

**Interannual variations of sea ice and
spring bloom occurrences
at the Japanese scallop farming area
in the Okhotsk Sea**

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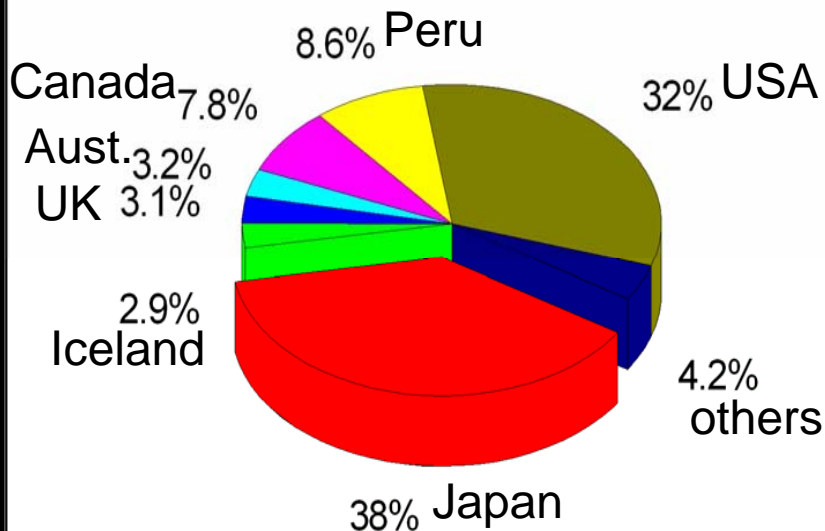
*Laboratory of Marine BioResource
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Hokkaido University.*

Contents

- **Background**
- **Objectives**
- **Data**
- **Results & Discussion**
- **Conclusions**

BACKGROUND

Scallop landings



Network Of Aquac. Cent. In Asia, 2000

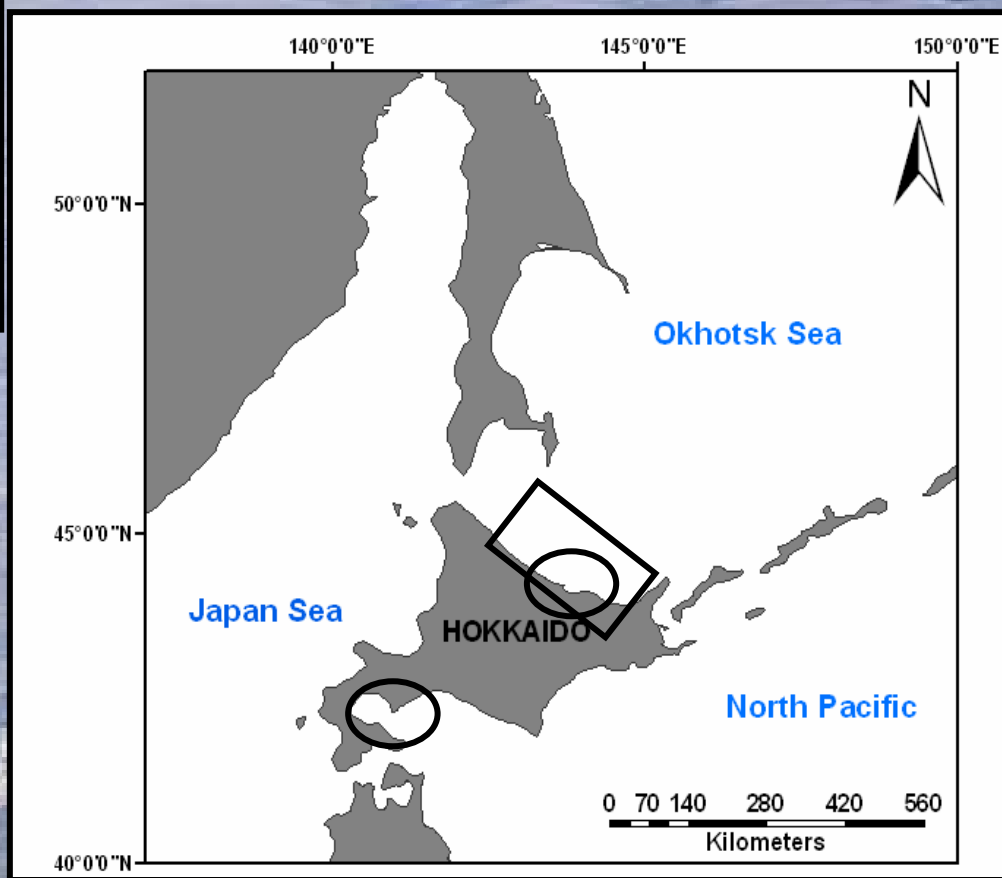
cold water species

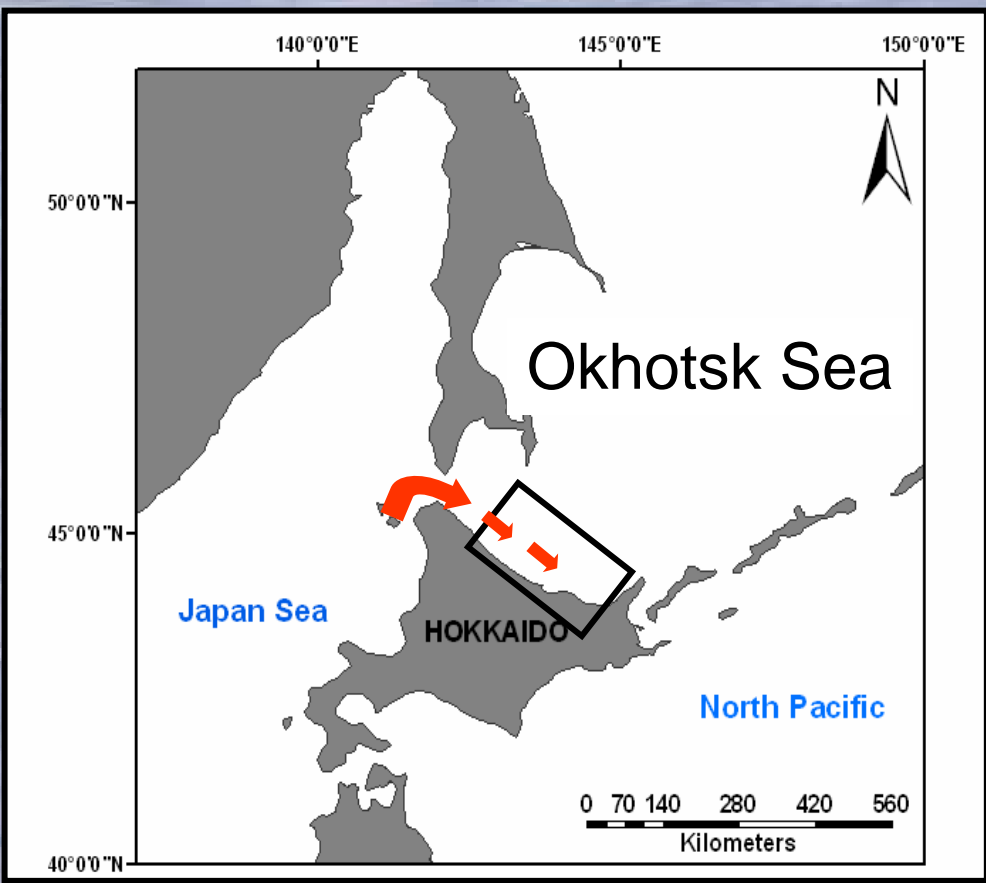
cultured along Hokkaido coast

increase landings from Okhotsk area (MAFF 2004)



Patinopecten yessoensis

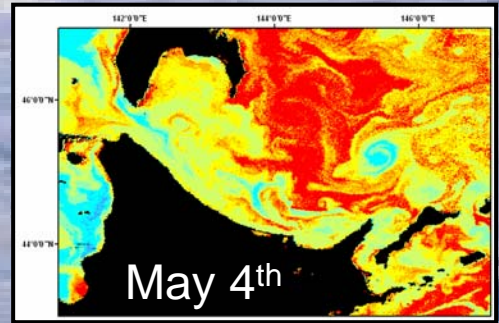




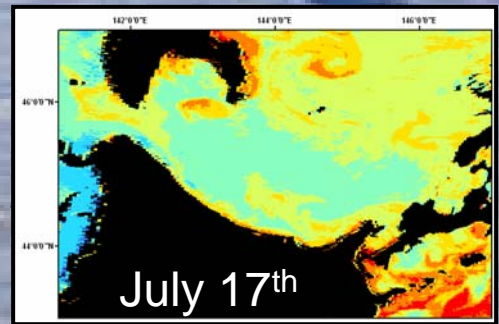
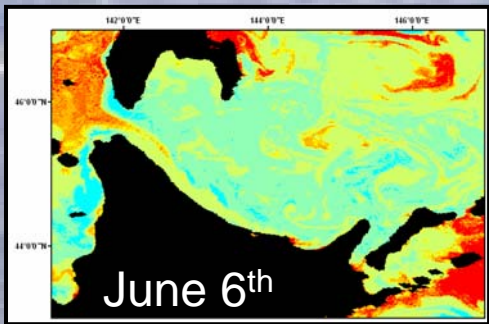
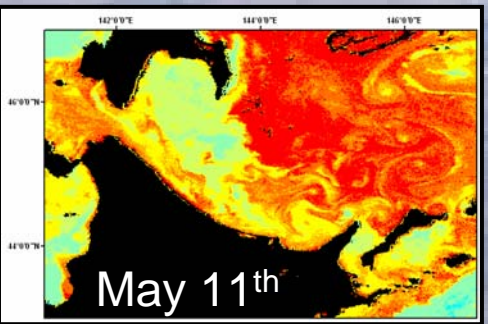
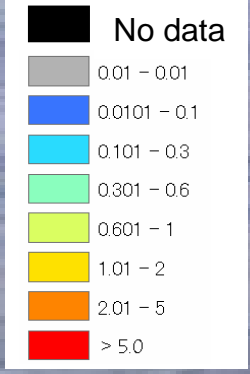
marginal sea

Seasonal variability:

a) *Advection of warm soya current (summer)*



Chlorophyll-a concentration (mgm-3)



Sea WiFS daily images of 1998

b) southern most seasonal sea ice zone (winter)

variations in sea ice extent (Sakurai & Seto, 2000)

important role in high production at the ice edge

(Okunishi, 2006; Mizuta et al., 2004)

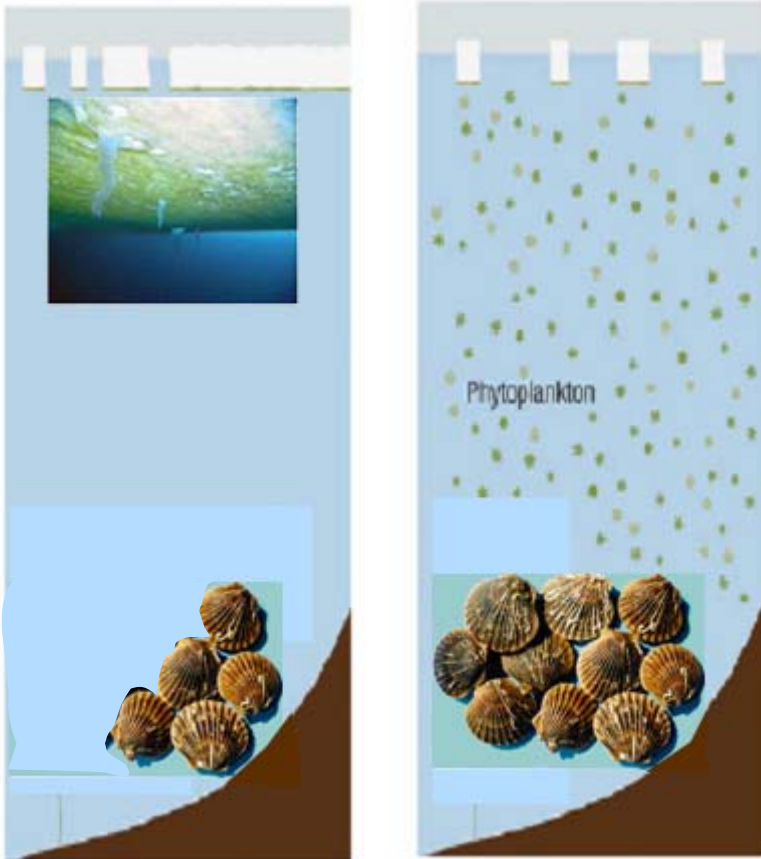
**Dynamics of ice formation and
phytoplankton bloom development**



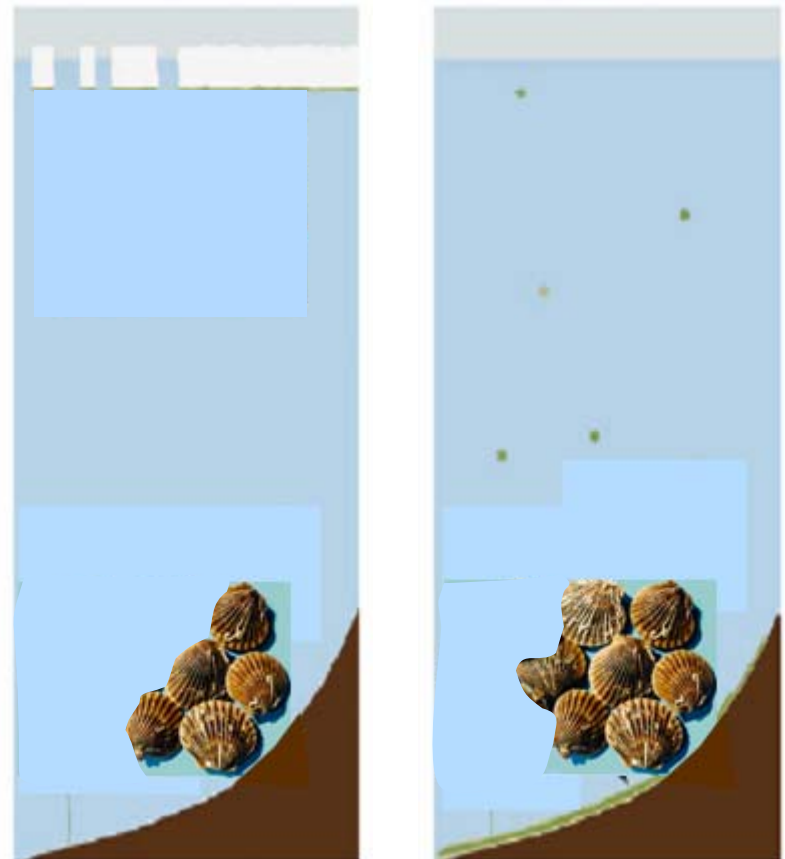
**affect food web dynamics
(pelagic and benthic environment)**

Dynamics of ice formation and phytoplankton bloom development

Late ice retreat



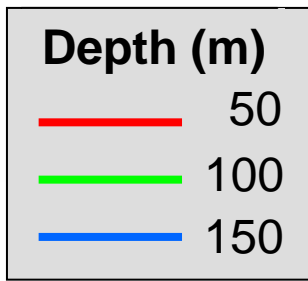
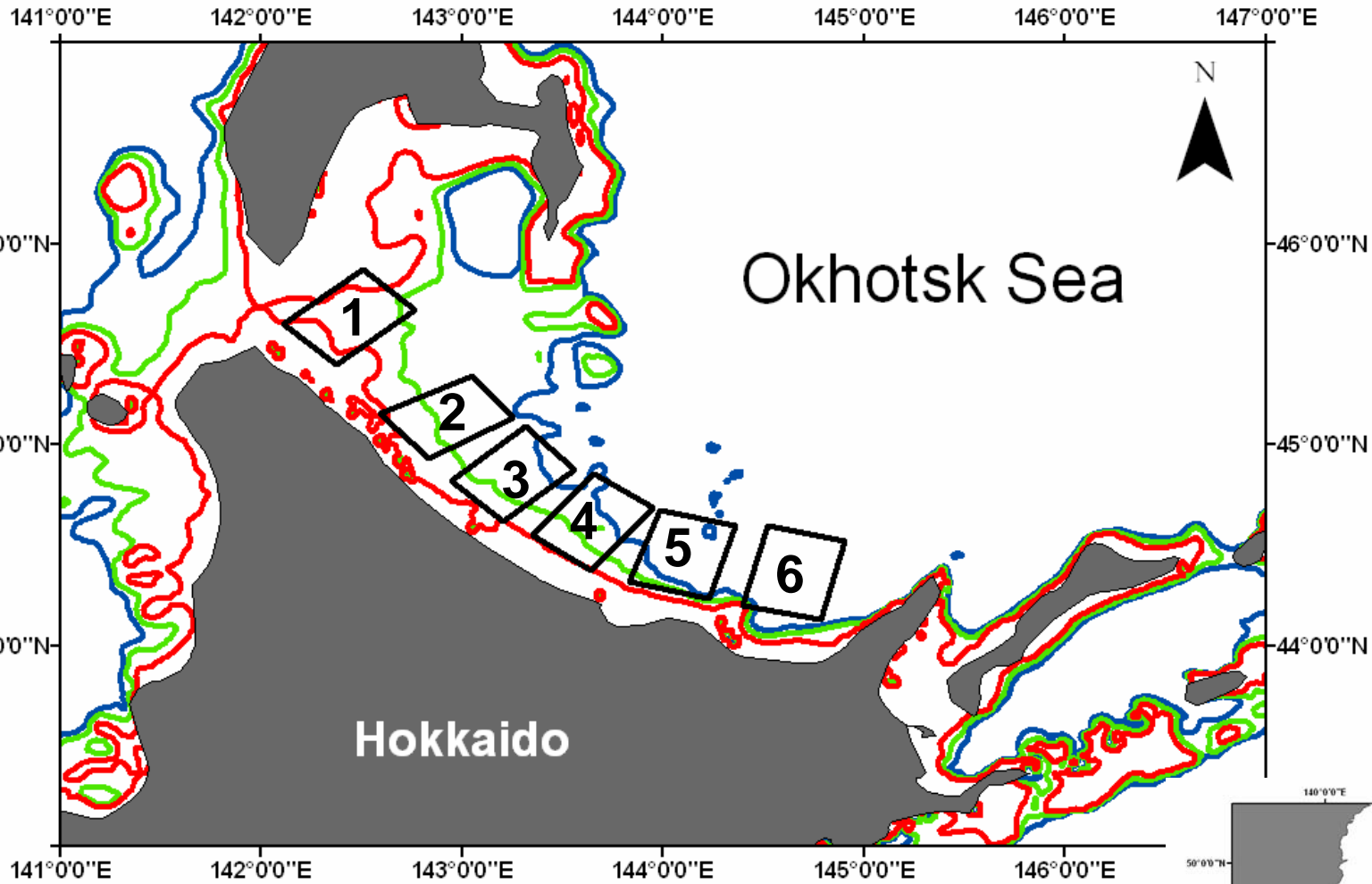
Early ice retreat



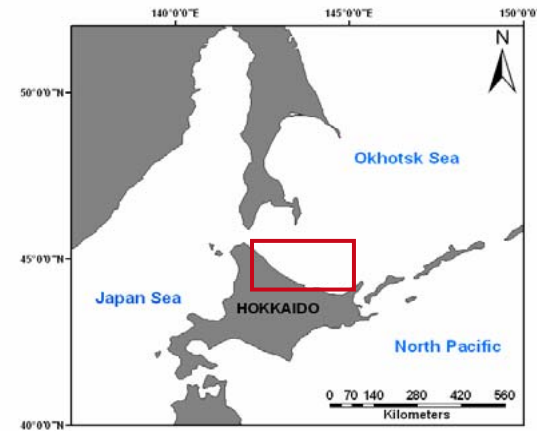
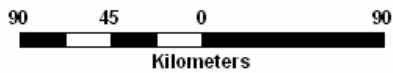
OBJECTIVES

- **To clarify inter-annual variability of sea ice cover**
- **To determine timing of spring bloom occurrences**

Scallop farming area in the Okhotsk Sea



Scallop area



DATA

Satellite data : 1998 - 2004

Parameter	Sensor name/Data	Spatial/temporal resolution
Chlorophyll <i>a</i>	SeaWiFS	9km/8-day
Sea ice concentration	SSM/I	25km/daily
Wind	NCEP/NCAR	2.5°/daily

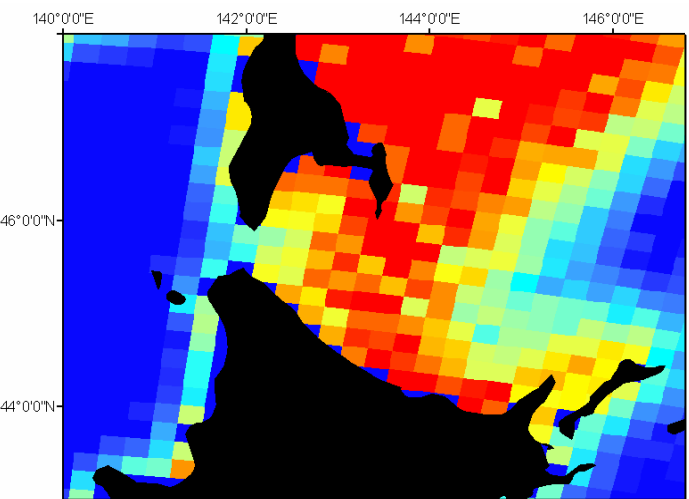
Sea ice concentration

- : percentage of ice coverage in a certain area**
- : sea ice concentration exceeding 15%**

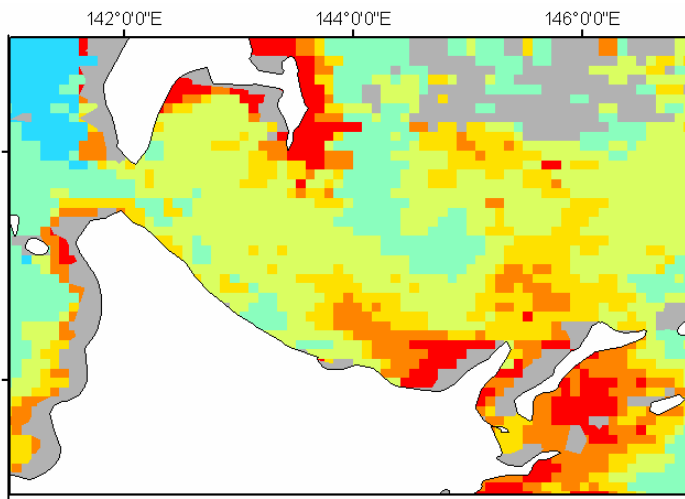
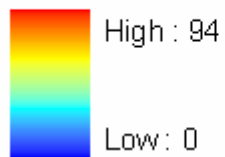
Sea surface wind

- : wind speed at 10 m height from sea surface**

RESULTS

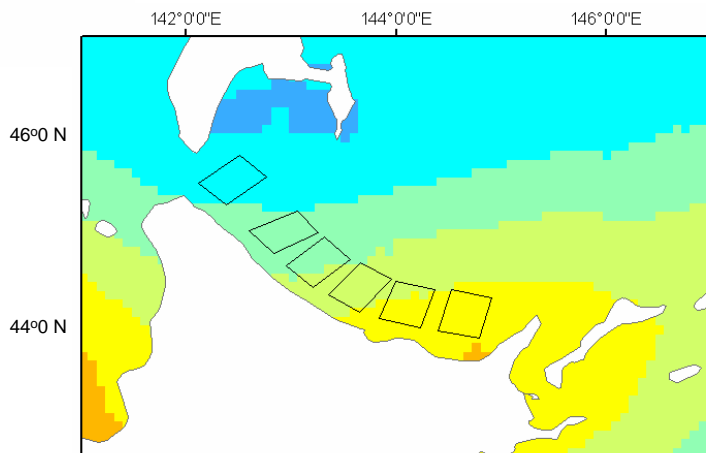
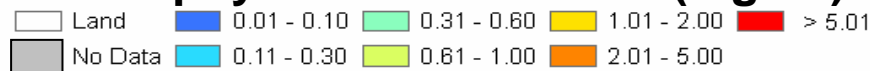


**Weekly image of SSM/I
sea ice concentration %**

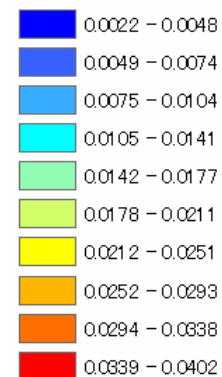


**Weekly mapped
images of SeaWiFS
Level 3**

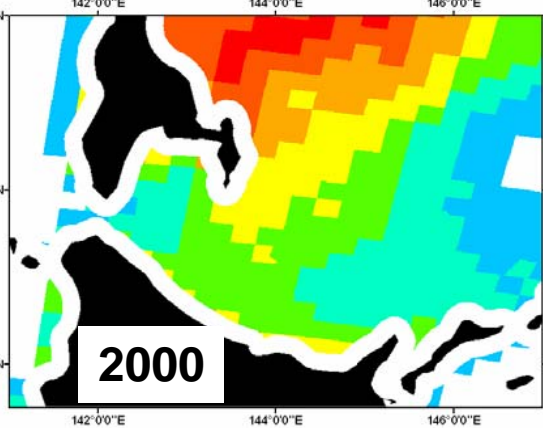
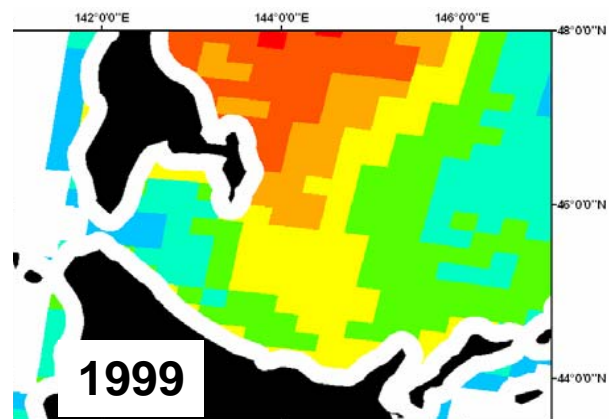
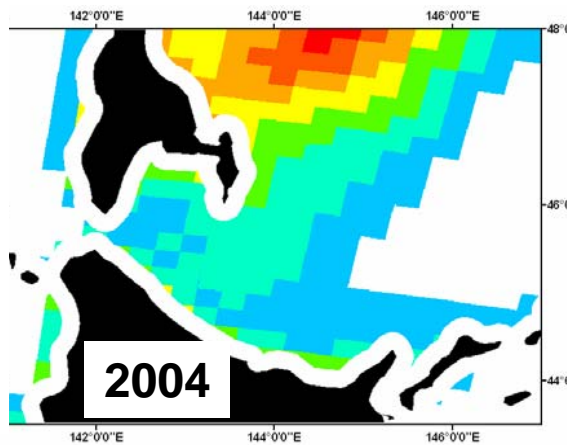
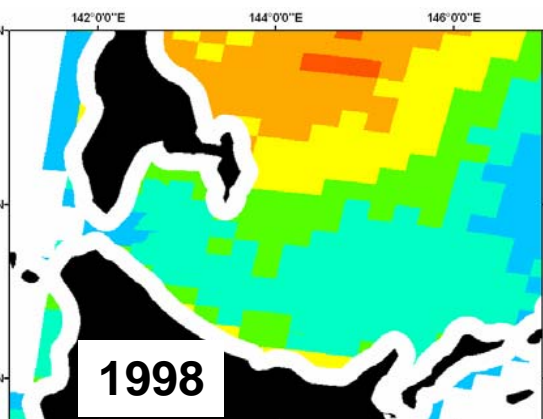
Chlorophyll-a concentration (mgm⁻³)



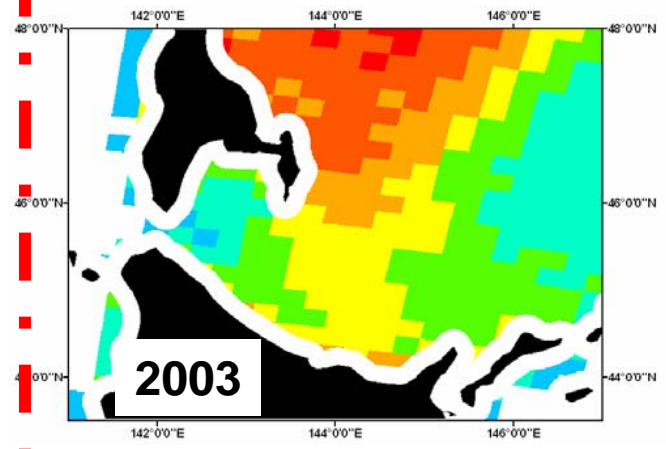
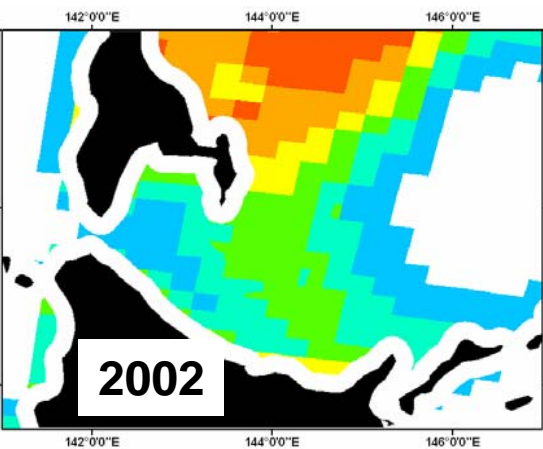
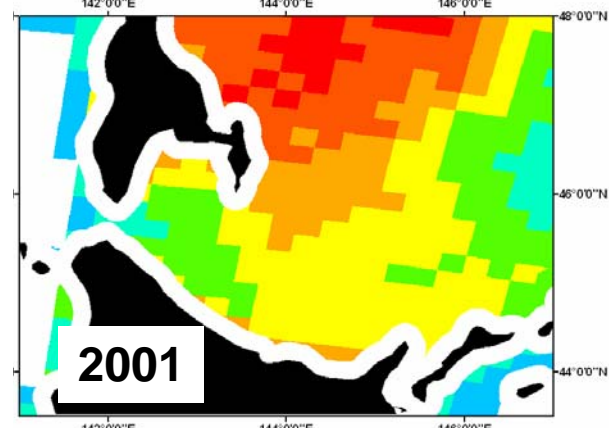
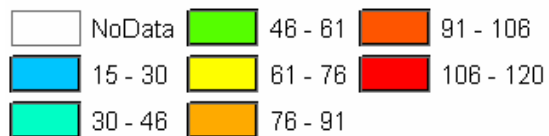
wind stress (Nm⁻²)

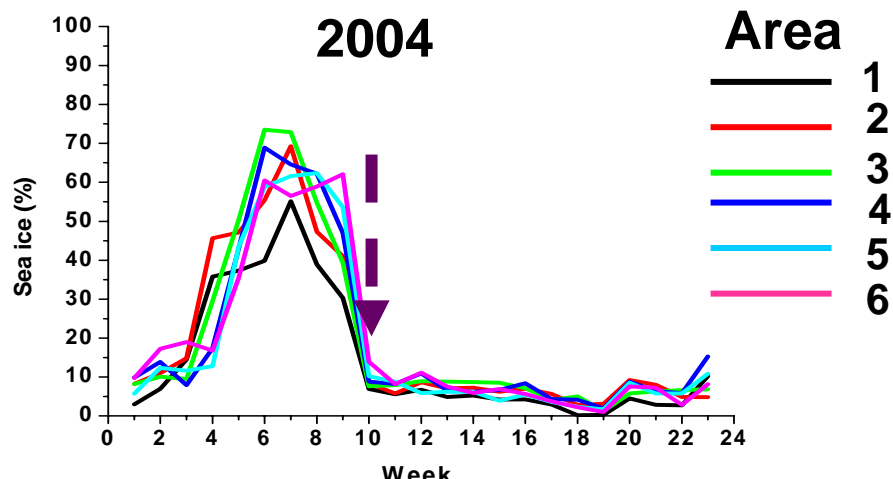
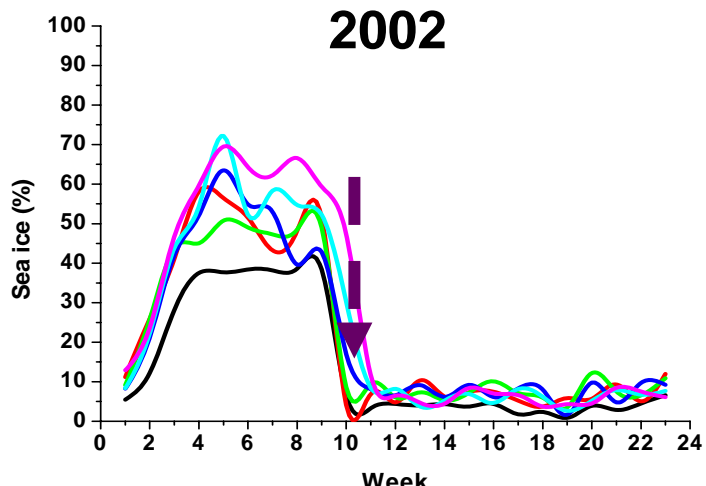
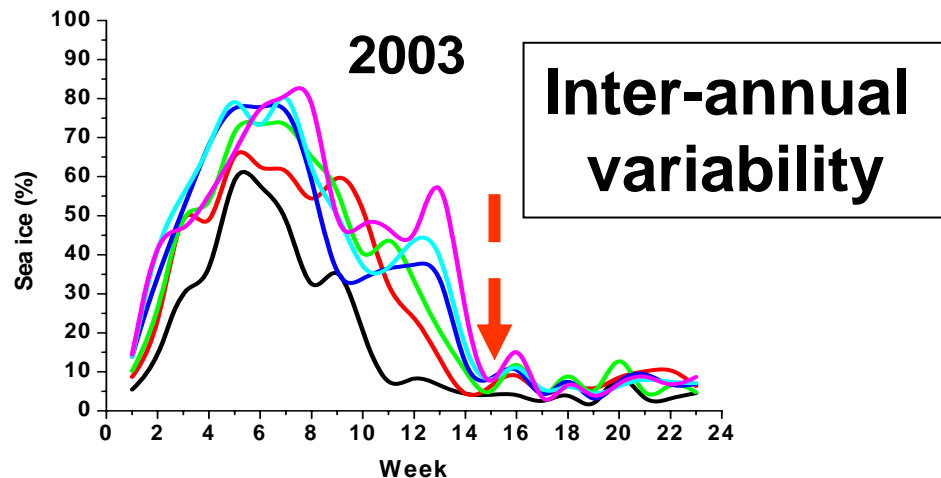
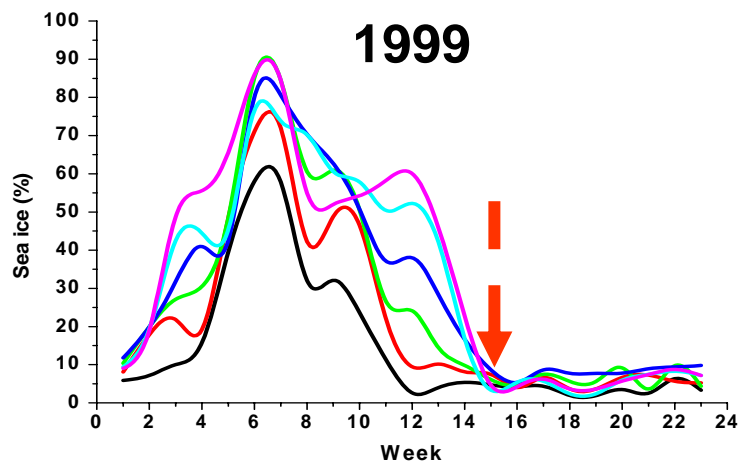
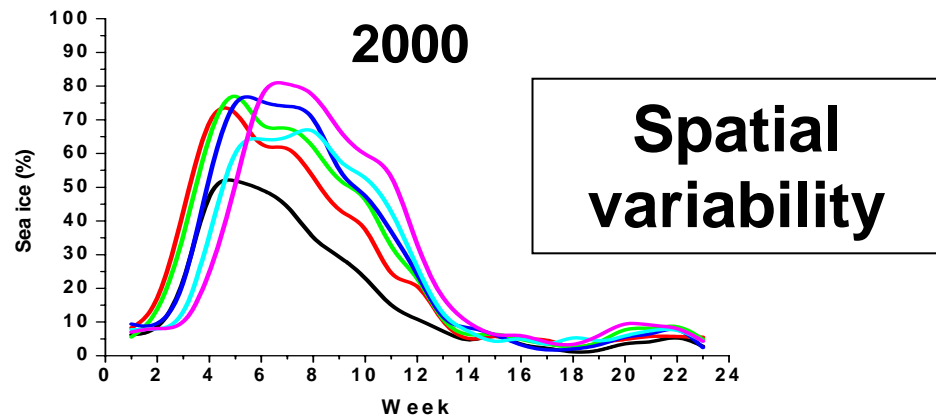
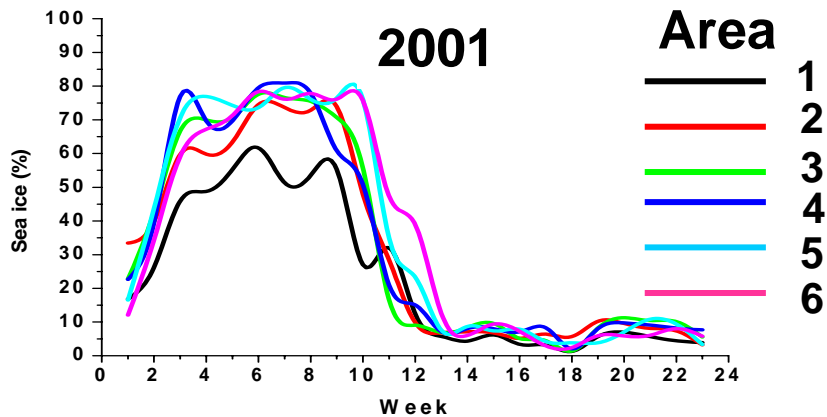


**Weekly wind
stress data**

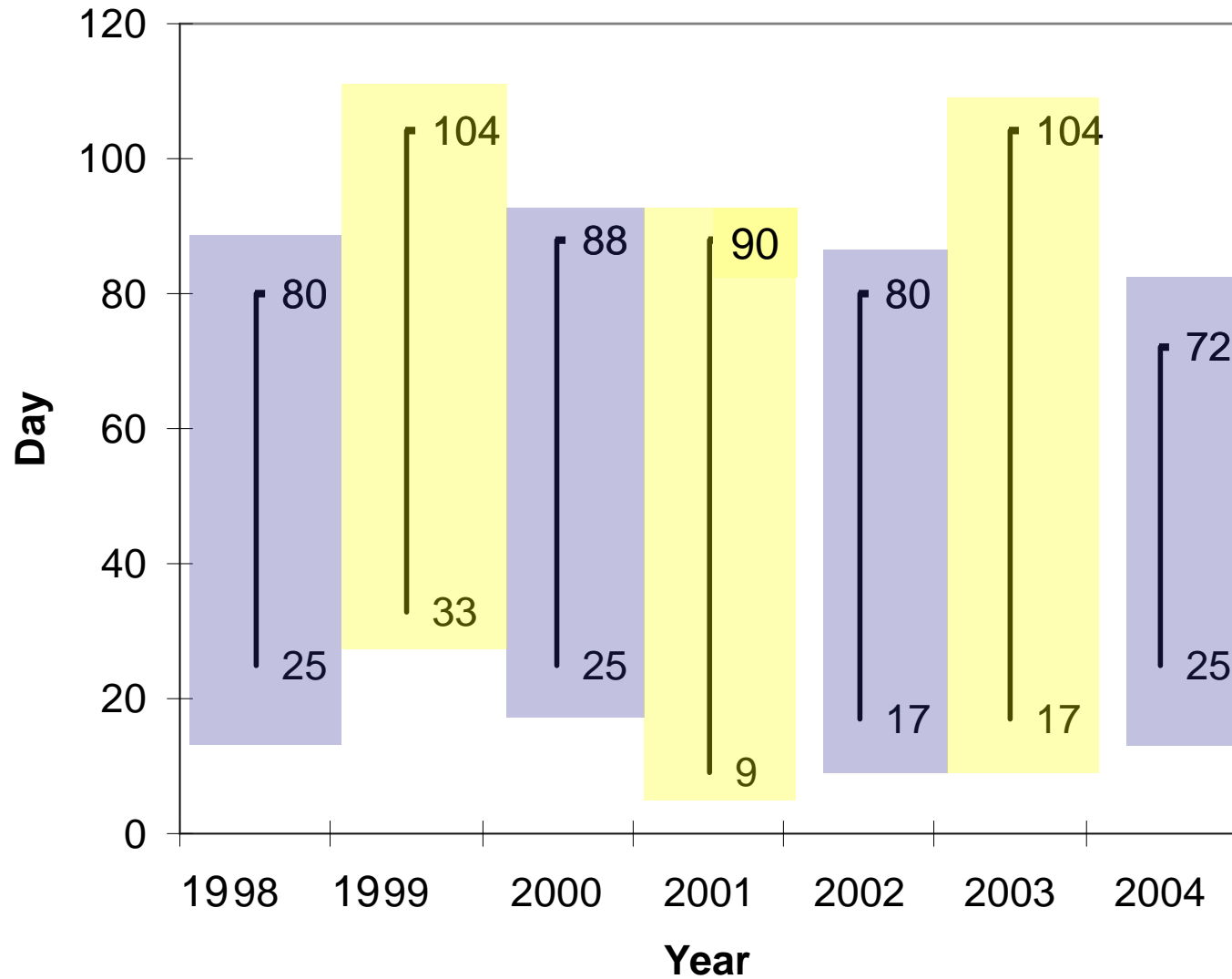


staying period of ice (days)

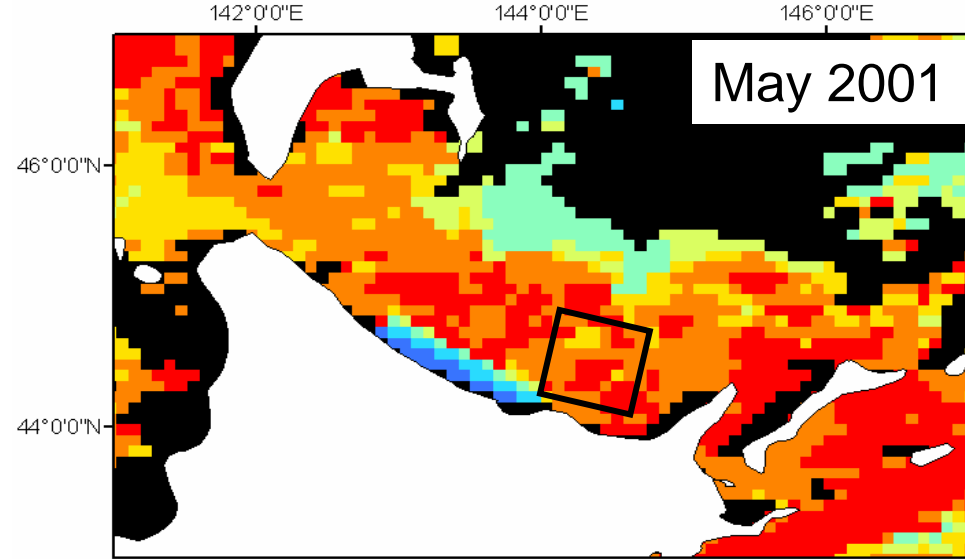
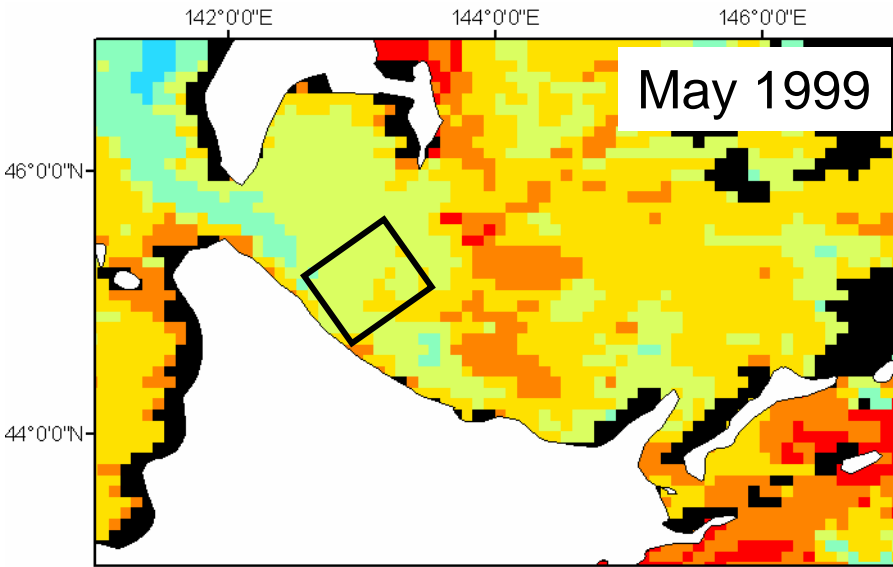




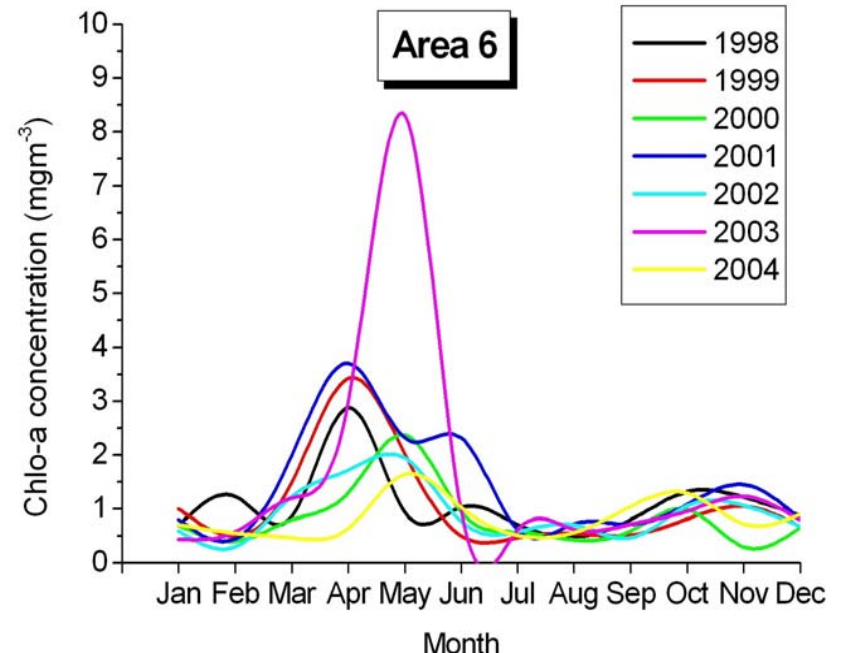
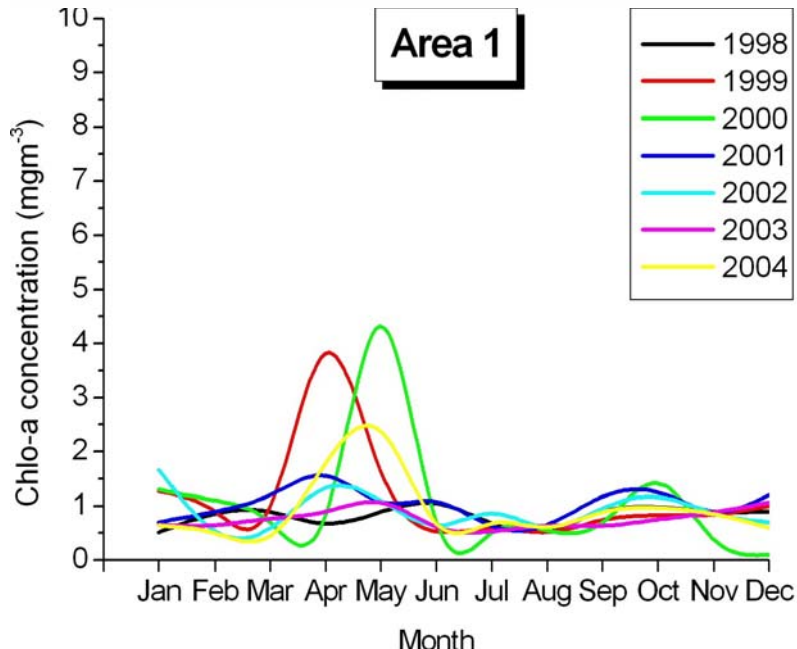
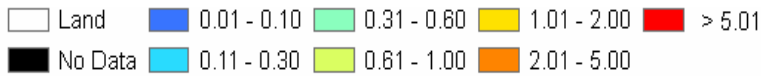
Timing of arrival and retreat of sea ice

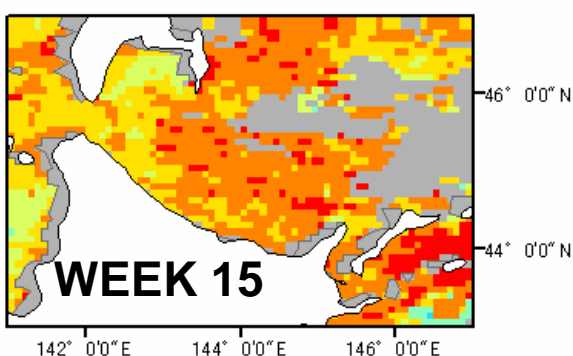
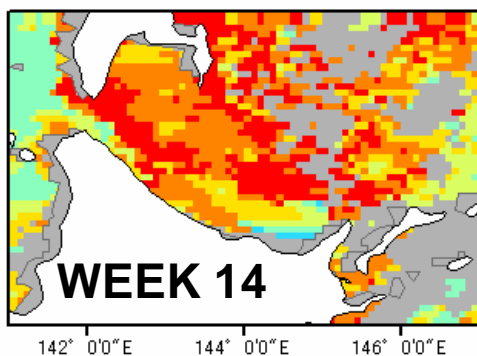
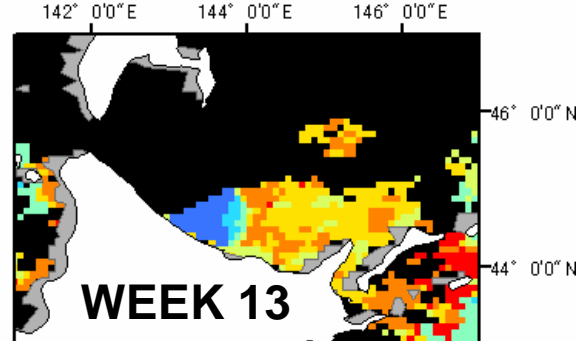
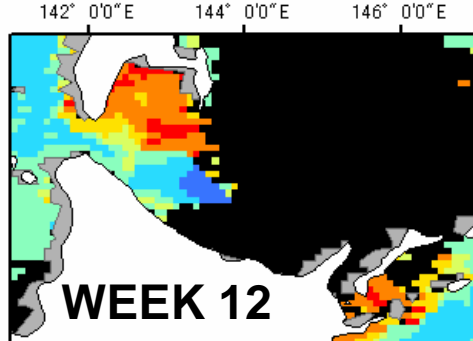
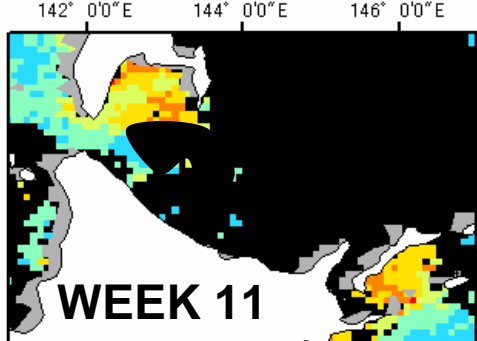


monthly composite standard mapped images of SeaWiFS Level 3

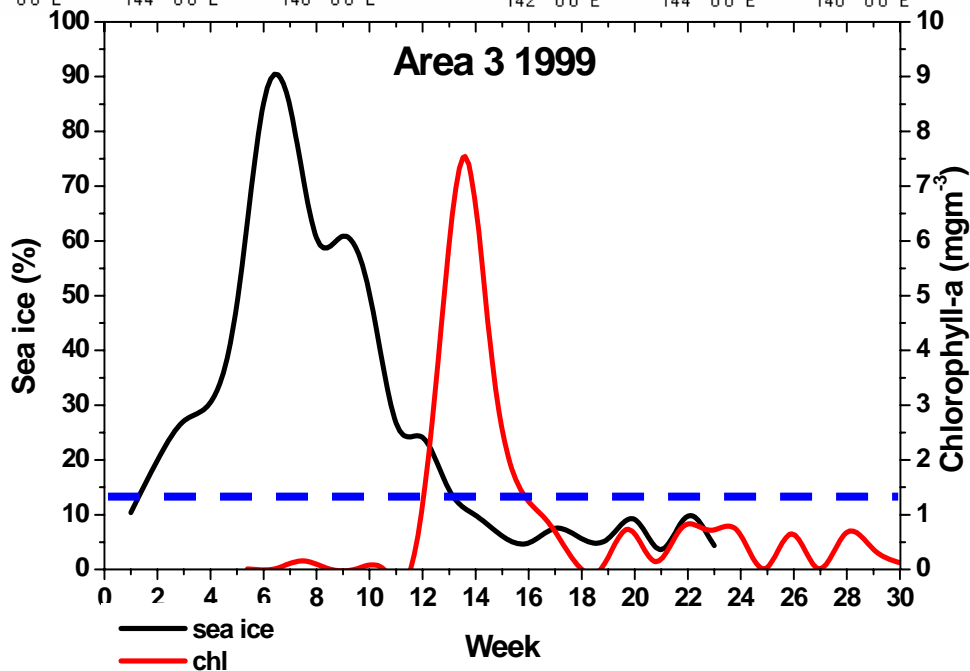


Chlorophyll-a concentration (mgm^{-3})

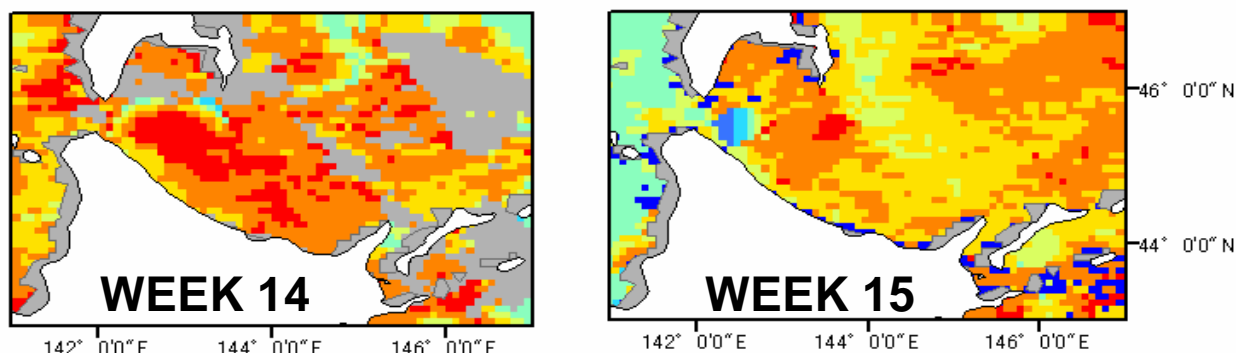
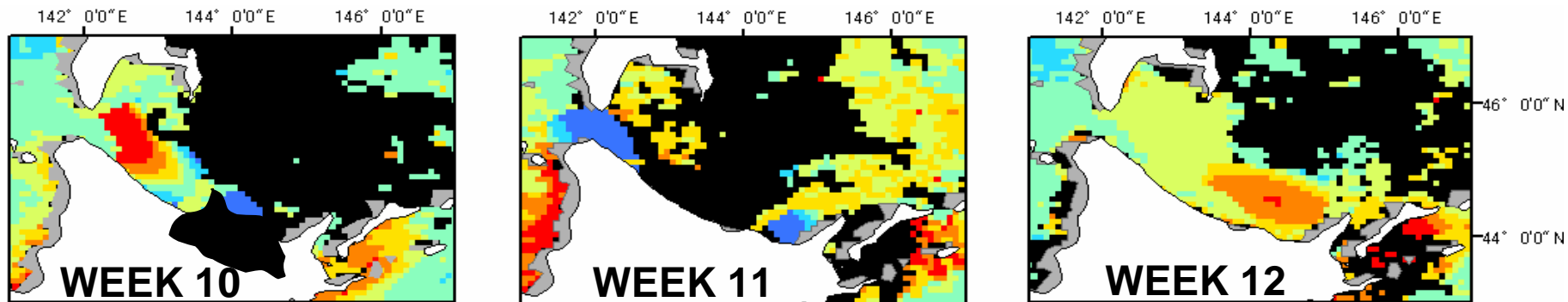




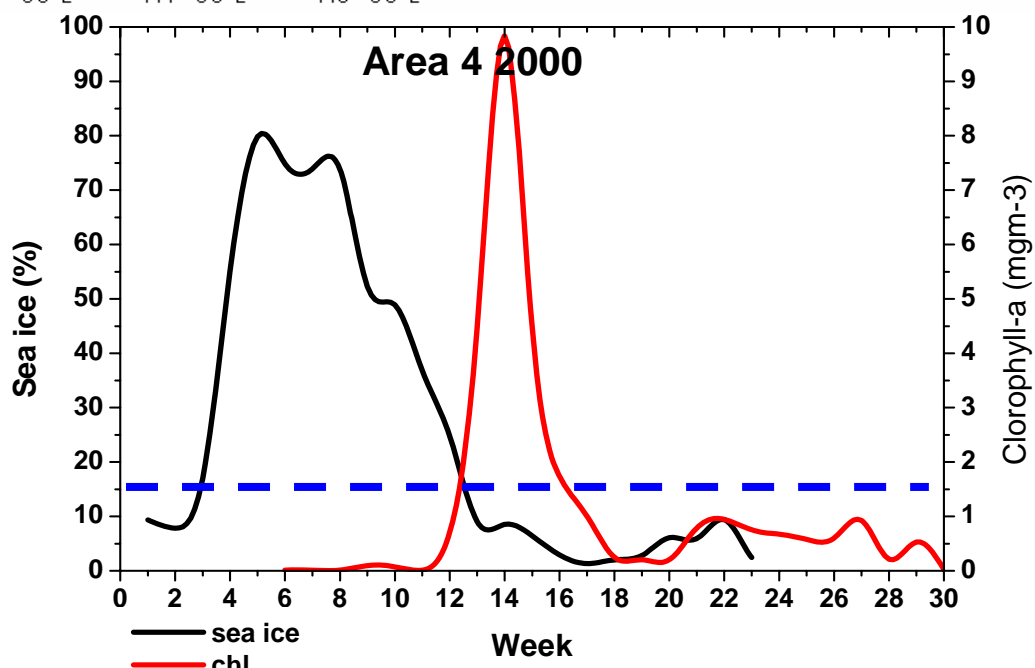
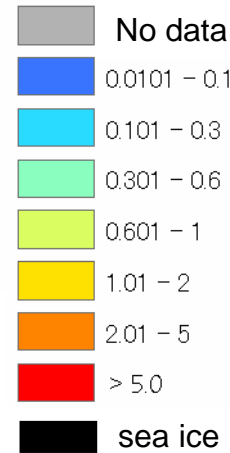
Chlorophyll-a concentration (mgm⁻³)



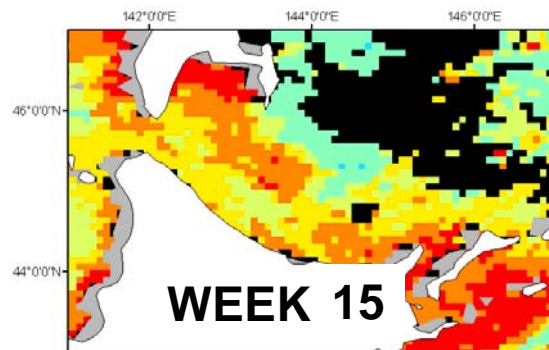
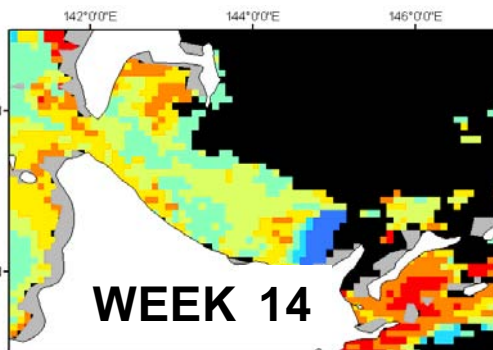
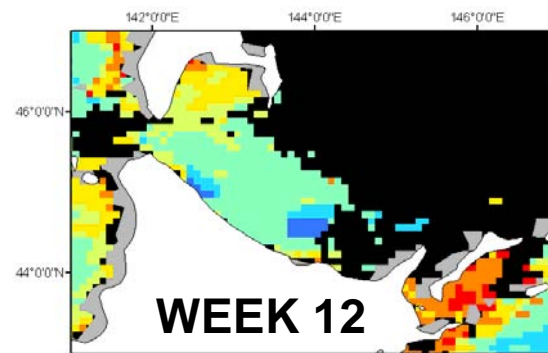
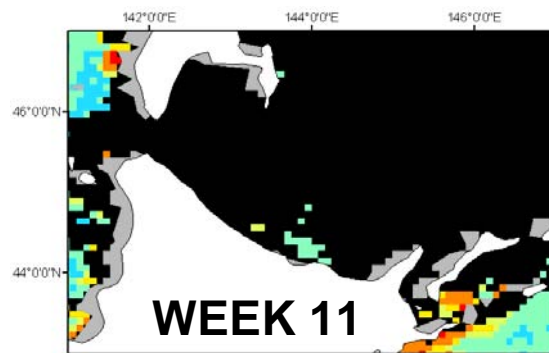
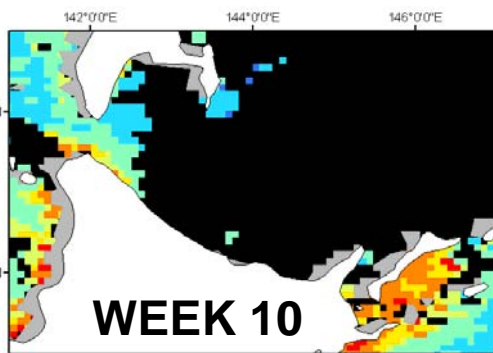
ice edge bloom



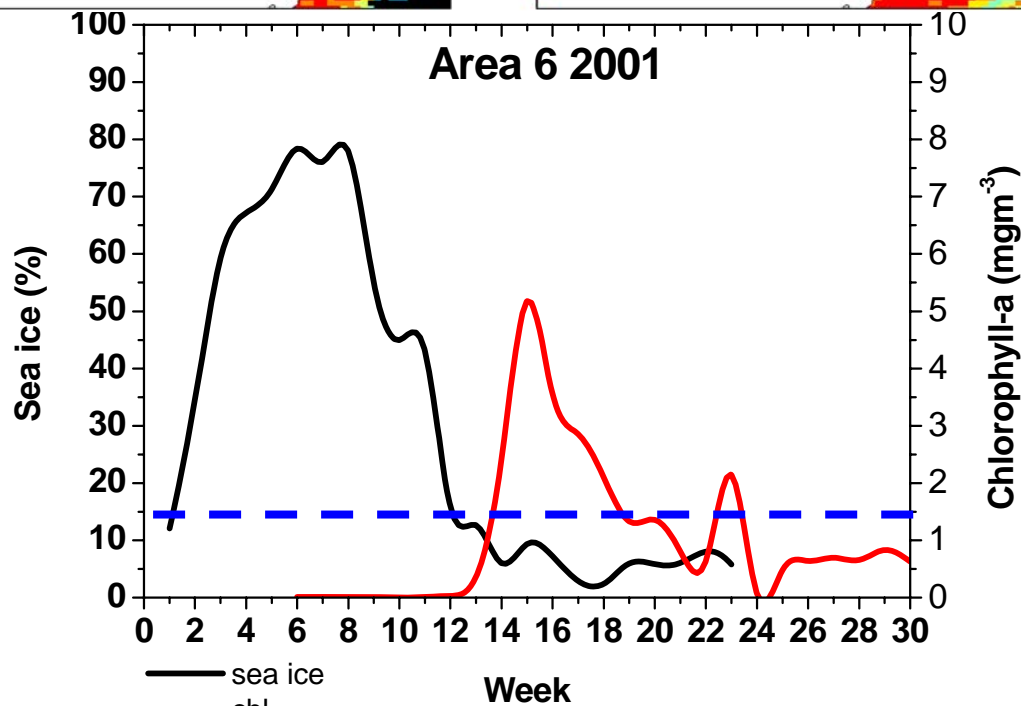
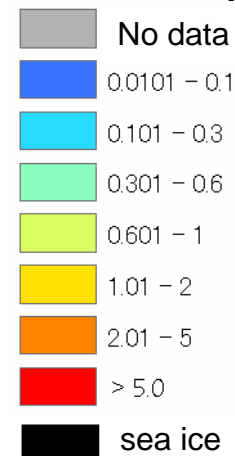
Chlorophyll-a concentration (mgm-3)



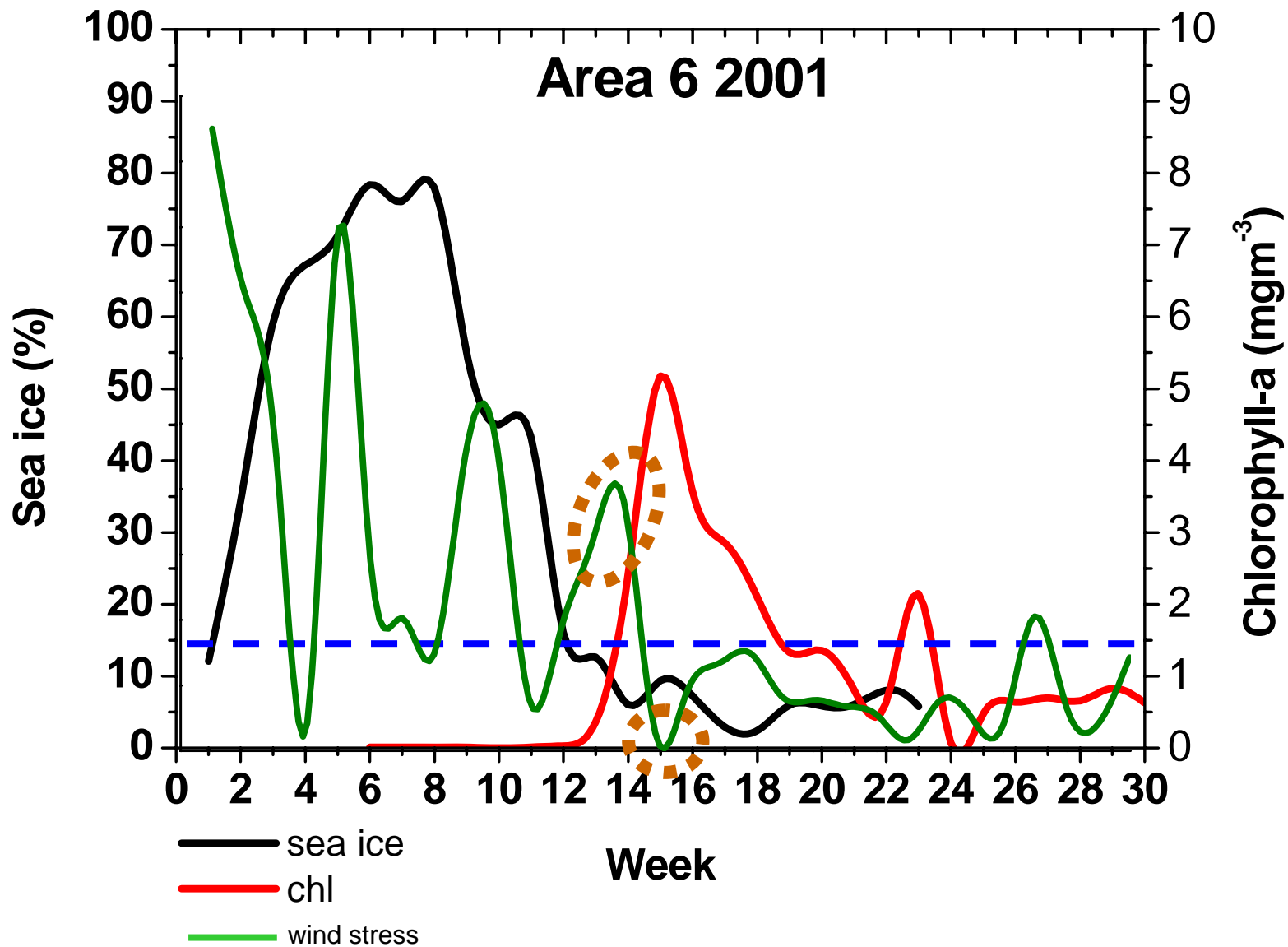
ice edge bloom

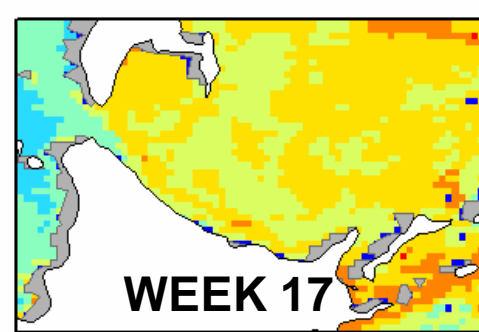
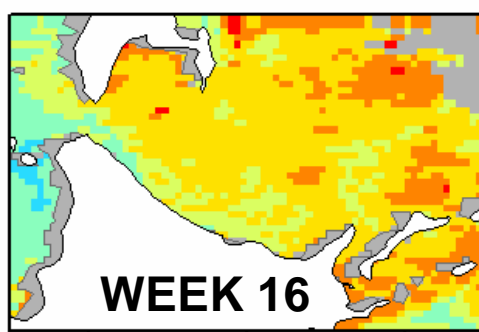
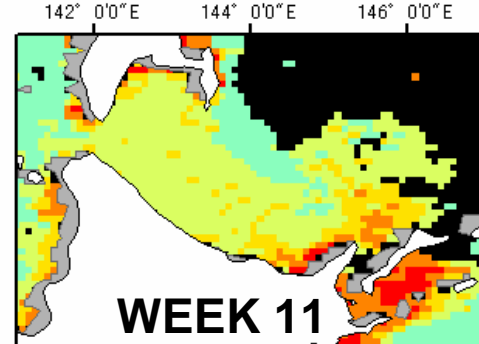
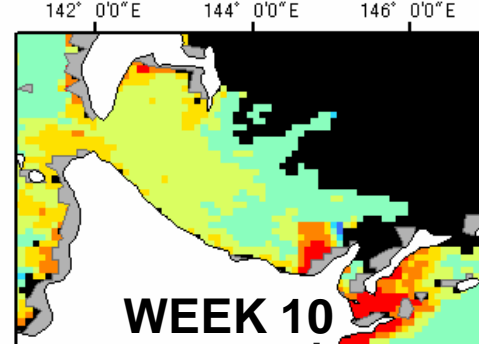
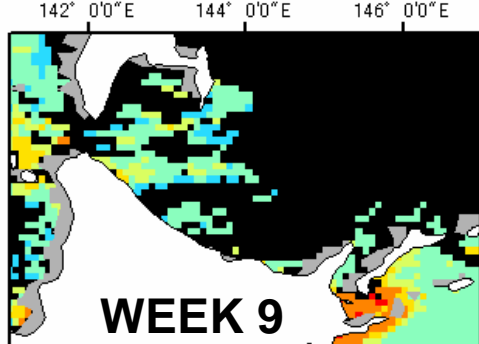


**Chlorophyll-a
concentration (mgm⁻³)**

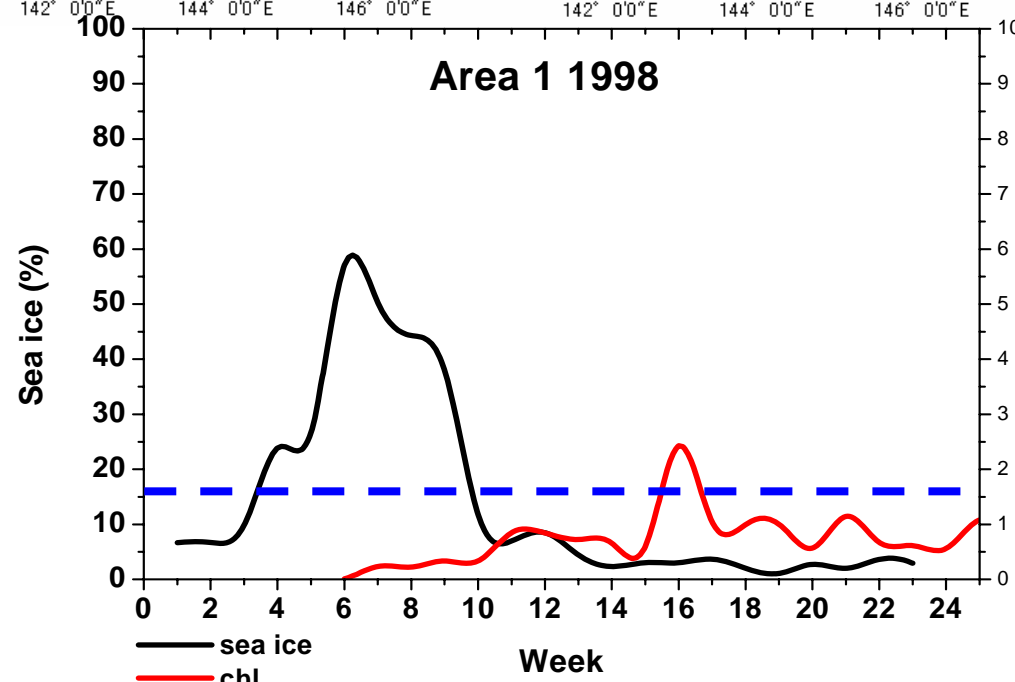
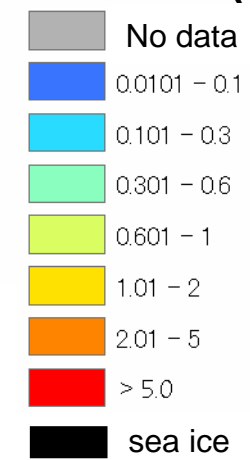


ice edge bloom

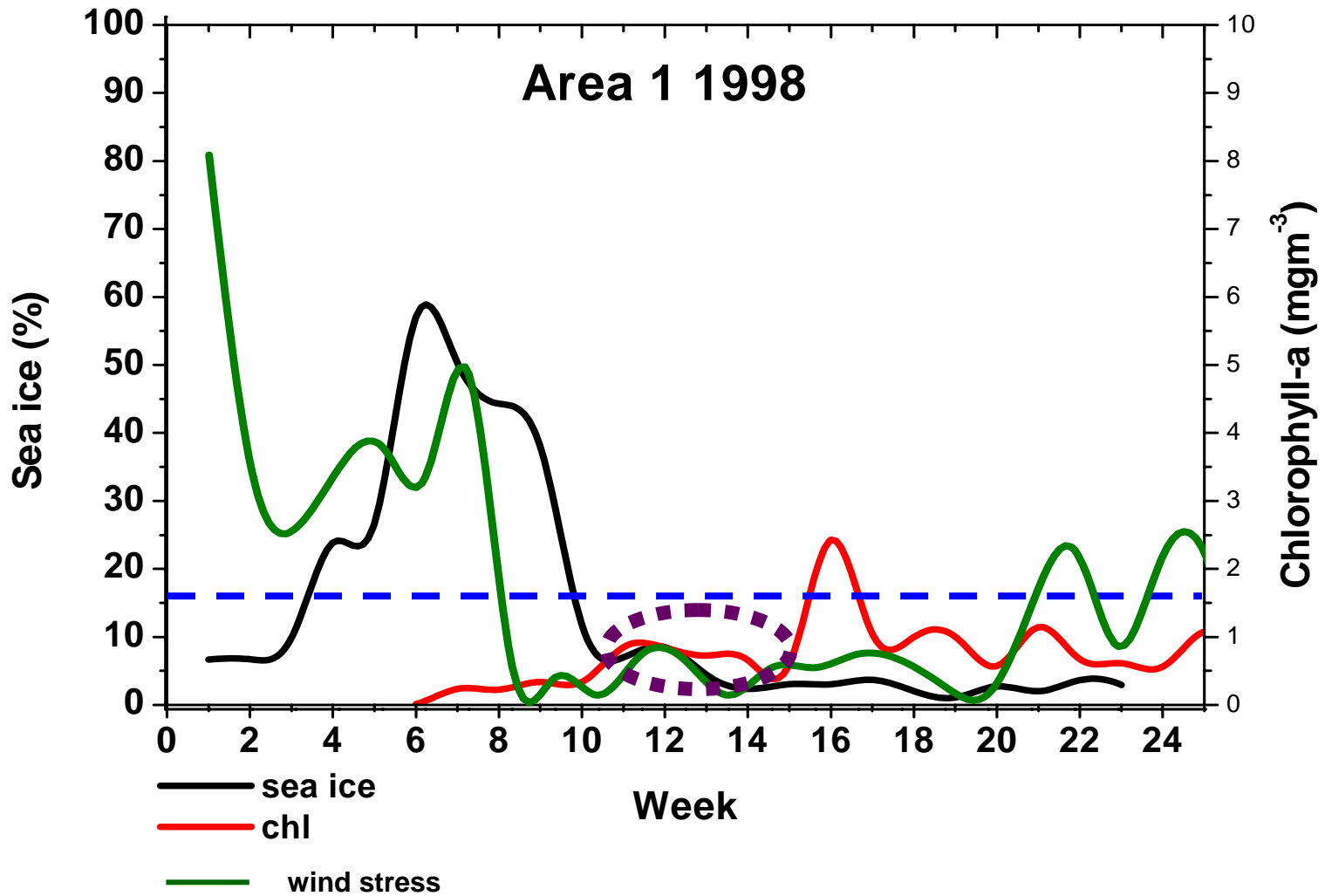


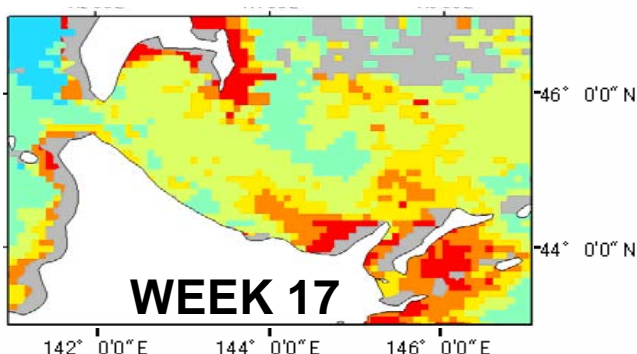
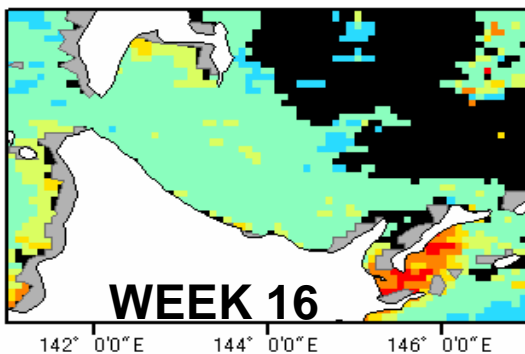
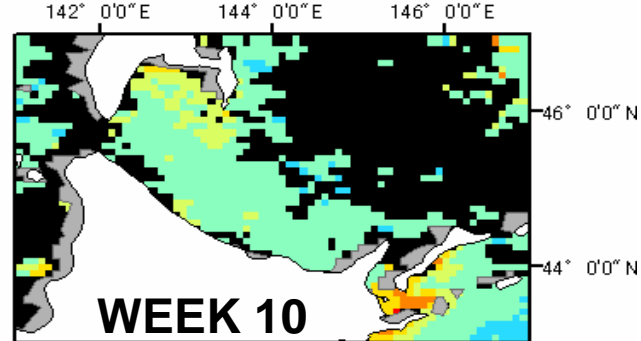
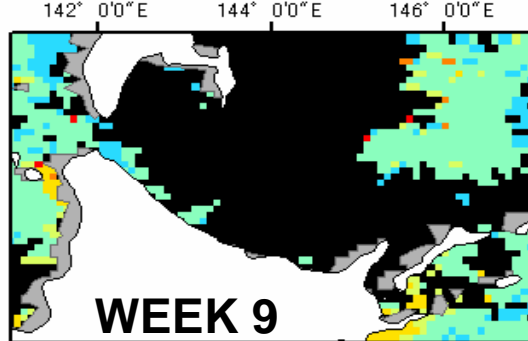
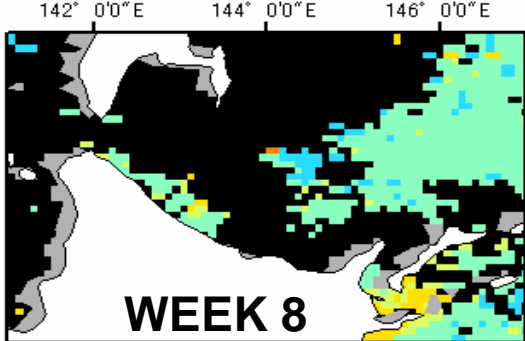


Chlorophyll-a concentration (mgm⁻³)

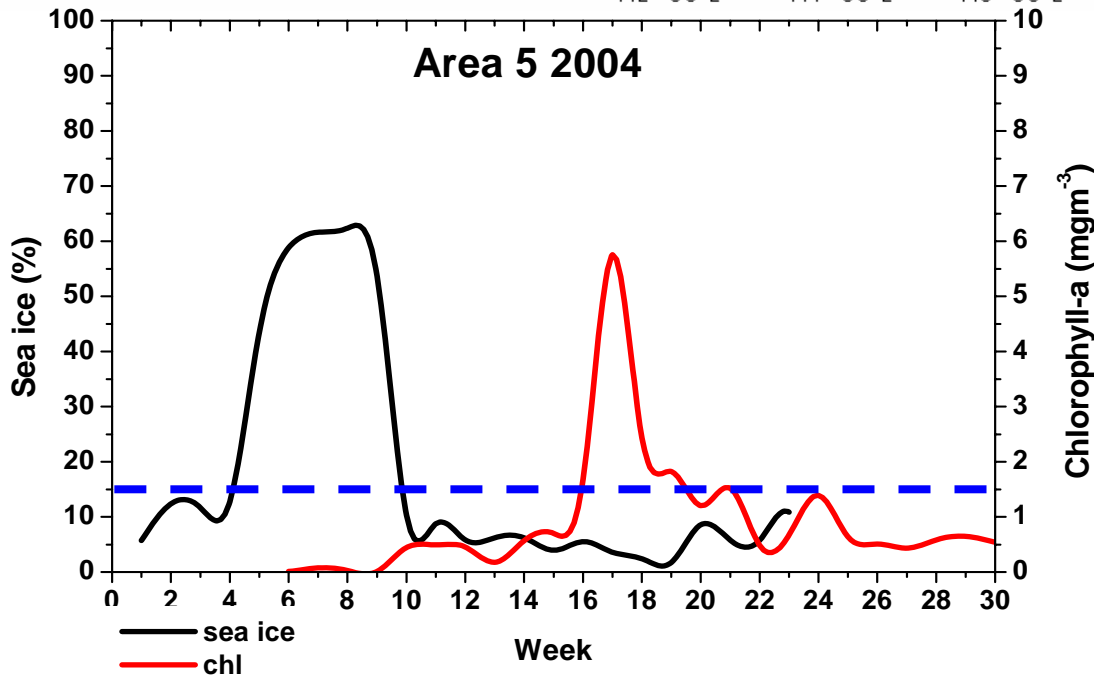


open water bloom

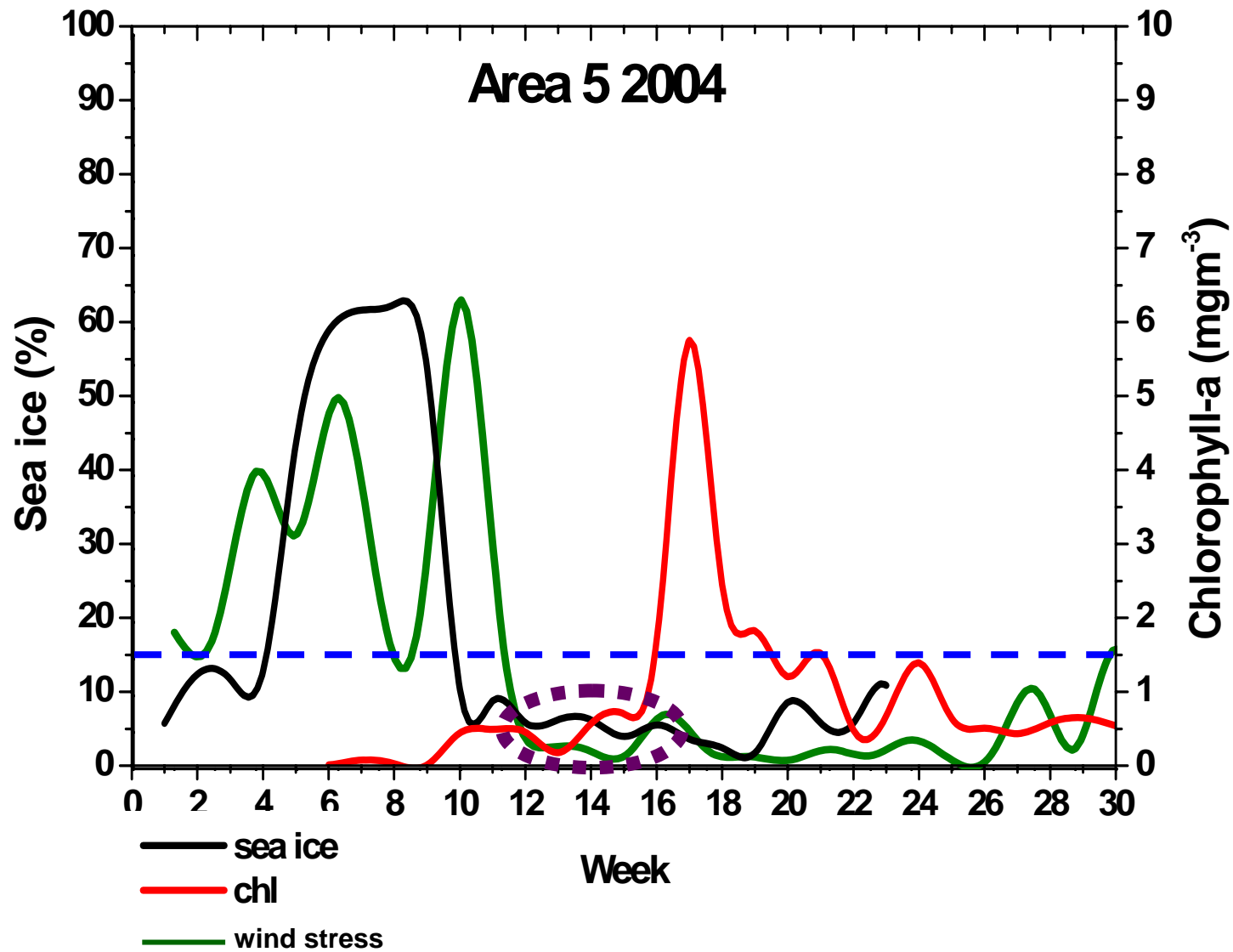




Chlorophyll-a concentration (mgm⁻³)



open water bloom



CONCLUSIONS

**ice formation and
phytoplankton
bloom development**



growth rate of scallop



CONCLUSIONS

1. Ice cover

- [1999, 2001 and 2003] prolonged presence of ice until early April
- [1998, 2000 and 2004] ice retreat occurred earlier until early March

2. Later ice retreat - ice edge bloom

Early ice retreat –open water bloom

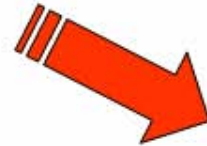
- **Spring bloom timing was influenced by wind events**

FUTURE WORK

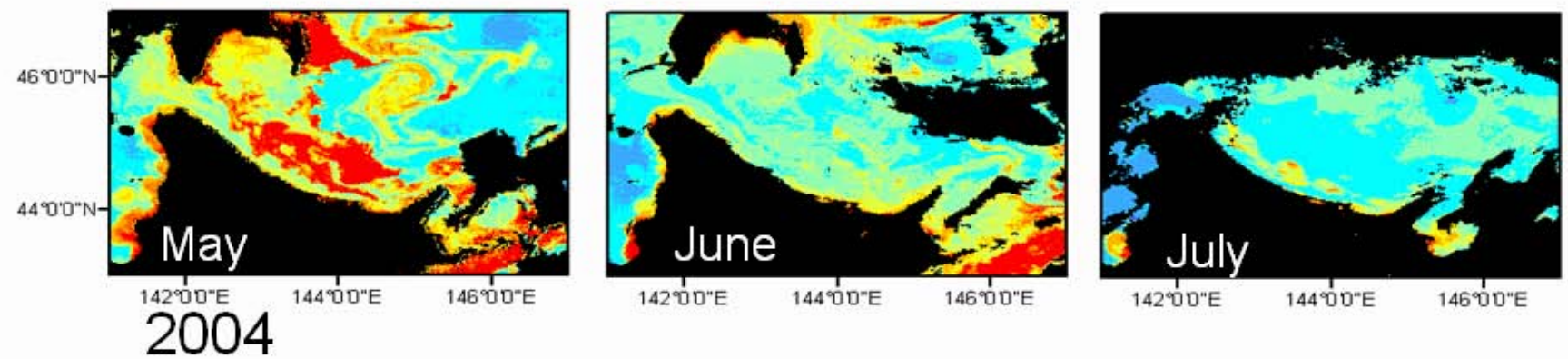
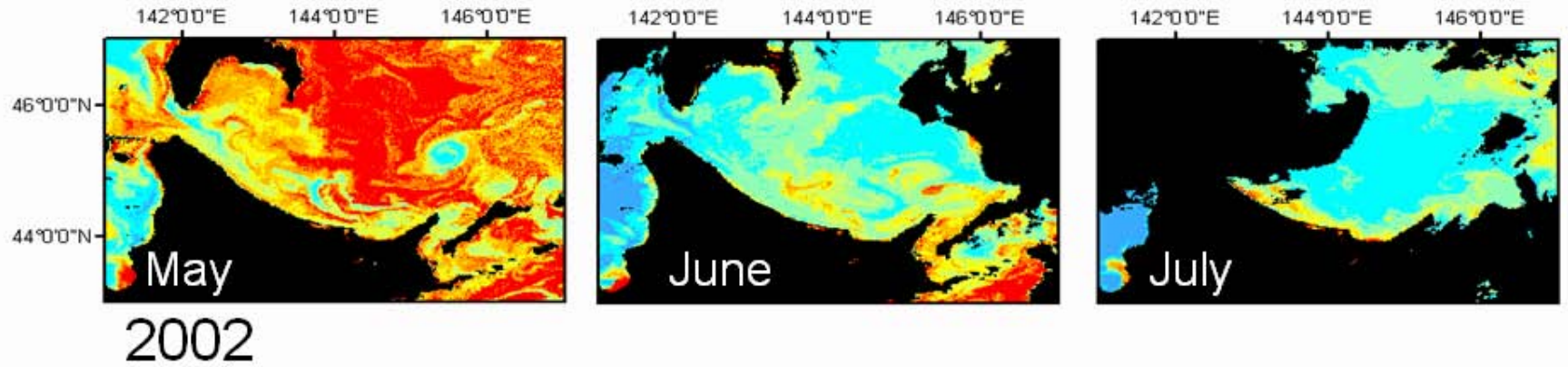
**ice formation and
phytoplankton
bloom development**

**advection of warm
soya current**

growth rate of scallop



FUTURE WORK



FUTURE WORK

ice formation and
phytoplankton
bloom development

growth rate of scallop



advection of warm
soya current



Depth

Sea ice

Current

Chl-a

HS April

HS May

HS June

Overall
HS

HS: Habitat suitability

THANK YOU