Blue Swimming Crab

Stock Assessment of Western Visayan Sea

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Outline

• Introduction
• Materials & Methods
• Results & Discussion
  - crab gear inventory
  - estimated harvest & CPUE
  - species composition
  - monthly seasonality
  - MSY
  - reproductive biology
  - population parameters
• Conclusion
• Recommendation
I. Introduction

I. 1. Stock Profile

- Order: Decapoda (ten appendages)
- Infraorder: Brachyura (true crab)
- Family: Portunidae (swimming crab)
- blue swimming crab, flower crab, manna crab or sand crab
- *kasag, alimasag, lambay or masag.*
Philippine Blue Crab
Major Fishing Grounds
(Ingles, 1996)

1. Lingayen Gulf
2. Tayabas Bay
3. Ragay Gulf
4. San Miguel Bay
5. Sorsogon Bay
6. Samar Sea
7. Carigara Bay
8. Visayan Sea
9. Guimaras Strait
10. Taytay Bay
11. Malampaya Sound
12. Honda Bay
13. Panguil Bay
14. Tawi-tawi
I. 2. Crab Fishing Gears

- Crab Pot/Panggal
- Crab Trap/Bubo Pangasag
- Otter trawl
- Push net/Hud-hud
- Bottomset gillnet/Palugdang
I. 3. Framework for BSC Stock Conservation

Section 3. Regulations. The following are the rules and regulations for the proper utilization and conservation of Blue Swimming Crab:

3.1 Minimum Size of Blue Swimming Crab. The minimum carapace width of blue swimming crab allowed for catching, collecting and trading shall be 10.2 cm, as shown in Diagram 1 which forms an integral part of this Order. Provided, that coastal municipalities may adopt a minimum size limit higher than 10.2 cm for catching BSC.

3.2 Crab Fishing Gear Limitation

a. Mesh Size/Diameter hole. The minimum mesh size for the following gears shall be implemented:

   a1. Crab Entangling Nets (single layer only) and Crab Liftnets shall have a minimum mesh size of 11 cm and 3 cm stretch mesh, respectively.
   a2. Crab Pots/Traps shall have a 5 cm minimum hole diameter.

3.3 Closed Season/Area. To prevent overexploitation/overfishing, a closed season shall be imposed by the LGUs, in consultation with the FARMC based on scientific data gathered. The NFRDI and BFAR Regional Field Offices through its NSAP, other research institutions/agencies and academe shall provide such data.

3.4 Other Subjects for Regulations. If public interest so requires, based on sound scientific evidence and/or the precautionary approach in fisheries management based on the recommendation of the LGUs and BFAR, in consultation with FARMC and other stakeholders, the Secretaries of DA and DILG may issue regulations on any or all of the following: 1) the number of registered crab fishers to be allowed to operate for the catching of blue swimming crab in any areas in Philippine waters; 2) limit the number of crab pots/traps allowed per boat/banca; 3) limit the length/depth and number of nets a fisher could own and operate; and 4) specific closed fishing season for BSC by municipality.
Local Policies

• Negros Occidental:
  - Provincial Ordinance No. 019: “An ordinance regulating the catching, selling, possessing or buying of gravid blue crabs and crablets in the Province of Negros Occidental”
  - September 2003

• Iloilo:
  - Provincial Ordinance No. 2012-093
  - Catch size limit at 11cm; 50mesh size depth
  - February 22, 2012
1.5. Objectives:

This study aims to provide scientific information on the biology of *Portunus pelagicus* caught in Western Visayan Sea.

Informations will serve as baseline in the implementation of the JAO 01-2014 as:

- fishing gear inventory
- harvest estimate and catch per unit of effort
- species relative abundance and monthly seasonality
- maximum sustainable yield
- reproductive biology
- population parameters
II. Materials & Methods:

Map of Visayan Sea showing the 10 monitoring stations of the Blue Swimming Crab Project.
Five point scale of female gonadal maturity used for *P. pelagicus* (Sumpton *et al.*, 1994):

- **Premature**
- **FI Stage/Immature**
- **FII Stage/Developing**
- **FIII Stage/Ripening**
- **FIV Stage/Spawning**
- **FV Stage/Spent**
Data Analysis:

- Total Inventory of crab gears
- Estimated Harvest:
  \[ \text{CPUE} \times \text{Fishing days} \times \text{Inventory} \]
  
  CPUE (computed in kg/d and kg/panel)

- MSY – Schaeffer & Fox Model

- FiSAT ver. 1.2.2 – population parameters
Reproductive Biology:

Sex Ratio (SR) = \( \sum \text{no. of male} / \sum \text{no. of female} \)

GSI = GW/BW x 100

\[
P = \frac{1}{1 + \exp (S_1 + S_2 \times L)}
\]

\[
W = aL^b
\]

- \( P \) = proportion of mature individuals within a length class
- \( S_1 \) = intercept
- \( S_2 \) = slope
- \( L \) = mid-length
III. Results & Discussion:

Annual cpue, fishing days, and gear count of major crab fishing gears operating in Western Visayan Sea

<table>
<thead>
<tr>
<th>CY 2011</th>
<th>cpue (kg/d)</th>
<th>Fishing days</th>
<th>Vessel count by inventory</th>
<th>Harvest (MT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottomset gillnet</td>
<td>3.26</td>
<td>248</td>
<td>325</td>
<td>262.92</td>
</tr>
<tr>
<td>Crab pot</td>
<td>4.61</td>
<td>246</td>
<td>479</td>
<td>542.93</td>
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<tr>
<td>Crab trap</td>
<td>4.00</td>
<td>229</td>
<td>36</td>
<td>32.94</td>
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<tr>
<td>Modified danish seine (municipal)</td>
<td>0.38</td>
<td>25</td>
<td>131</td>
<td>1.26</td>
</tr>
<tr>
<td>Fish coral</td>
<td>10.00</td>
<td>36</td>
<td>195</td>
<td>70.20</td>
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<tr>
<td>Filter net</td>
<td>3.08</td>
<td>4</td>
<td>32</td>
<td>0.39</td>
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<tr>
<td>Fish trap</td>
<td>0.83</td>
<td>8</td>
<td>49</td>
<td>0.33</td>
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<tr>
<td>Manual push net</td>
<td>16.89</td>
<td>70</td>
<td>21</td>
<td>24.83</td>
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<tr>
<td>Otter trawl</td>
<td>7.77</td>
<td>42</td>
<td>111</td>
<td>36.22</td>
</tr>
<tr>
<td>Surface-set gillnet</td>
<td>3.59</td>
<td>6</td>
<td>21</td>
<td>0.45</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>972.47</strong></td>
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</tbody>
</table>
### Annual cpue, fishing days, and gear count of major crab fishing gears operating in Western Visayan Sea

<table>
<thead>
<tr>
<th>CY 2012</th>
<th>cpue (kg/d)</th>
<th>Fishing days</th>
<th>Vessel count by inventory</th>
<th>Harvest (MT)</th>
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</thead>
<tbody>
<tr>
<td>Bottomset gillnet</td>
<td>3.72</td>
<td>246</td>
<td>834</td>
<td>763.06</td>
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<tr>
<td>Crab pot</td>
<td>5.61</td>
<td>249</td>
<td>326</td>
<td>455.13</td>
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<tr>
<td>Crab trap</td>
<td>3.62</td>
<td>232</td>
<td>87</td>
<td>72.98</td>
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<tr>
<td>Fish coral</td>
<td>2.57</td>
<td>21</td>
<td>5</td>
<td>0.27</td>
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<tr>
<td>Fish trap</td>
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<td>Otter trawl</td>
<td>2.09</td>
<td>101</td>
<td>27</td>
<td>5.70</td>
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<tr>
<td>Surface-set gillnet</td>
<td>1.25</td>
<td>29</td>
<td>21</td>
<td>0.76</td>
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<td><strong>TOTAL</strong></td>
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<td><strong>1,303.61</strong></td>
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</table>
Dominant species of all fishing gears in the crabbing areas of Western Visayan Sea CY 2011-2012
Relative abundance of crab species identified per major crab fishing gears in the Visayan Sea

<table>
<thead>
<tr>
<th>Gear</th>
<th>% 10 Dominant Species</th>
<th>% Crab Species</th>
<th>% P. pelagicus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottomset gillnet</td>
<td>88.43</td>
<td>51.97</td>
<td>51.11</td>
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<tr>
<td>Crab pot</td>
<td>99.99</td>
<td>100.00</td>
<td>93.49</td>
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<tr>
<td>Crab trap</td>
<td>99.86</td>
<td>94.09</td>
<td>87.37</td>
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<tr>
<td>Manual push net</td>
<td>99.96</td>
<td>3.74</td>
<td>3.57</td>
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<tr>
<td>Otter trawl</td>
<td>60.81</td>
<td>7.22</td>
<td>2.09</td>
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MSY and $f_{MSY}$ for the crab fishery of Western Visayas at different period using the Fox Models
Observed sex ratio and monthly male and female distribution of *P. pelagicus* caught in Western Visayan Sea.
Monthly female gonadal frequency and GSI distribution of *P. pelagicus* caught in Western Visayan Sea
Computed length at first maturity (Lm) for *P. pelagicus* caught in Western Visayan Sea

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Lm (cm)</th>
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<tbody>
<tr>
<td>Ragay Gulf</td>
<td>10.5</td>
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<tr>
<td>(Inglés &amp; Braum, 1989)</td>
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</tr>
<tr>
<td>Visayan Sea</td>
<td>10.6</td>
</tr>
<tr>
<td>(Inglés, 1996)</td>
<td></td>
</tr>
<tr>
<td>Danajon Bank</td>
<td>12.0</td>
</tr>
<tr>
<td>(Armada, 2009)</td>
<td></td>
</tr>
<tr>
<td>Visayan Sea</td>
<td>11.5</td>
</tr>
<tr>
<td>(This study)</td>
<td></td>
</tr>
</tbody>
</table>
Observed length frequency distribution of *P. pelagicus* caught in Western Visayan Sea by bottomset gillnet (BSGN), crab pot (CP), and otter trawl (OT)
## Comparative growth parameter values for *P. pelagicus* in various fishing grounds of the Philippines

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Area</th>
<th>$L_\infty$</th>
<th>k</th>
<th>$\sigma'$</th>
</tr>
</thead>
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<tr>
<td>Ingles &amp; Braum, 1989</td>
<td>Ragay Gulf, Philippines</td>
<td>18.00</td>
<td>1.58</td>
<td>-</td>
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<tr>
<td>Germano et.al., 2006</td>
<td>Eastern Visayas, Philippines</td>
<td>8.95</td>
<td>1.23</td>
<td>-</td>
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<tr>
<td>Olaño et.al., 2009</td>
<td>Sorsogon Bay, Philippines</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>21.09</td>
<td>1.58</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>19.39</td>
<td>1.58</td>
<td>-</td>
</tr>
<tr>
<td>Bayate et.al., 2011</td>
<td>Guimaras Strait, Philippines</td>
<td>21.77</td>
<td>1.40</td>
<td>2.84</td>
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<td>Ingles, J., 1996</td>
<td>Visayan Sea, Philippines</td>
<td>22.50</td>
<td>0.70</td>
<td>-</td>
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<td>Romero, F., 2009</td>
<td>Visayan Sea, Philippines</td>
<td>19.95</td>
<td>1.40</td>
<td>-</td>
</tr>
<tr>
<td><strong>Mesa <em>et al.</em>, 2012</strong></td>
<td><strong>Visayan Sea, Philippines</strong></td>
<td><strong>19.10</strong></td>
<td><strong>1.55</strong></td>
<td><strong>2.75</strong></td>
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<tr>
<td>(this study)</td>
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</table>
Exploitation rate (E) values from mortalities and optimum exploitation rate (E_{10}) from Beverton & Holt yield per recruit analysis in comparison to the threshold value of *P. pelagicus* from various biological studies conducted.
IV. Conclusion:

*P. pelagicus* stocks in Western Visayan Sea is experiencing overfishing based on the following results:

- decreasing CPUE (kg/panel)

- MSY with decreasing yield and increasing $f_{\text{MSY}}$

- Growth overfishing with decreasing $L_\infty$ and higher $E$ values than $E_{10}$

- Recruitment overfishing with high percentage of catch size prior to $L_m$ of major crab gears
V. Recommendations:

- banning of otter trawl operation in the municipal waters (FAO 201)

- JAO 01-2014
  - Effort reduction for bottomset gillnet or crab entangling net thru systematic licensing system
    - reduction of number of gillnet-panels or
    - reduction of fishing vessels operating
• JAO 01-2014

• Regulation of crab pots:
  • use of bamboo made materials
  • limit the number of pots used per operation
  • and increase the trap entrance diameter

• Catching size limit to 11.5cm carapace width (CW).

• Ban of catching berried crabs

• Possible closed season in the months of August to September or January to February.