|-------|--|
| Class | Z | Total | OTB | GNS | GTR | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0.899 | 0.409 | 0.288 | 0.017 | 0.103 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1.744 | 1.484 | 0.339 | 0.646 | 0.499 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 0.921 | 0.701 | 0.19 | 0.19 | 0.321 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 0.457 | 0.257 | 0.086 | 0 | 0.171 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 0.251 | 0.061 | 0.008 | 0.009 | 0.043 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 0.359 | 0.179 | 0 | 0.069 | 0.11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 0.707 | 0.527 | 0 | 0 | 0.527 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 0.47 | 0.3 | 0 | 0 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mean Mort | 0.726 | 0.49 | 0.114 | 0.116 | 0.259 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Global Fs | --- | 0.609 | 0.27 | 0.147 | 0.192 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Current sto | 1 | 16.594 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Virgin sto | 4 | 27.759 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | Biomass | Percentage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recruitme | 41874699 | 11.53 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Growth | 3.21E+08 | 88.47 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Natural de | 1.09E+08 | 29.93 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fishing | 2.55E+08 | 70.07 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R/B(mean) | 11.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D/B(mean) | 98.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B(max)/B(r | 39.32 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B(max)/D | 40 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Class | Z | Total F | F of gear 1 | F of gear 2 | F of gear 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0,79 | 0,3 | 0,01 | 0,16 | 0,12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 1,38 | 1,12 | 0,31 | 0,63 | 0,18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 0,75 | 0,53 | 0,14 | 0,26 | 0,13 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 0,5 | 0,3 | 0,13 | 0,16 | 0,01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 0,28 | 0,09 | 0,05 | 0,03 | 0,01 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 0,25 | 0,07 | 0,01 | 0,05 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 0,46 | 0,28 | 0,02 | 0,26 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 0,3 | 0,13 | 0,01 | 0,12 | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mean Mor | 0,59 | 0,35 | 0,08 | 0,21 | 0,06 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Global Fs | --- | 0,47 | 0,09 | 0,26 | 0,12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Current str | 1 | 17,11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Virgin stoc | 4 | 28,63 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | Biomass | Percentage | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recruitme | ### | 9,98 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Growth | ### | 90,02 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Natural de | ### | 35,75 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fishing | ### | 64,25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R/B(mean) | 7,47 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D/B(mean) | 74,83 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B(max)/B(| 28,98 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B(max)/D | 38,73 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

2009

2010

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

Assessment form

Sheet A3
Indirect methods: VPA results

Code: MUR0911Sbr

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| | | | | | |
|------|--------|-------|---------|-------------|---|
| Sex* | merged | Gear* | 3 gears | Analysis #* | 1 |
|------|--------|-------|---------|-------------|---|

Population in figures

| VPA Results--Numbers 2009 | | | VPA Results--Numbers 2010 | | |
|---------------------------|-----------|-------------|---------------------------|-----------|-------------|
| Age class | Initial n | Mean number | Class | Initial n | Mean number |
| 0+ | 6E+06 | 4E+06 | 1 | 5E+06 | 4E+06 |
| 1 | 2E+06 | 1E+06 | 2 | 2E+06 | 1E+06 |
| 2 | 416266 | 271984 | 3 | 617312 | 435060 |
| 3 | 165655 | 132975 | 4 | 292785 | 230266 |
| 4 | 104905 | 92788 | 5 | 177352 | 154949 |
| 5 | 81642 | 68586 | 6 | 134517 | 119273 |
| 6 | 57003 | 40864 | 7 | 105226 | 84309 |
| 7 | 28103 | 22423 | 8 | 66367 | 57353 |
| Total | --- | 6E+06 | Total | --- | 6E+06 |
| Stock M--- | | 0.983 | Stock M--- | | 1.244 |
| Stock M--- | | 15.052 | Stock M--- | | 16.683 |

Population in biomass

| 2009 | | | 2010 | | |
|---------------------|-----------|-------------|---------------------|-----------|-------------|
| VPA Results--Weight | | | VPA Results--Weight | | |
| Class | Initial W | Mean Weight | Class | Initial W | Mean Weight |
| 1 | 4E+07 | 1E+08 | 1 | 4E+07 | 1E+08 |
| 2 | 1E+08 | 1E+08 | 2 | 2E+08 | 1E+08 |
| 3 | 6E+07 | 5E+07 | 3 | 1E+08 | 9E+07 |
| 4 | 4E+07 | 4E+07 | 4 | 7E+07 | 7E+07 |
| 5 | 3E+07 | 3E+07 | 5 | 6E+07 | 6E+07 |
| 6 | 3E+07 | 3E+07 | 6 | 5E+07 | 5E+07 |
| 7 | 2E+07 | 2E+07 | 7 | 5E+07 | 4E+07 |
| 8 | 1E+07 | 1E+07 | 8 | 3E+07 | 3E+07 |
| Total | --- | 4E+08 | Total | --- | 6E+08 |

Fishing mortality rates

| VPA Results--Mortalities | | | | | | VPA Results--Mortalities | | | | | |
|----------------------------|-----------------------------|--------|-------|-------|-------|----------------------------|-----------------------------|---------|-------------|-------------|-------------|
| Class | Z | Total | OTB | GNS | GTR | Class | Z | Total F | F of gear 1 | F of gear 2 | F of gear 3 |
| 0 | 0.899 | 0.409 | 0.288 | 0.017 | 0.103 | 1 | 0,79 | 0,3 | 0,01 | 0,16 | |
| 1 | 1.744 | 1.484 | 0.339 | 0.646 | 0.499 | 2 | 1,38 | 1,12 | 0,31 | 0,63 | |
| 2 | 0.921 | 0.701 | 0.19 | 0.19 | 0.321 | 3 | 0,75 | 0,53 | 0,14 | 0,26 | |
| 3 | 0.457 | 0.257 | 0.086 | 0 | 0.171 | 4 | 0,5 | 0,3 | 0,13 | 0,16 | |
| 4 | 0.251 | 0.061 | 0.008 | 0.009 | 0.043 | 5 | 0,28 | 0,09 | 0,05 | 0,03 | |
| 5 | 0.359 | 0.179 | 0 | 0.069 | 0.11 | 6 | 0,25 | 0,07 | 0,01 | 0,05 | |
| 6 | 0.707 | 0.527 | 0 | 0 | 0.527 | 7 | 0,46 | 0,28 | 0,02 | 0,26 | |
| 7 | 0.47 | 0.3 | 0 | 0 | 0.3 | 8 | 0,3 | 0,13 | 0,01 | 0,12 | |
| Mean Mort | 0.726 | 0.49 | 0.114 | 0.116 | 0.259 | Mean Mor | 0,59 | 0,35 | 0,08 | 0,21 | |
| Global Fs | --- | 0.609 | 0.27 | 0.147 | 0.192 | Global Fs | --- | 0,47 | 0,09 | 0,26 | |
| --- | Critical ageCritical length | | | | | --- | Critical ageCritical length | | | | |
| Current stoc | 1 | 16.594 | | | | Current stoc | 1 | 17,11 | | | |
| Virgin stoc | 4 | 27.759 | | | | Virgin stoc | 4 | 28,63 | | | |
| Total Biomass balance (D): | 363273271.22 | | | | | Total Biomass balance (D): | 426212357.00 | | | | |
| --- | Biomass Percentage | | | | | --- | Biomass Percentage | | | | |
| Recruitmer | 41874699 | 11.53 | | | | | | | | | |
| Growth | 3.21E+08 | 88.47 | | | | | | | | | |
| Natural de | 1.09E+08 | 29.93 | | | | | | | | | |
| Fishing | 2.55E+08 | 70.07 | | | | | | | | | |

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

Assessment form

Sheet A3
Indirect methods: VPA results

Code: MUR0911Sbr

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

Population in figures

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

Population in biomass

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

Fishing mortality rates

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





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

| | | | |
|-----|-----|------------|------------------|
| Sex | M+F | | Code: MUR0911Sbr |
| | | Analysis # | 1 |

| | | | |
|------------|---|----------|------------------|
| # of gears | 1 | Software | YPR NOAA toolbox |
|------------|---|----------|------------------|

Parameters used

| | |
|----------|---|
| Vector F | age1=0.79,age2=1,38,age3=0.75,age 4=0.5,age5=0.28,age6=0.25,age7=0.46,age8=0.3 |
| Vector M | Age ₁ =0.49, Age ₂ =0.26, Age ₃ =0.22, Age ₄ =0.20, Age ₅ =0.19, Age ₆ =0.18, |
| Vector N | |
| | |
| | |

Model characteristics

The models allows estimating Y/R, B/R and some Reference Points as F_{0.1}
 Data requested: growth parameters, L/W relationship, an estimate of M, age of first capture

Results

| | Total | Gear | | | |
|------------------|-------|------|--|--|--|
| | | | | | |
| Current YR | | | | | |
| Maximum Y/R | | | | | |
| Y/R 0.1 | | | | | |
| F _{max} | 1.02 | | | | |
| F _{0.1} | 0.48 | | | | |
| Current B/R | | | | | |
| Maximum B/R | | | | | |
| B/R 0.1 | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Comments

Comments

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

An ASPIC forecasting model (ASPIC-P) was run to estimate future 10 years stock parameters under status quo fishing mortality. Projections suggest that a light increase in biomass should occur in the medium term (up to 2020) if F is kept at the current rate. The new biomass level that is assumed to be obtained at medium term keeping F unchanged is however lower (about 90%) than BMSY, that is the level of

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Assessment form

Sheet D
Diagnosis

Code: MUR0911Sbr

Reference points

| Criterion | Current value | Units | Reference Point | Trend | Comments |
|-----------|---------------|-------|-----------------|-------|----------|
| B | | | | | |
| SSB | | | | | |
| F | 0.48 | | F0.1 | | |
| Y | | | | | |
| CPUE | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

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

Comments

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Assessment form

Sheet Z

Objectives and recommendations

Code: MUR0911Sbr

Management advice and recommendations*

The species is considered overexploited. The current F was estimated as 0.71 and 0.56 respectively for 2009 and 2010. Considering the reference value of $F_{0.1}=0.48$, the current exploitation rate is considered too high (overexploitation). The total landings in the most recent years are lightly lower.

Advice for scientific research*

Abstract for SCSA reporting

Authors Sbrana M., Abella A., Colloca F., Ligas A., Mannini A. **Year** 2011

Species Scientific name Mullus surmuletus - MUR
Source: GFCM Priority Species

Source: -

Source: -

Geographical Sub-Area 09 - Ligurian and North Tirrenian Sea

Fisheries (brief description of the fishery)*

The stock is caught with different fishing strategies: bottom trawling operates on soft bottoms while the use of gillnets and trammel nets occur in areas close to the coast most of the times on hard bottoms

Source of management advice*

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

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

Management advice and recommendations*

The area is currently blank, intended for handwritten notes or printed text.

Advice for scientific research*

