

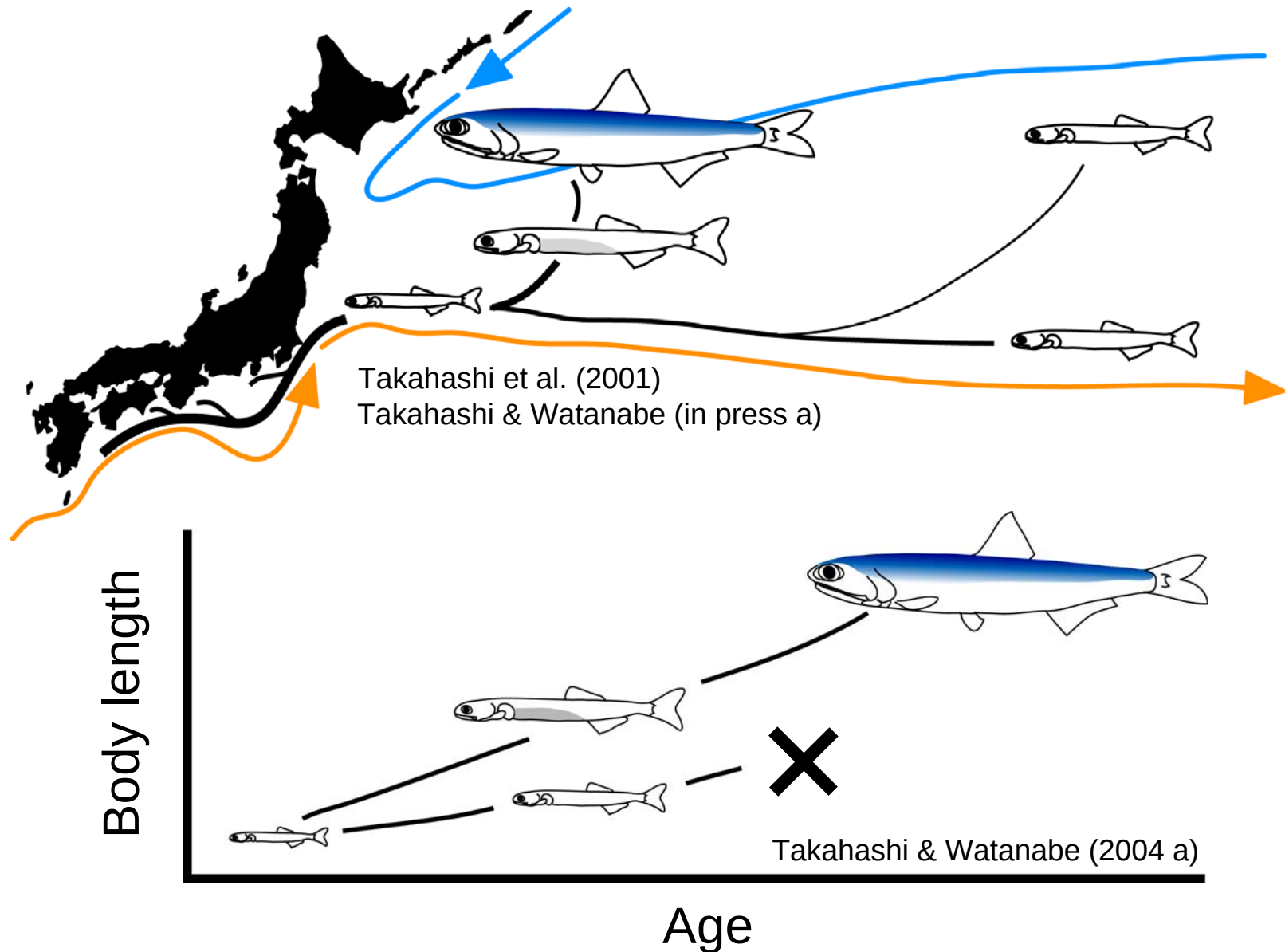
# Interannual variation in growth of larval and early juvenile Japanese anchovy in the Kuroshio-Oyashio transition region

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# Growth, development and survival



# 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

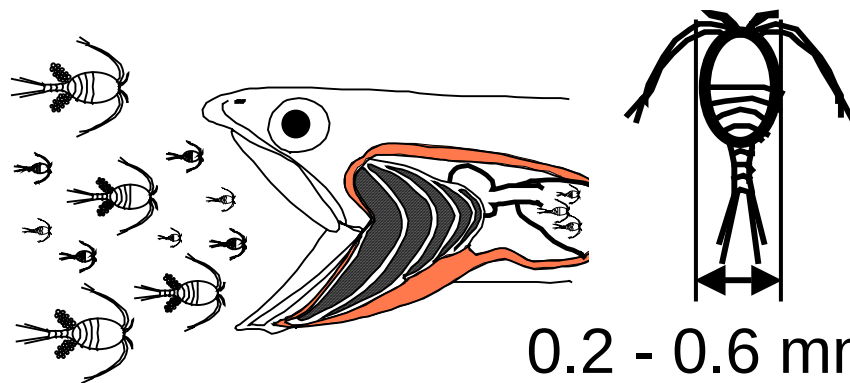
Recent 10-day growth rate (Gr)



$$Gr = (SL_{last} - SL_{last-10}) / 10$$

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

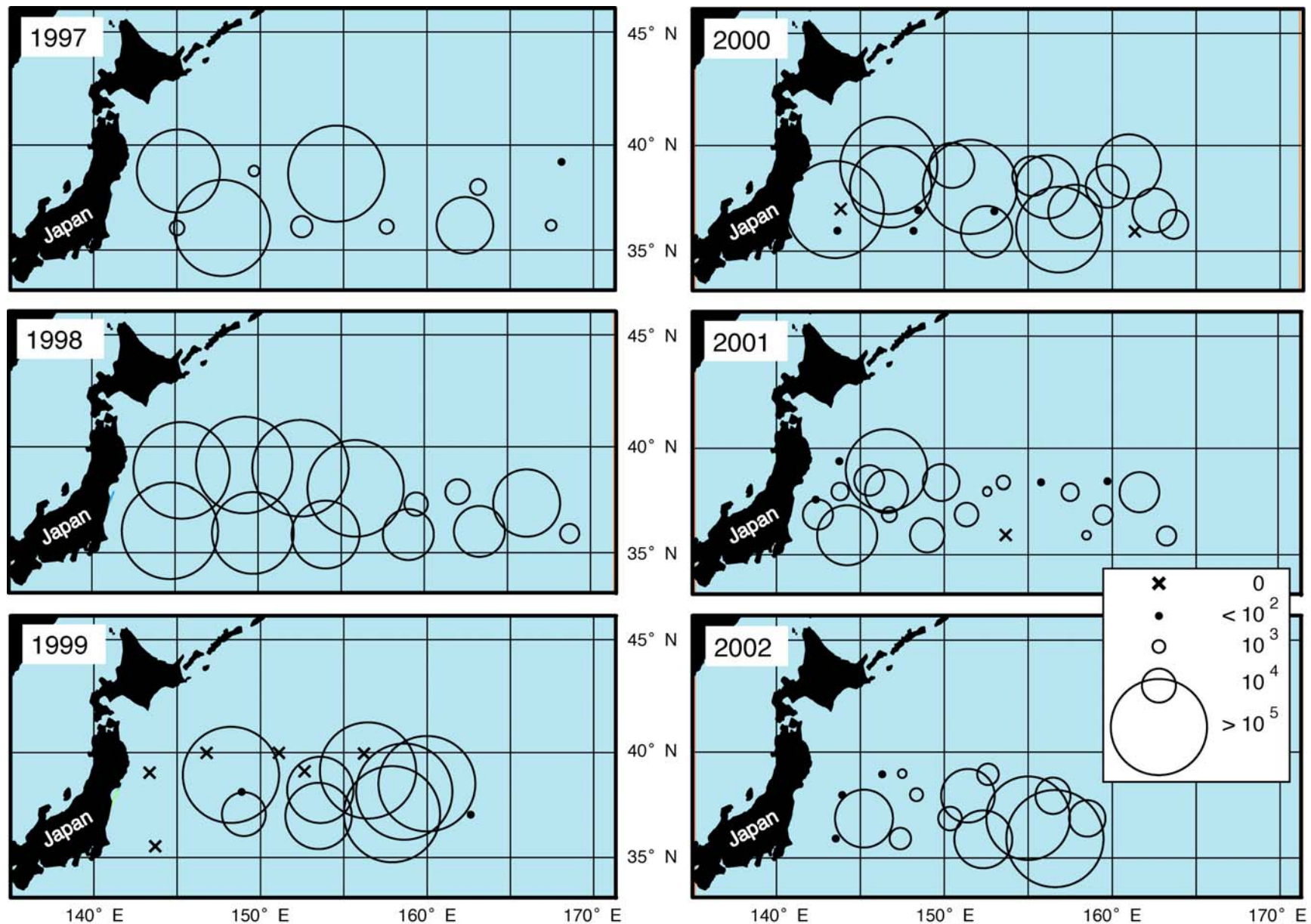
Available prey density



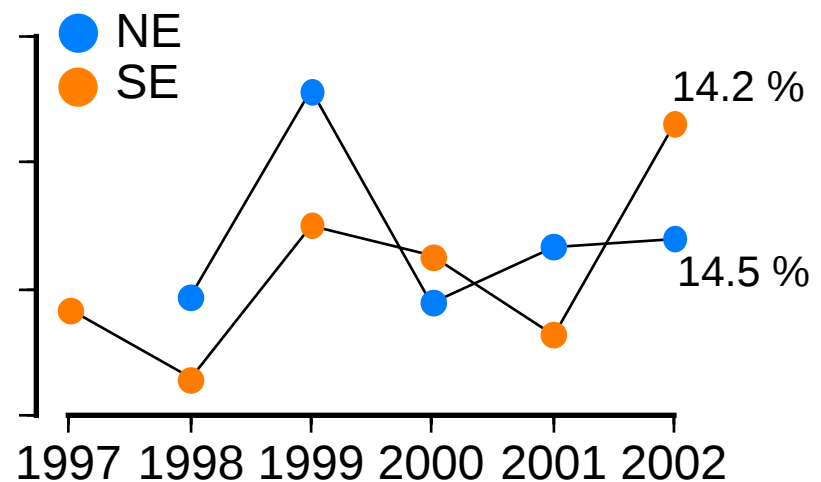
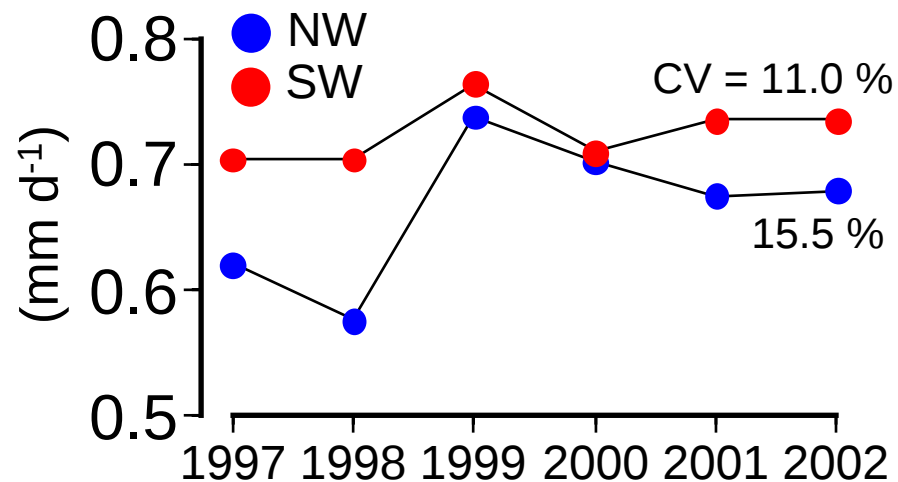
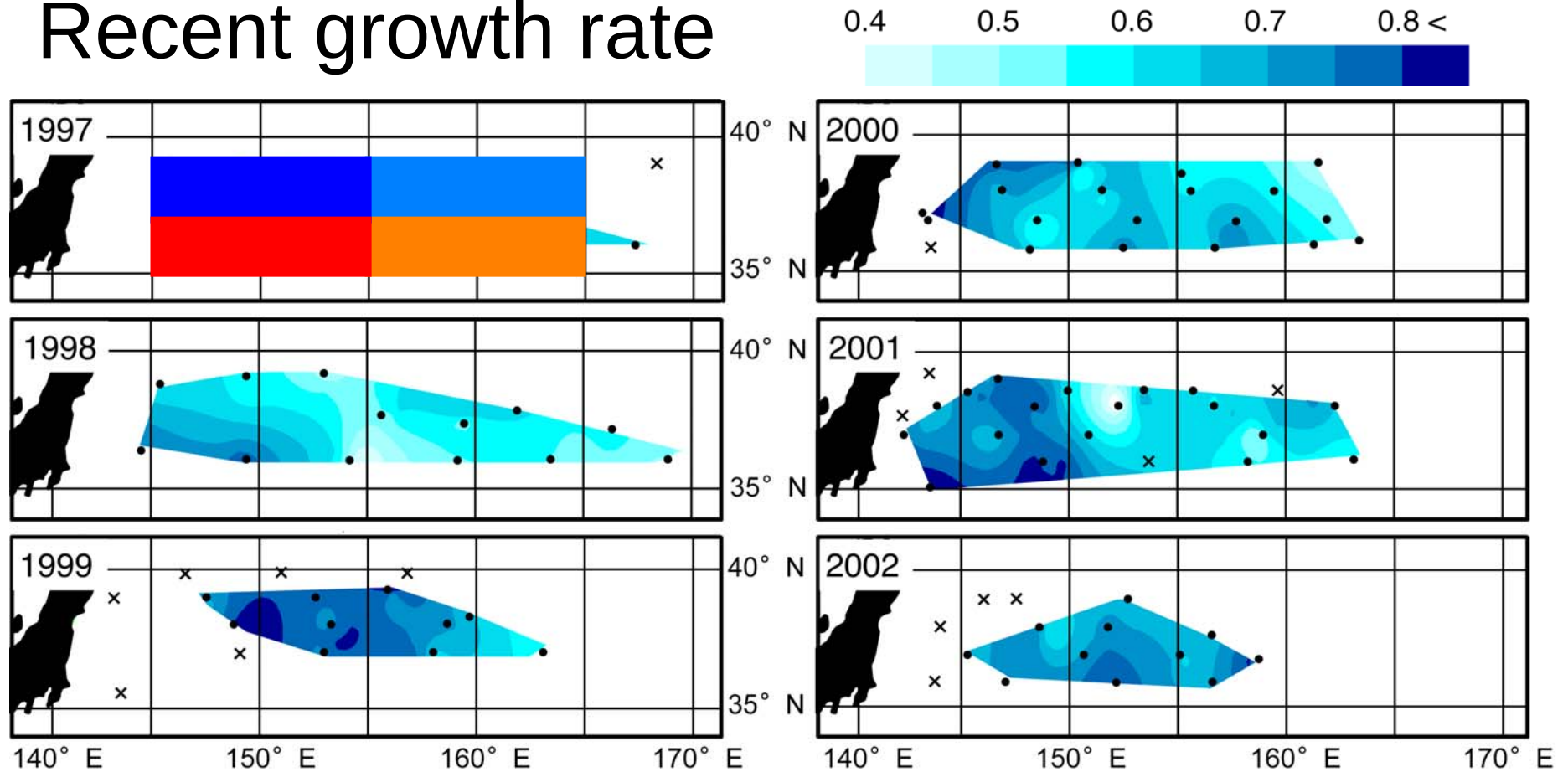
0.2 - 0.6 mm in  
prosomal width

Takahashi & Watanabe (in press b)

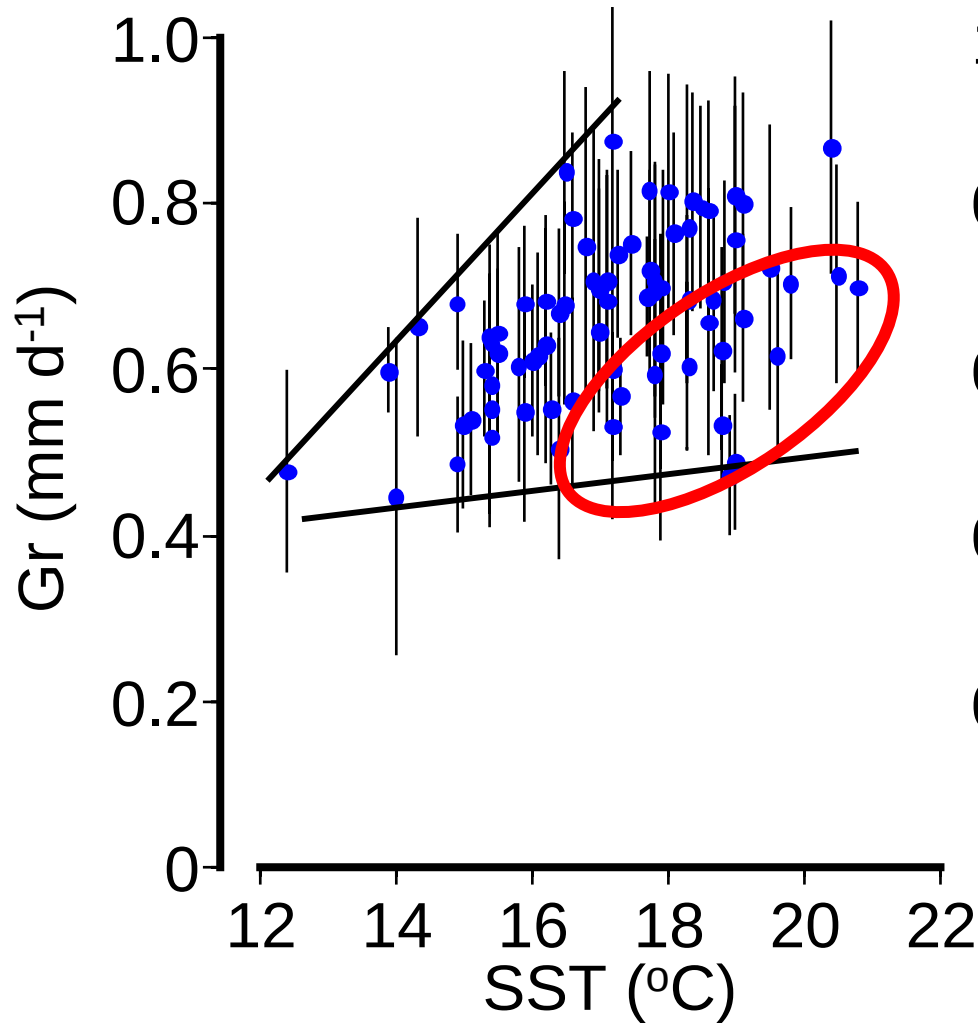
# Distribution



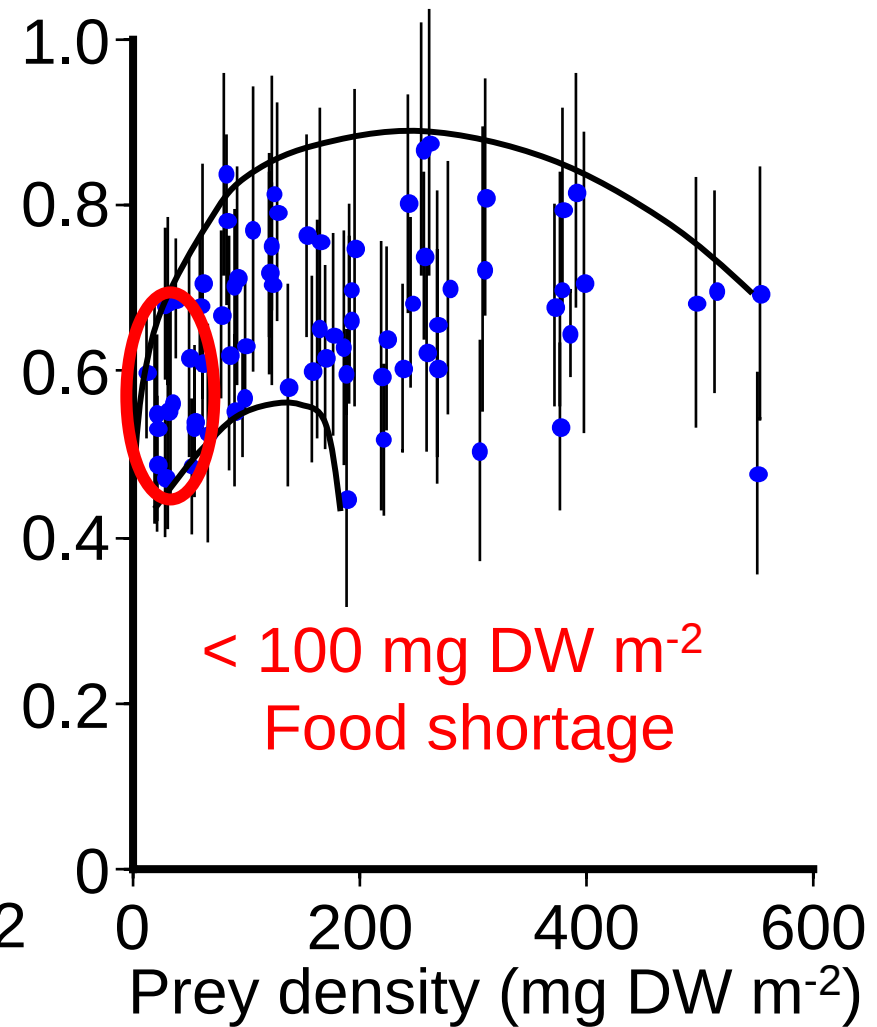
# Recent growth rate



# Gr and environmental conditions

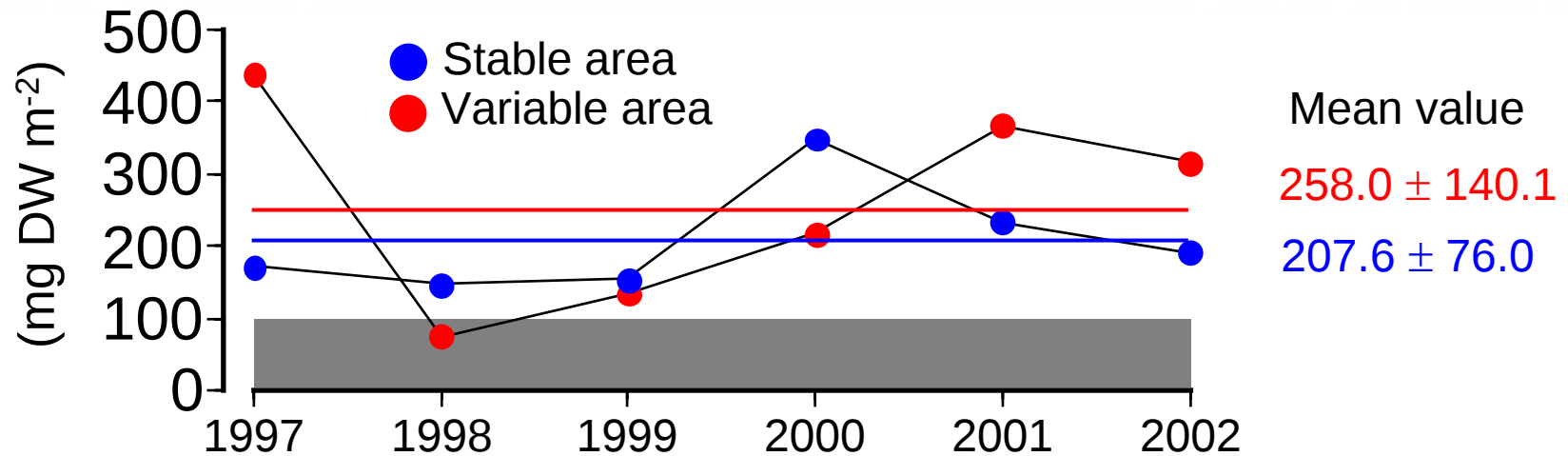
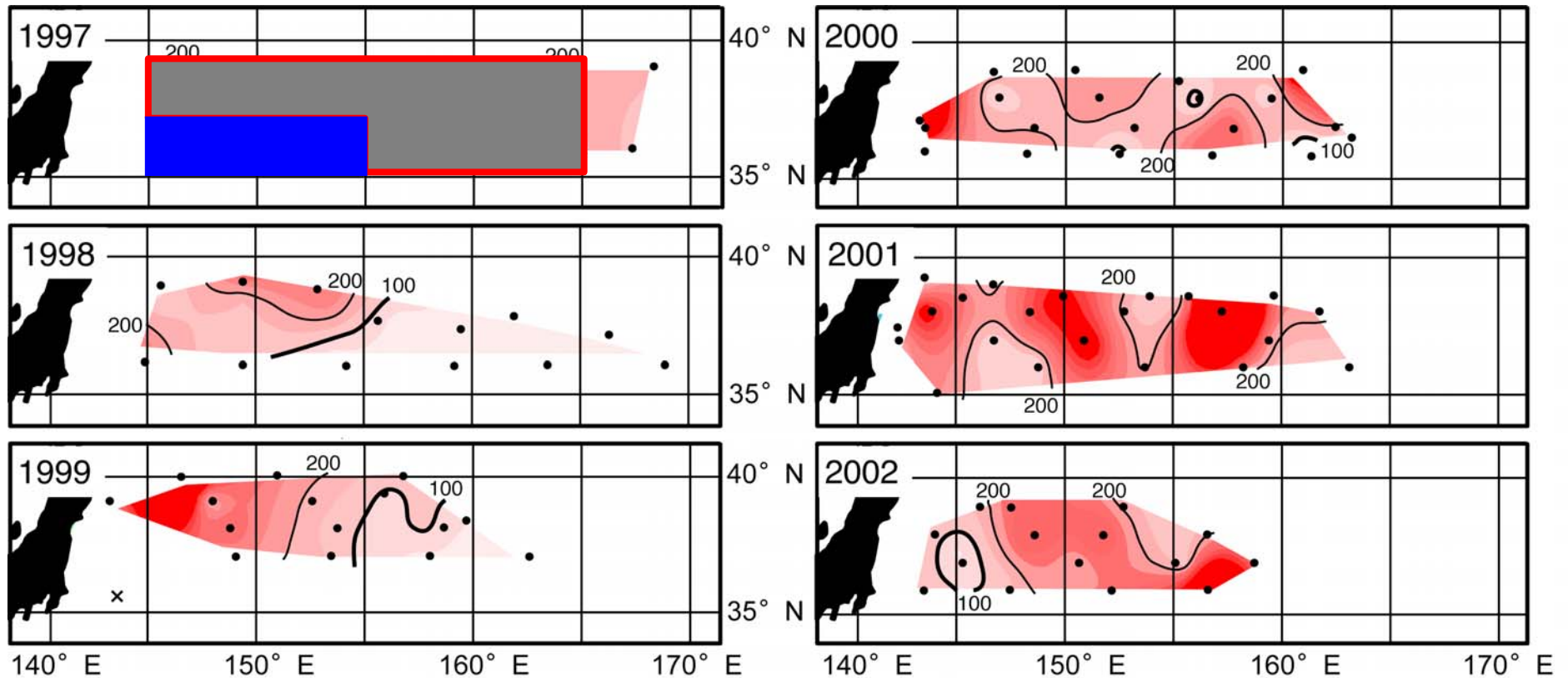
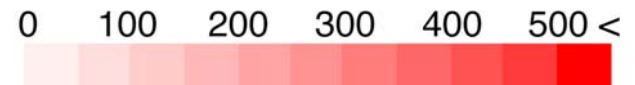


Controlling factor

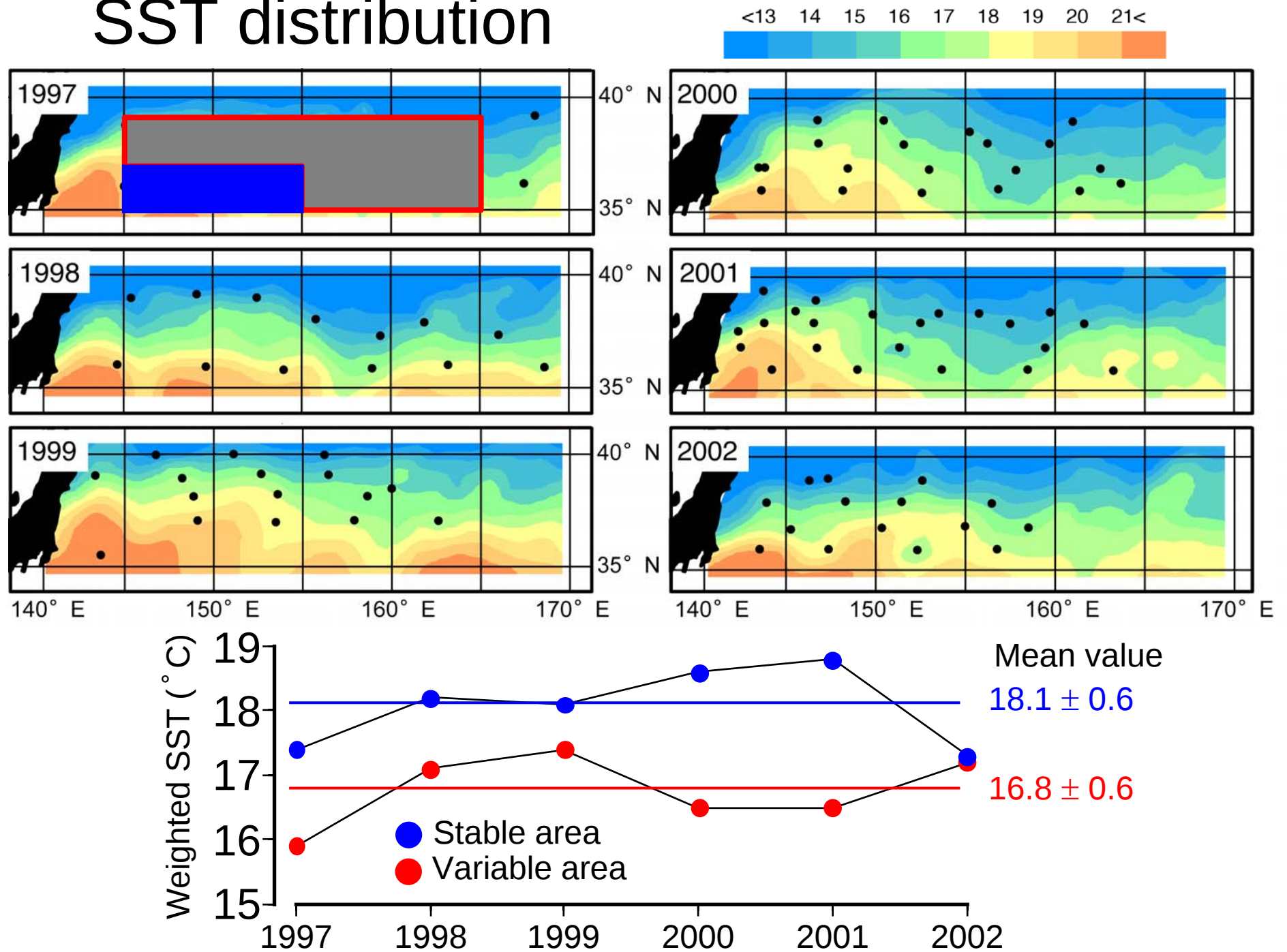


Regulating factor

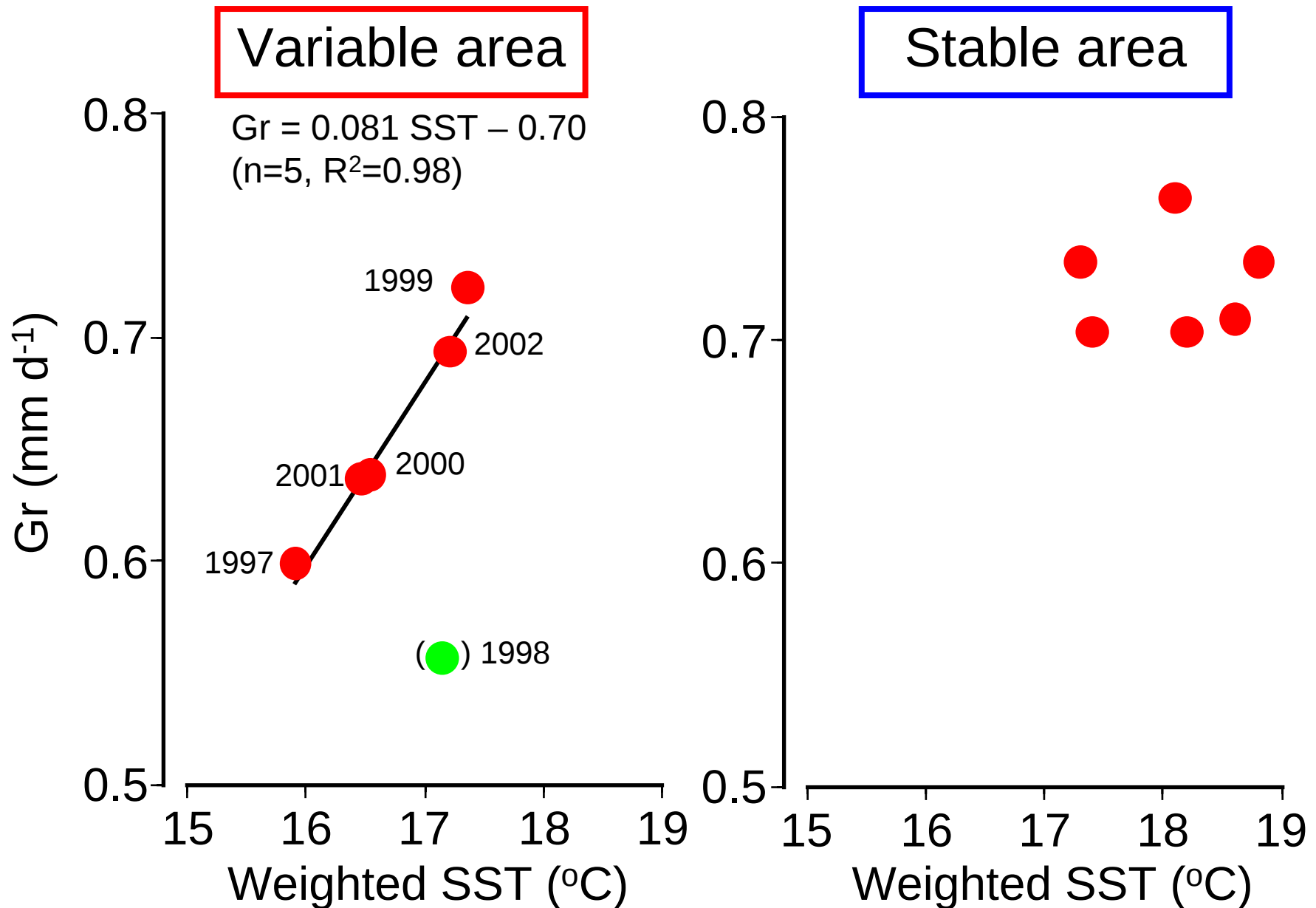
# Available copepod density



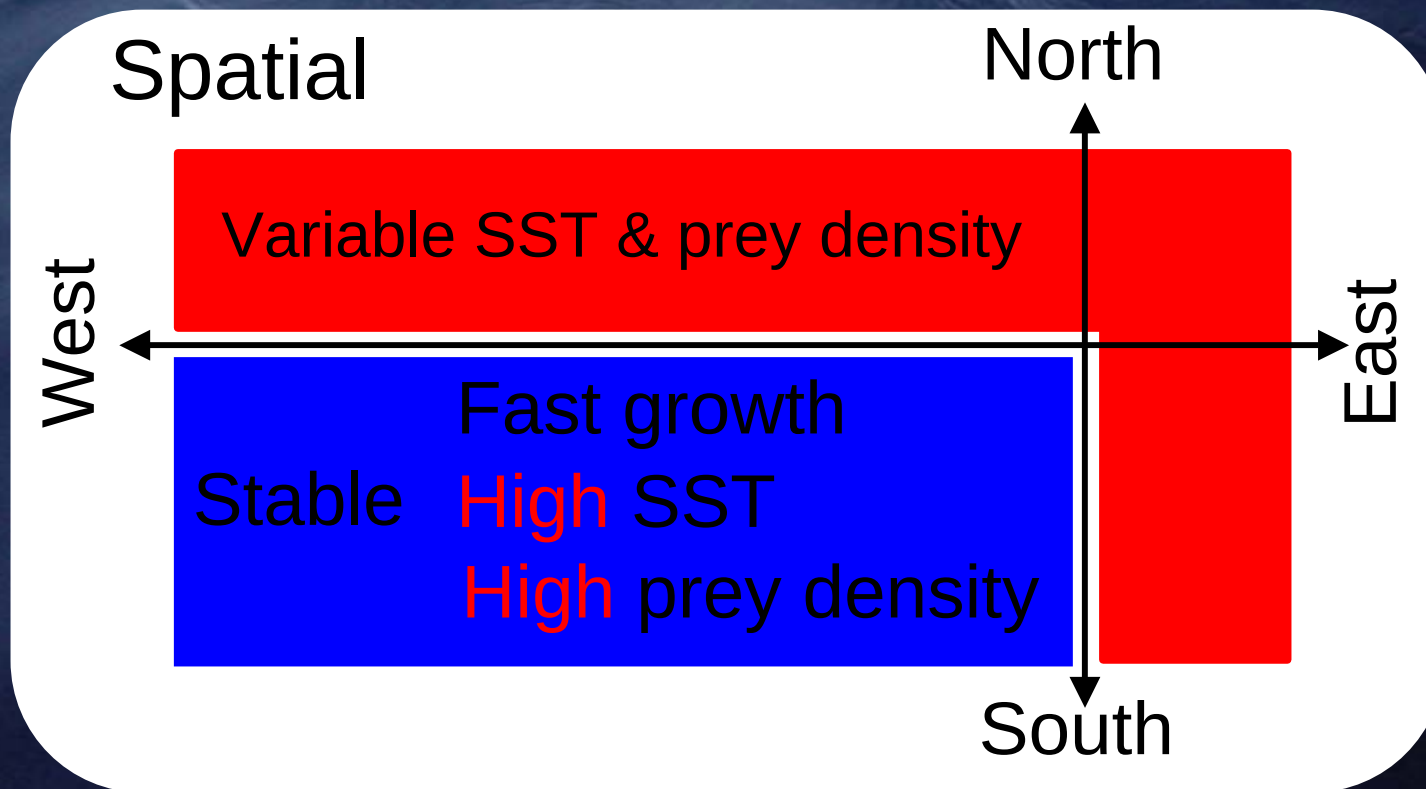
# SST distribution



# Interannual variation in growth and SST



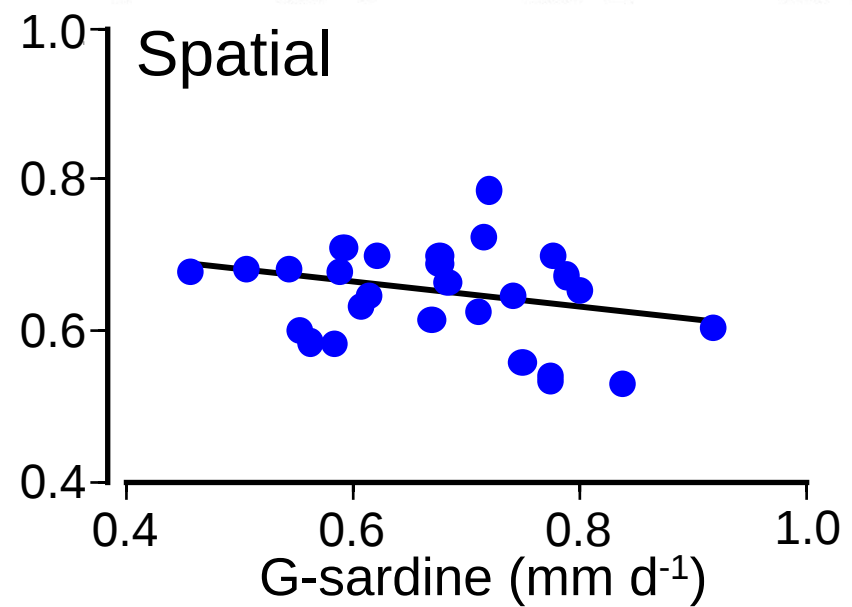
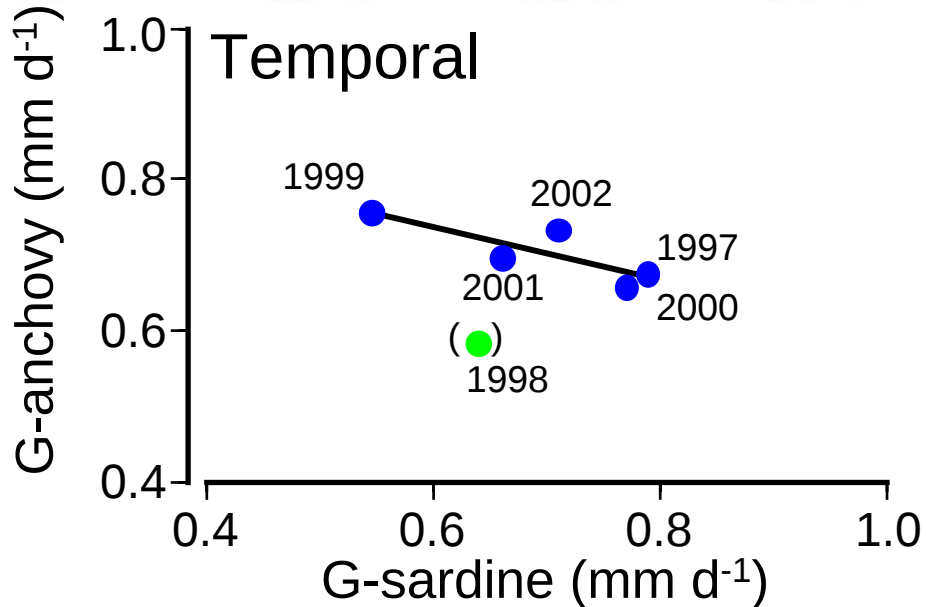
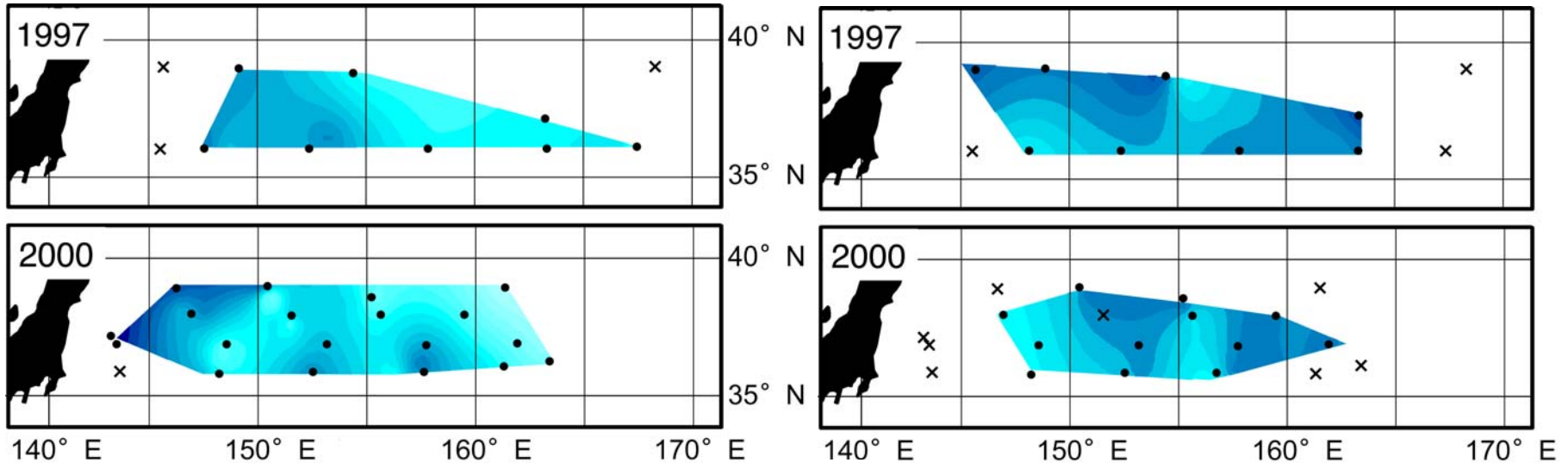
# Summary of results



| Temporal       | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|----------------|------|------|------|------|------|------|
| Gr             | --   | --   | ++   | -    | -    | ++   |
| SST            | --   | +    | ++   | -    | -    | +    |
| Small copepods | ++   | --   | +    | ++   | ++   | ++   |

# Growth comparison to sardine

Anchovy 0.4 0.6 0.8 1.0 Sardine



# Conclusion

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

| Anchovy        | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|----------------|------|------|------|------|------|------|
| Gr             | --   | --   | +++  | -    | -    | +++  |
| SST            | --   | +    | +++  | -    | -    | +    |
| Small copepods | +++  | --   | +    | +++  | +++  | +++  |

| Sardine        | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|----------------|------|------|------|------|------|------|
| Gr             | +++  | -    | -    | +++  | --   | -    |
| SST            | -    | +    | --   | +++  | +++  | -    |
| Small copepods | +    | --   | --   | +    | +++  | +++  |
| Large copepods | -    | --   | +    | +++  | -    | --   |

# Thanks Hawaii!!

