Distinguishing southern and western Korean kishi velvet shrimp (Metapenaeopsis dalei) stocks

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Taxonomical position

- In Korean waters: 19 species (Kim et al., 2003), five commercial
- Class Crusatacea
  - Order Decapoda
    - Family Penaeidae
      - Subfamily Penaeoidae
        - *Penaeus chinensis*
        - *Penaeus japonicus*
        - *Metapenaeus joyneri*
        - *Trachypenaeus curvirostris*
        - *Metapenaeopsis dalei* (Kishi velvet shrimp)
Penaeid shrimp fishing in Korea

**Landings:**
Decreased from 1993 to 2001 (19,616 to 6,625 t)

**Fishing areas**
South and west Korean coasts

**Fishing gear**
Stow nets and anchors
Shrimp trawl
Previous Korean penaeid shrimp studies

Population studies

*Penaeus chinensis*: Cha et al., 2002
*Metapenaeus joyneri*: Cha et al., 2003
*Trachypeaneus curvirostris*: Cha et al., 2003
*Metapenaeopsis dalei*: Choi et al., 2003

Species distribution studies

*P. chinensis*: Kim, 1973
*M. joyneri* and *T. curvirostris*: Cha, 1997

Fisheries management and stock assessment studies

None
Spawning patterns of Korean penaeid shrimps

A. Summer spawning pattern:
   - *M. joyneri*
   - *M. dalei*
   - *T. curvirostris*

B. Spring spawning pattern:
   - *P. chinensis*

Dall et al. (1990)
Life cycle of kishi velvet shrimp

1. Eggs
2. Nauplius
3. Protozoea
4. Mysis
5. Offshore migration
6. Juveniles
Previous understanding of spatial distribution and migration
Study purpose

- To distinguish kishiki velvet shrimp stocks in Korean waters through parasite presence, growth and migration patterns.
- To characterise kishiki velvet shrimp stock boundaries on the basis of the above parameters.
Features considered to distinguish kishi velvet shrimp stocks

- Spatial distribution
- Parasite rate
- Growth pattern
- Temperature
- Current flow direction
Spatial distributions
## Parasite infection rate

<table>
<thead>
<tr>
<th>Area</th>
<th>Rate</th>
<th>Host species</th>
<th>Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td>South</td>
<td>48 %</td>
<td><em>M. dalei</em></td>
<td><em>Parapenaeon consolidatum</em></td>
</tr>
<tr>
<td>West</td>
<td>0 %</td>
<td><em>M. dalei</em></td>
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</tbody>
</table>
Kishi velvet shrimp growth patterns

South West – faster growth

\[ L_t = L_\infty \{1 - \exp \left[-K (t - t_0) - \left(\frac{CK}{2\pi}\right) \sin \left(\frac{2\pi (t - t_s)}{}\right)\right]\} \]
The average estimated low temperature tolerance of penaeid shrimps in general is 8°C (Joyce, 1965).
Kuroshiro Current
Divergence

Yellow Sea

Kuroshio

NFRDI
## Summary

<table>
<thead>
<tr>
<th>Items</th>
<th>South</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spatial distribution</td>
<td>All seasons</td>
<td>Summer</td>
</tr>
<tr>
<td>Parasite rate</td>
<td>48 %</td>
<td>0 %</td>
</tr>
<tr>
<td>Von Bertalanffy Growth parameter</td>
<td>$L_\infty = 24.8$ (female)</td>
<td>$L_\infty = 22.1$ (female)</td>
</tr>
<tr>
<td></td>
<td>$\varphi' = 2.67$ (female)</td>
<td>$\varphi' = 2.77$ (female)</td>
</tr>
<tr>
<td>Migration</td>
<td>Inshore – Offshore</td>
<td>West – Northern East China Sea</td>
</tr>
</tbody>
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$\varphi' = \log(K) + 2\log(L_\infty)$
Conclusions

- The boundary between the southern and western kishih velvet shrimp stocks is Mokpo City, and is identified by water temperature and Kuroshio current direction.

- Suggested cause of differential parasite load:
  - Temperature
  - Sediment type
Future studies

To examine morphological variation and genetic study
To examine tagging study
To compare the commercial fish stock
To suggest different management approaches