Interannual variation in growth of larval and early juvenile Japanese anchovy in the Kuroshio-Oyashio transition region

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Growth, development and survival

Takahashi et al. (2001)
Takahashi & Watanabe (in press a)

Body length

Takahashi & Watanabe (2004 a)
Objectives

Temporal and spatial variability in growth rates of larvae and early juveniles in the nursery grounds

- Environmental conditions
  - Sea surface temperature (SST)
  - Available prey density

- Comparison to sardine growth
Growth analysis

Recent 10-day growth rate (Gr)

\[ \text{Gr} = \frac{\text{SL}_{\text{last}} - \text{SL}_{\text{last-10}}}{10} \]

Available prey density

SST weighted by no. of collected fish (< 50 mm SL)

0.2 - 0.6 mm in prosomal width

Takahashi & Watanabe (in press b)
Gr and environmental conditions

- **Gr (mm d⁻¹)**
  - Y-axis: 0 to 1.0

- **SST (°C)**
  - X-axis: 12 to 22

- **Prey density (mg DW m⁻²)**
  - X-axis: 0 to 600
  - Y-axis: 0 to 1.0

- **< 100 mg DW m⁻²**
  - **Food shortage**

- **Controlling factor**
- **Regulating factor**
Available copepod density

Variable area

Stable area

Mean value

258.0 ± 140.1

207.6 ± 76.0
SST distribution

1997

1998

1999

2000

2001

2002

Mean value
18.1 ± 0.6

16.8 ± 0.6

Weighted SST (°C)

Stable area

Variable area
Interannual variation in growth and SST

Variable area

Gr = 0.081 SST – 0.70
(n=5, R²=0.98)

Stable area

Gr (mm d⁻¹)

Weighted SST (°C)

Weighted SST (°C)
Summary of results

Spatial

Variable SST & prey density
Fast growth
Stable High SST
High prey density

Temporal

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<td>SST</td>
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<td>Small copepods</td>
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Growth comparison to sardine

Anchovy

Sardine

Temporal

Spatial
**Conclusion**

Anchovy growth was a spatially and temporally negative function of sardine growth.

### Anchovy Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>1997</th>
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<th>2000</th>
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<td>Gr</td>
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<td>SST</td>
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<td>Small copepods</td>
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### Sardine Growth

<table>
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<tbody>
<tr>
<td>Gr</td>
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<td>SST</td>
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<tr>
<td>Small copepods</td>
<td>+</td>
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<td>+</td>
<td>++</td>
<td>++</td>
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<tr>
<td>Large copepods</td>
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Thanks Hawaii!!

15 Oct. 2004