Distribution and community structure of ichthyoplankton from the northern and central California Current in May 2004-2006

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Outline

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  – Dominant taxa
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Why do we care about fish early-life stages?

- Recruitment
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- Trophic interactions
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• Recruitment
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• Spawning location
Why do we care about fish early-life stages??

- Recruitment
- Trophic interactions
- Spawning location
- Environmental indicators
Sampling stations

Washington
Oregon
California

Year
- 2004
- 2005
- 2004
- 2006
- 2005

North
South
Sample collection

- 1-m² Tucker trawl
- Oblique tow
- Two 335-µm meshed nets
- Depths: 20-100 & 0-20 m
Sample preservation and sorting

- Preserved in a 10% buffered-formalin seawater solution.
- Enumerated, measured (0.1mm), and identified to the lowest taxonomic level possible in the lab.
Sea surface temperature (SST)
Sea surface salinity (SSS)

2004

2005

2006

Salinity
Environmental indices

- Upwelling index
- MEI

Date

- Jan 04
- May 04
- Sep 04
- Jan 05
- May 05
- Sep 05
- Jan 06
- May 06

Environmental indices

- Upwelling index
- MEI

Date

- Jan 04
- May 04
- Sep 04
- Jan 05
- May 05
- Sep 05
- Jan 06
- May 06
Dominant Taxa

- 170 depth-stratified samples (106 hauls)
- 14,819 fish larvae
- 56 taxa in 23 families
- Four dominant taxa = 78% of total mean larval density
- Noteworthy larvae found:
  - Pacific sardine
  - Pacific hake
  - Citharichthys spp.
  - Engraulis mordax
  - Sebastes spp.
  - Stenobrachius leucopsarus
Station MDS

2004

2005

Stress: 0.14

Stress: 0.13

NC
NS
NO
SC
SS
SO
Depth concentrations

**Mean concentration (no. 1000 m^-3)**

- **Citharichthys spp.**
- **Engraulis mordax**
- **Sebastes spp.**
- **Stenobrachius leucopsarus**
- **Total larvae**

**Depth**
- **0-20 m**
- **> 20 m**
Annual concentrations

<table>
<thead>
<tr>
<th>Year</th>
<th>Citharichthys spp.</th>
<th>Engraulis mordax</th>
<th>Sebastes spp.</th>
<th>Stenobrachius leucopsarus</th>
<th>Total larvae</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>*</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>*</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>&gt;100</td>
<td>&gt;1000</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>600</td>
</tr>
</tbody>
</table>

* ≤ 1 larva found
North/South concentrations

* ≤ 8 larvae found
Cross-shelf concentrations
Cross-shelf concentrations

*E. mordax*

![Graph showing cross-shelf concentrations of *E. mordax* for the years 2004 and 2005. The graph displays the mean concentration (no. 1000 m⁻³) for Coastal, Shelf, and Offshore areas. The data shows a higher concentration in Coastal areas compared to Shelf and Offshore areas in both years.]
## Correlations

<table>
<thead>
<tr>
<th></th>
<th>Temperature (°C)</th>
<th>Salinity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salinity</td>
<td>-0.43</td>
<td>-</td>
</tr>
<tr>
<td><em>Citharichthys</em> spp.</td>
<td>0.57</td>
<td>-0.28</td>
</tr>
<tr>
<td><em>Engraulis mordax</em></td>
<td>0.58</td>
<td>-0.41</td>
</tr>
<tr>
<td><em>Sebastes</em> spp.</td>
<td>0.18</td>
<td>0.01</td>
</tr>
<tr>
<td><em>Stenobrachius leucopsarus</em></td>
<td>0.17</td>
<td>0.18</td>
</tr>
<tr>
<td>Total larvae</td>
<td>0.44</td>
<td>-0.20</td>
</tr>
</tbody>
</table>

$P < 0.05$
Multivariate BIO-ENV

- **Model variables:** latitude, station depth (m), distance from shore (km), temperature (°C), and salinity
- **Significant variables:** latitude, station depth, and temperature ($p_w = 0.48$)
Conclusions

• **Dominant taxa:** *Citharichthys* spp., *E. mordax*, *Sebastes* spp., *S. leucopsarbus*

• **Assemblages:** combination of latitude (north, south) and cross-shelf (coastal, shelf, offshore)

• **Concentrations:**
  - *Citharichthys* spp., *E. mordax*, total larvae: 0-20 m; *Sebastes* spp. and *S. leucopsarbus*: > 20 m
  - 2004 & 2005 > 2006
  - North > South
  - *Citharichthys* spp.: coastal; *E. mordax*: upwelling dependent; *Sebastes* spp.: shelf; *S. leucopsarbus*: offshore; total larvae: coastal/offshore

• **Environ. correlations:**
  - + temperature, - salinity
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