Use of Ichthyoplankton Survey in Fisheries Resource Management

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Presentation Outline

- Establishment of fish *refugia*
- Recruitment
- Ichthyoplankton survey
- Some practical applications
REVERSING ENVIRONMENTAL DEGRADATION TRENDS IN THE SOUTH CHINA SEA AND GULF OF THAILAND
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INDONESIA
Candidate Refugia Site

1) Riau Islands
2) Bangka Belitung waters
3) Riau Province Coast (Tentative)
4) West Kalimantan Waters (Tentative)
THAILAND
Candidate Refugia Site

1) Koh Chang Strait
2) Chumphorn Group
3) Pha Ngan Island
4) Samui Island
5) Pattani Bay (Tentative)
Fisheries Management Intervention

Establishment of “Fish Refugia”

Protecting specific life stage/s of a fish stock

Enhance Recruitment

Sustainable Fisheries
Russel’s axiom
(Russel 1931)
Surplus production
(Schaefer 1954, Fox 1970)
Yield per recruit analysis
(Beverton and Holt 1957)
Stock-Recruitment curve
(Ricker 1954, Beverton and Holt 1957)

- Recruitment line
- Replacement line
- Equilibrium density or Carrying capacity
- Surplus production

Recruits (numbers) vs Stock size (numbers)
Recruitment

- Spawning stock size
- Fecundity (spawning strength)
- Ichthyooplankton density
Ichthyoplankton survey

Provides information on potential recruits:

– What species of fish?
– Where they are found?
– How many (density)?
– Seasonal fluctuations?
Plankton stations

Map of plankton stations in Calamianes, Palawan in May 2004 (Campos 2004)
Density (no./100m³) distribution of fish eggs in Coron Bay in April 2004 (Campos 2004)
Density (ind./100m³) distribution of fish larvae in Coron Bay in April 2004. (Campos 2004)
Yolk sac larvae distribution

Distribution of yolk sac larvae in Coron Bay in April 2004 (Campos 2004)
Fish larvae composition

<table>
<thead>
<tr>
<th>Larvae Families</th>
<th>Larval Density (ind/100m³)</th>
<th>Standard deviation</th>
<th>Relative Abundance (%)</th>
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<tr>
<td>Gobiidae</td>
<td>4.99</td>
<td>12.68</td>
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<td>5.39</td>
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<td>Priacanthidae</td>
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<td>0.20</td>
<td>0.21</td>
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</table>
Circulation pattern

General tidal circulation in Coron Bay (Villanoy 2006).
Dispersal simulation

Simulation of dispersal in Coron Bay (Villanoy 2006).
April Dispersal
Source areas and relative amounts of dispersed particles settling in each of the areas marked by the colored boxes. Colored bars within each box represent the sources of the particles that settled in a particular box. L= 20 days, R=30 days. (Villanoy, 2006)
Source and Sink

January Dispersal
Sink areas and relative amounts of particles dispersed from each of the areas marked by the colored boxes. Colored bars within each box represent where the particles released from a source box ended up. L=20 days, R=30 days.
Simulated dispersal resulting from tidal circulation in Coron Bay (Villanoy 2006).
Simulated dispersal with wind effects typical of April (Villanoy 2006). Red ellipses indicate areas where settled particles originate from several sources. Grey lines indicate possible but weak dispersal, apparent only after 30 days.
Obeserving closed season for rabbit fish, *Siganus canaliculatus*
Obeserving closed season for rabbit fish, *Siganus canaliculatus*

Catch monitoring data from various gears catching rabbit fish in Danajon Bank from May to July 2004
Closed Season:
- In seagrass areas
- 4\textsuperscript{th}, 5\textsuperscript{th}, 6\textsuperscript{th} nights after the new moon
- March, April & May
Closed season for red grouper, *Plectropomus leopardus*

Length frequency distribution of *Plectropomus leopardus* in Calamianes in 1998 (Mamauag *et al.* 2002)
Ban on harvest of berried lobster

Panulirus larva, (A) Stage I and (B) Stage IX
Alternative sampling gears

- Beach seine
- Push net
- Fry gathering net
Beach seine
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Push net
Fry net
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Catch of beach seine
Catch of push net
Species of interest

Tuna

Scombrids

Carangids

Sardines