INTERANNUAL VARIABILITY OF ZOOPLANKTON COMMUNITY STRUCTURE BASED ON CONTINUOUS PLANKTON RECORDER IN THE WESTERN SUBARCTIC NORTH PACIFIC DURING 2001-2009

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Introduction

Western North Pacific area

Mixed water region
OBJECTIVES

To examine Interannul and seasonal variability of zooplankton community structure in Western North Pacific Area during 2001-2009 based on CPR sample

To discuss the differences between the two areas, WEST and EAST in western north pacific, and the possible link between the zooplankton variability and environmental factors such as SST and Chl.a data obtained by satellite

This study is a part of Japanese contribution to the North Pacific CPR (Continuous Plankton Recorder) project.
Study area

**Sampling**
CPR transect was operated one to three times per year, from Spring to Autumn during **2001-2009**

**Zooplankton analysis**
Large size mesozooplankton (>2mm)

**Temperature and Chl.α data**
Satellite data

*Cf. Chiba et al. session 1.*

Fig. Sampling transects

Analysis was conducted with WEST and EAST which was divided by 155°E line
Seasonal and Interannual variation of temperature based on the satellite data

Monthly Normalized SST in WEST area

Monthly Normalized SST in EAST area
Phytoplankton seasonality differs between the two region.

Bloom starts ca. one month earlier in the WEST.

(Detailed information on phytoplankton phenology in this area was already presented in Session 1 by Chiba et al. on 17 Oct.)
Abundant species in all area (Occurrence frequency >4%)

**Cold water species**
- *Eucalanus bungii*
- *Neocalanus plumchrus*
- *Neocalanus flemingeri*
- *Neocalanus cristatus*
- *Metridia okhotensis*
- *Metridia pacifica*

**Warm water species**
- *Calanus pacificus*
- *Candacia columbiae*
- *Paraeucheata elongata*
- *Heterorhabdus tanneri*
Cluster analysis (with >4% frequent appeared species)

The cluster analysis using the Bray-Curtis dissimilarity index (Bray & Curtis 1957).

Seasonal variation of zooplankton communities were clear both in WEST and EAST.
Appearance period of abundant species

West

<table>
<thead>
<tr>
<th>Species</th>
<th>Spring</th>
<th>Early summer</th>
<th>Summer</th>
<th>Autumn</th>
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<td>Euchaetidae</td>
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*Eucalanus bungii*

*Neocalanus plumchrus*

*Neocalanus flemingeri*

*Neocalanus cristatus*

*Calanus pacificus*

*C. pacificus* was abundant from July in WEST area, while from September in EAST area.
Warm-water species abundance between WEST and EAST

*Calanus pacificus*

**Relationship of abundance between WEST and EAST in Sep and Oct.**

- **Abundance in WEST (in log_{10}(x+1))**
- **Abundance in EAST (in log_{10}(x+1))**

**Autumn abundance anomaly in EAST**

- **Autumn abundance anomaly in EAST**
- **Average SST anomaly during Feb-Oct in EAST**

**Monthly Normalized SST in EAST area**

- **Cold**
- **Warm**

**Months:** 2000 - 2009

**Correlations:**
- $r = 0.747^{**}$
- $r = 0.846^{*}$

**Legend:**
- Cold
- Warm
Cold-water species - Relationship of abundance between WEST and EAST

**Neocalanus plumchrus**

- Abundance in EAST: log_{10}(x+1)
- Abundance in WEST: log_{10}(x+1)

$r=0.720^{**}$

**Neocalanus cristatus**

- Abundance in EAST: log_{10}(x+1)
- Abundance in WEST: log_{10}(x+1)

$r=0.443$

**Neocalanus flemingeri**

- Abundance in EAST: log_{10}(x+1)
- Abundance in WEST: log_{10}(x+1)

$r=0.728^{**}$

**Eucalanus bungii**

- Abundance in EAST: log_{10}(x+1)
- Abundance in WEST: log_{10}(x+1)

$r=0.516^{*}$

No correlation between WEST and EAST
Cold-water species - Relationship of developmental stage between WEST and EAST

**Neocalanus plumchrus**

- Relationship: $y = 1.06x$
- $R^2 = 0.5109$
- $r = 0.813^{**}$

**Neocalanus flemingeri**

- Relationship: $y = 1.02x$
- $R^2 = 0.5455$
- $r = 0.729^{**}$

**Neocalanus cristatus**

- Relationship: $y = 1.00x$
- $R^2 = 0.4363$
- $r = 0.678^*$

**Eucalanus bungii**

- No correlation between WEST and EAST
- $r = 0.385$
Percentage of young stages are lower in the EAST than that of the WEST.
Summary

- *C. pacificus* start to appear from July in WEST and while appear from September in EAST.

- *C. pacificus* was abundant in warm autumn year. This might be related to warm water mass from the Kuroshio current.

- Development timing of *Neocalanus plumchrus* was varied interannually, while that of *N. flemingeri* and *N. cristatus* was not different between years.

- Interannual variation of abundance and average developmental stages of *Neocalanus* species was in a synchronous manner between the WEST and EAST area.

- On the other hand, synchronous abundance variation and development was not observed in *Eucalanus bungii* between the WEST and EAST.

- The differences of abundance and average developmental stages of *E. bungii* between WEST and EAST might be caused by the timing of start and peak of phytoplankton bloom.