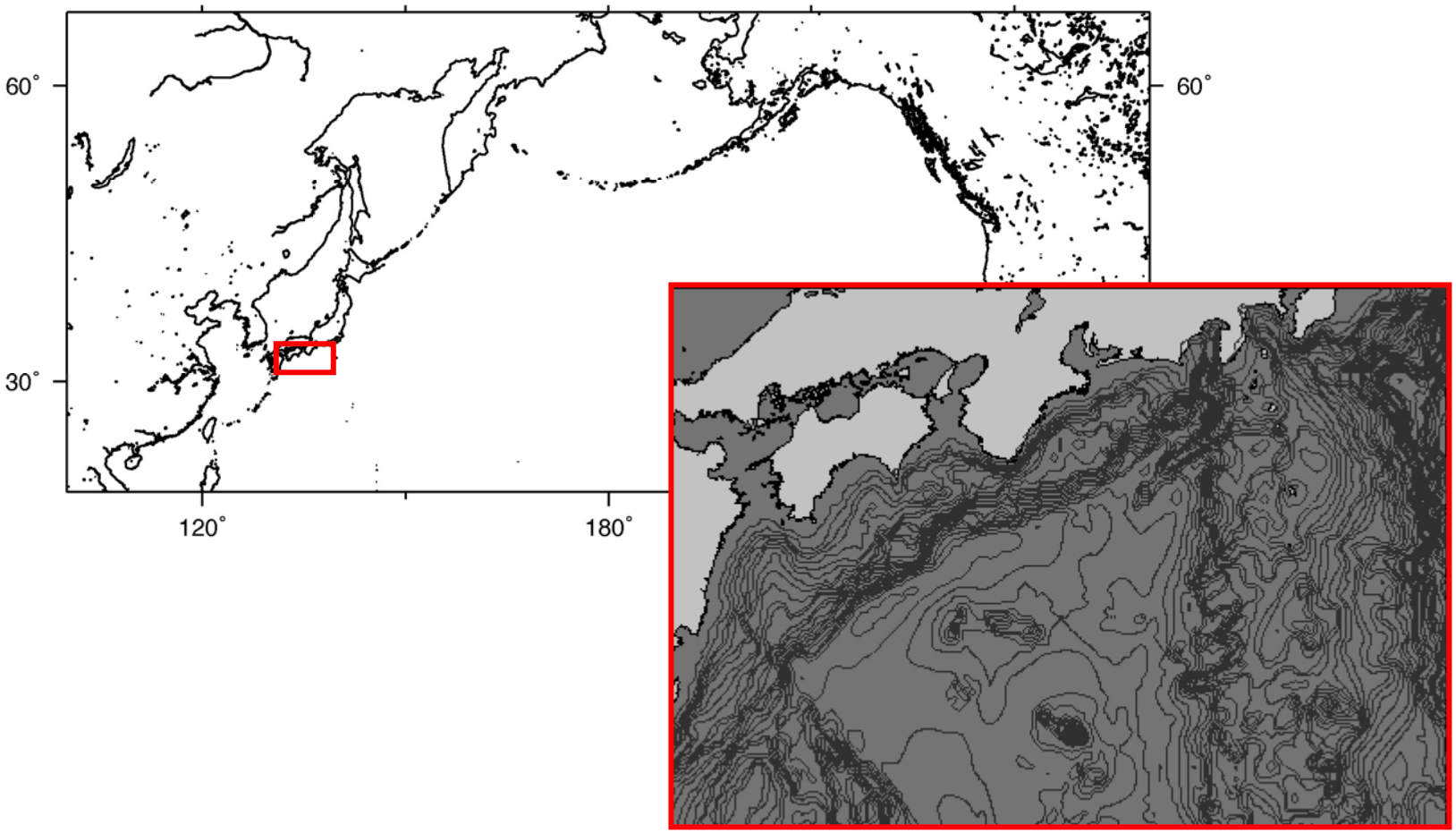
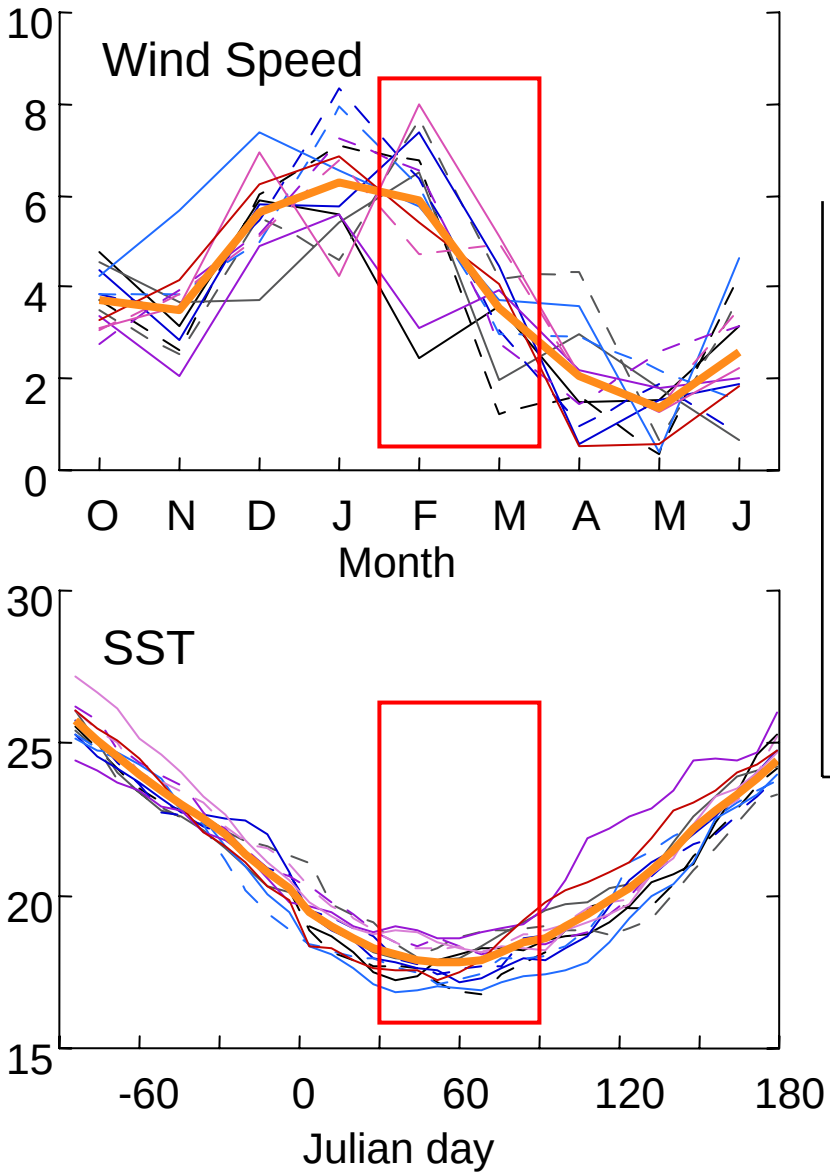
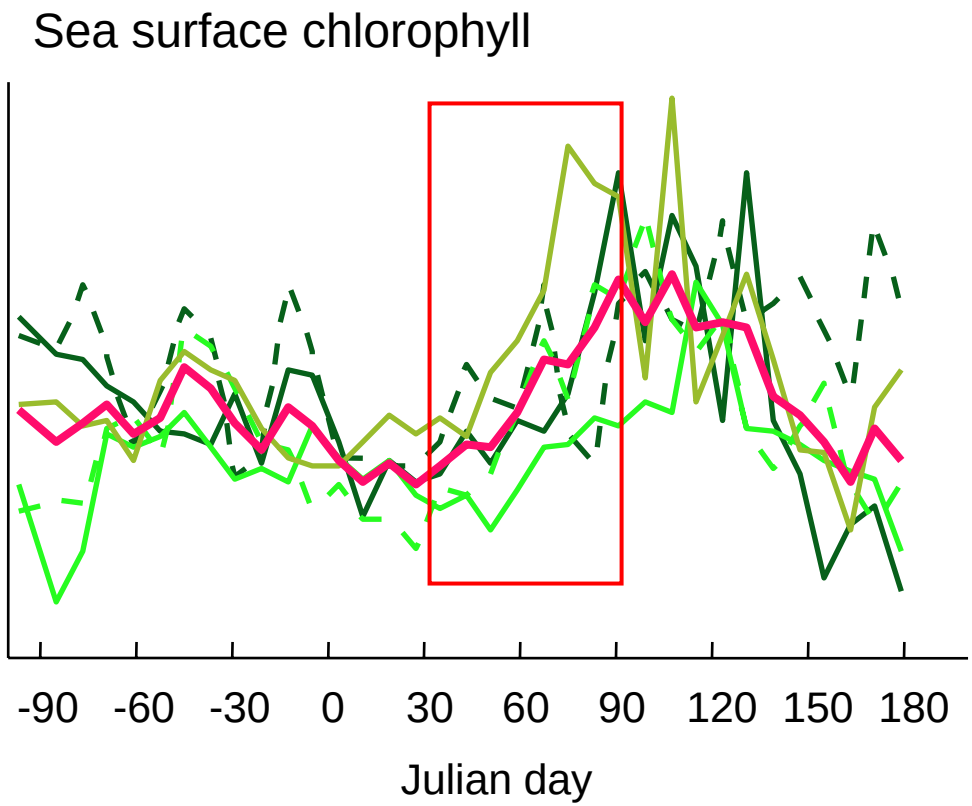
Climate effect on interannual variation in winter-spring plankton community in the slope water and Kuroshio

Kiyotaka Hidaka and Kaoru Nakata
(National Research Institute of Fisheries Science)



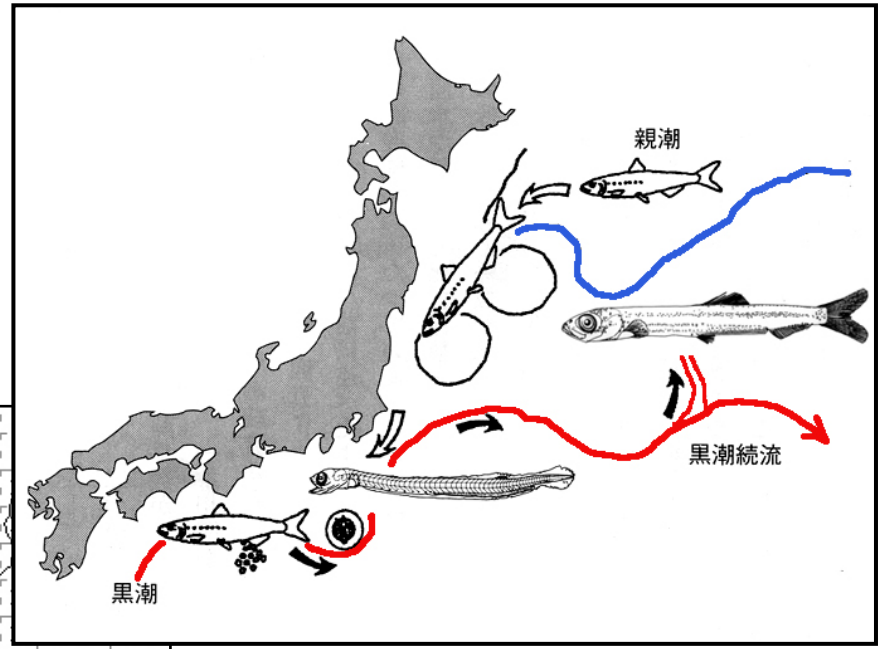
Ecosystem process in February-March

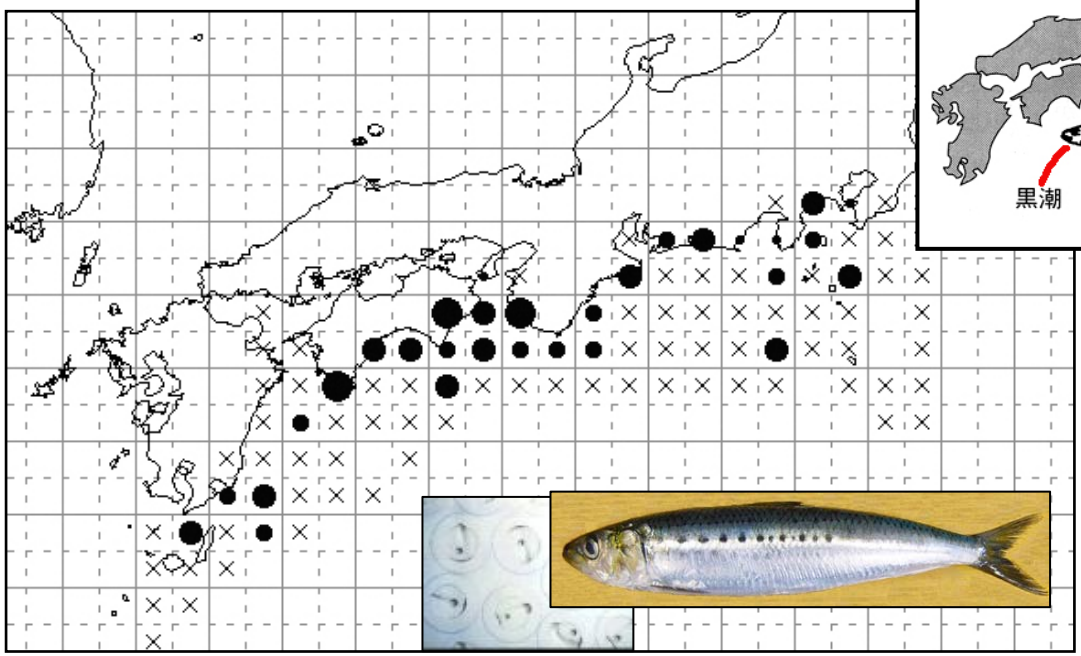




Migration of Japanese sardine□

Spawned in slope water
Transported by Kuroshio

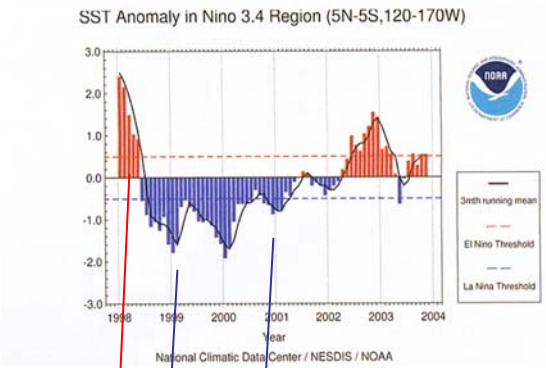




Egg abundance of Japanese sardine in 1999

Ecosystem change in 1998/1999

NPESR #1
PICES 2005

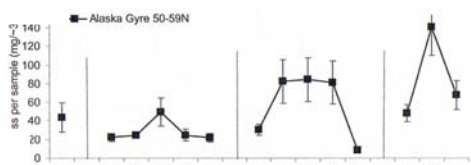


SST Anomaries in
Nino 3.4 region

1998

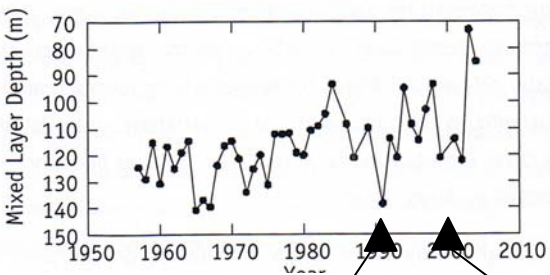
1999

2001



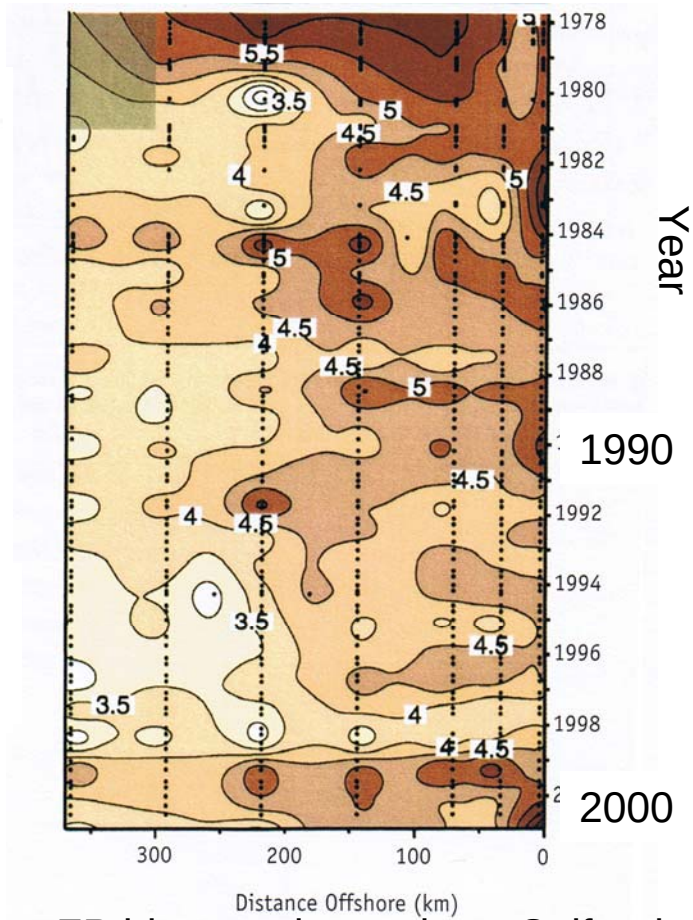
'97 2000 '01 '02

ZP biomass in
Alaska gyre



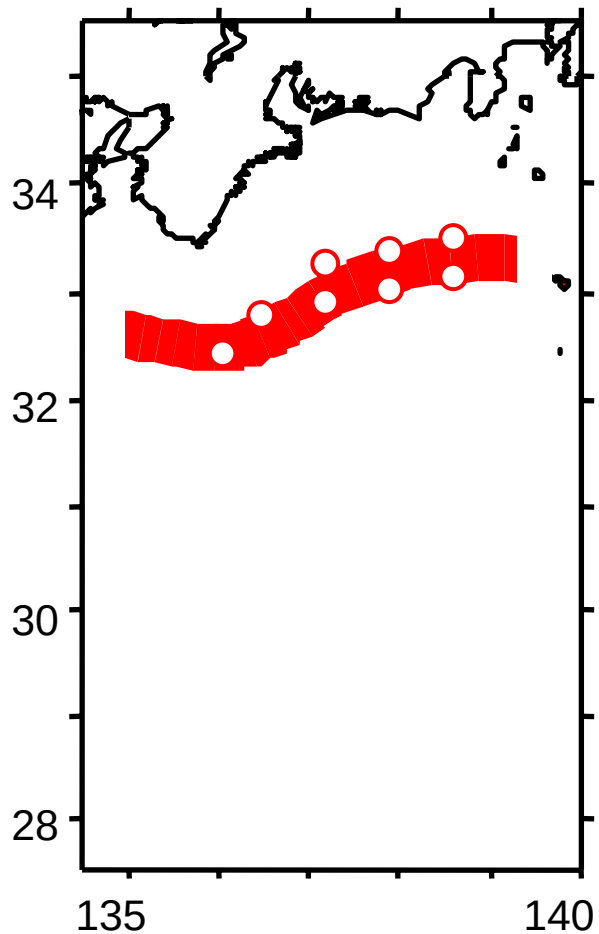
1990 2000

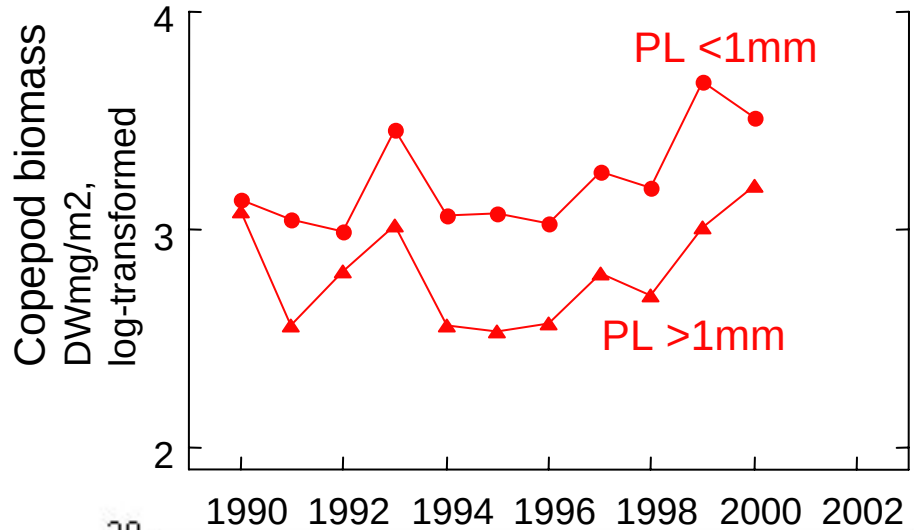
Mixed layer depth in
Gulf of Alaska

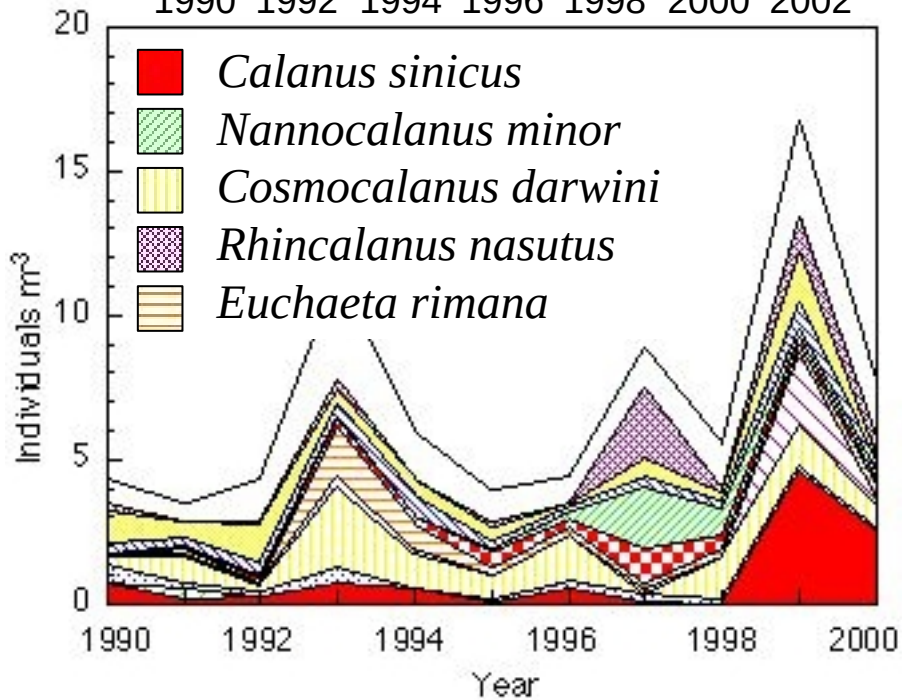


ZP biomass in southern Calfornia

Copepods in Kuroshio axis, Feb. -Mar. 1900-2000

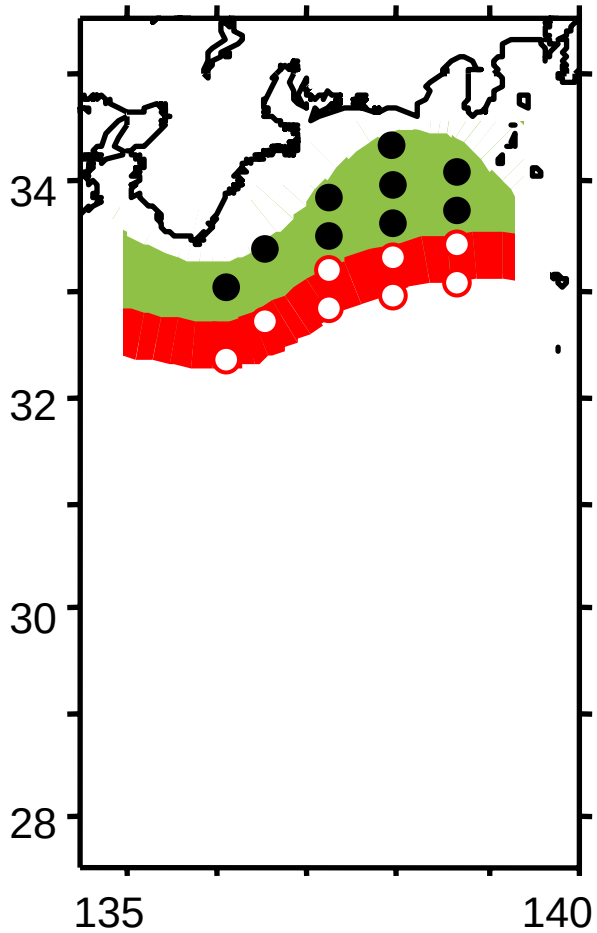






Nakata and Hidaka 2003, FO

Further examinatin of slope water - Kuroshio ecosystem, 1990-2002



Slope water

local wind
local SST
local chl. a

copepod community

Kuroshio

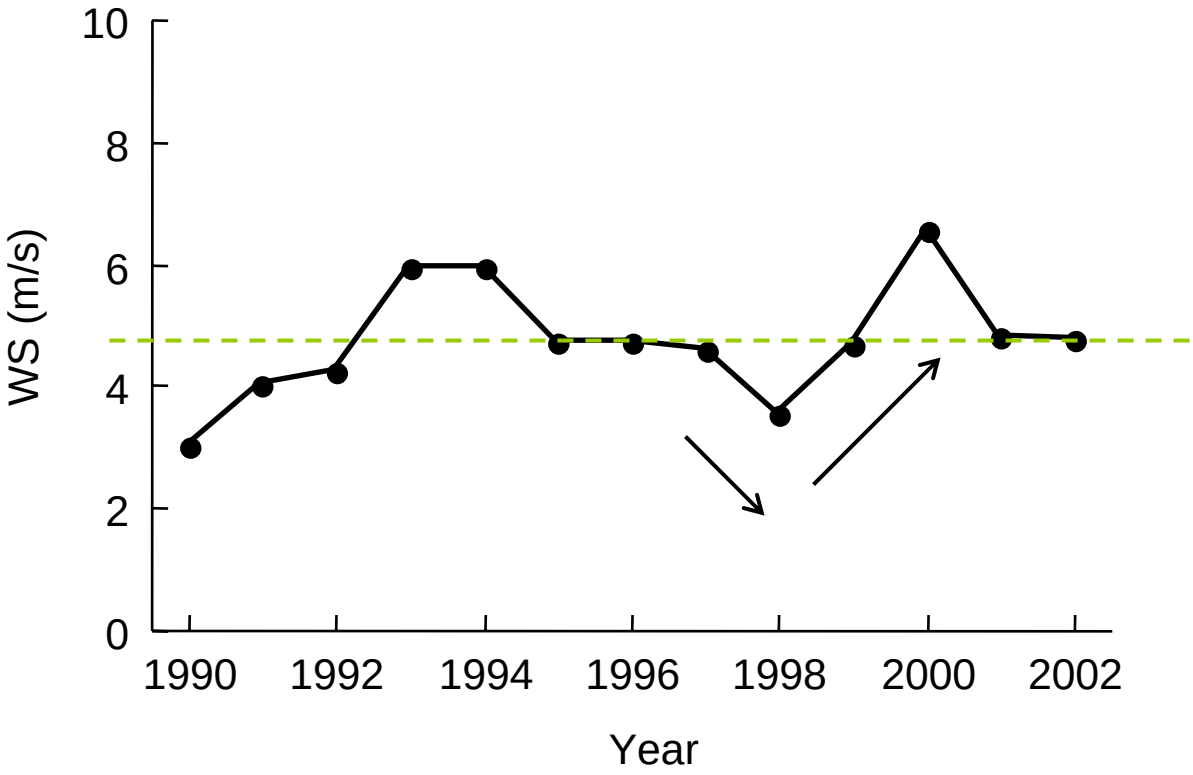
global climate indices

local wind
local SST
local chl. a

copepod community

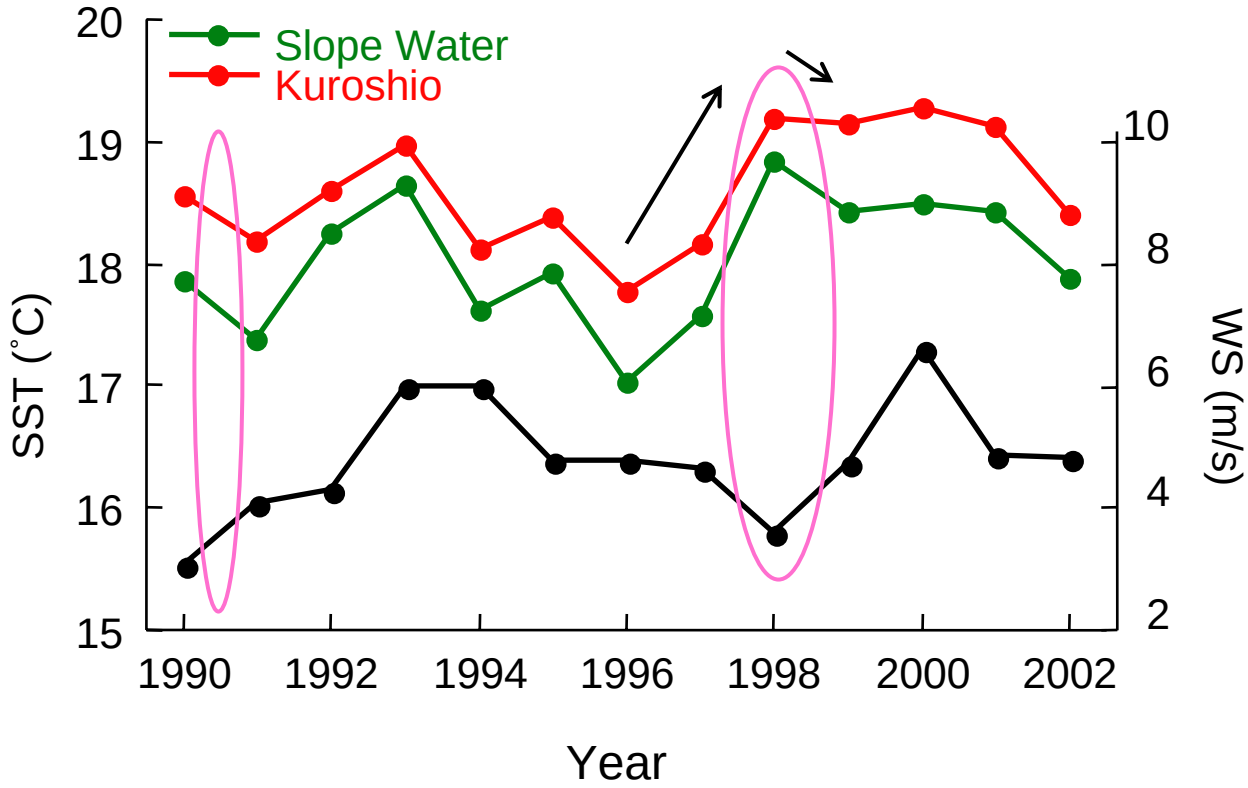
Wind speed

NCEP/NCAR reanalysis data
30-35˚N, 135-137.5˚E
February-March average



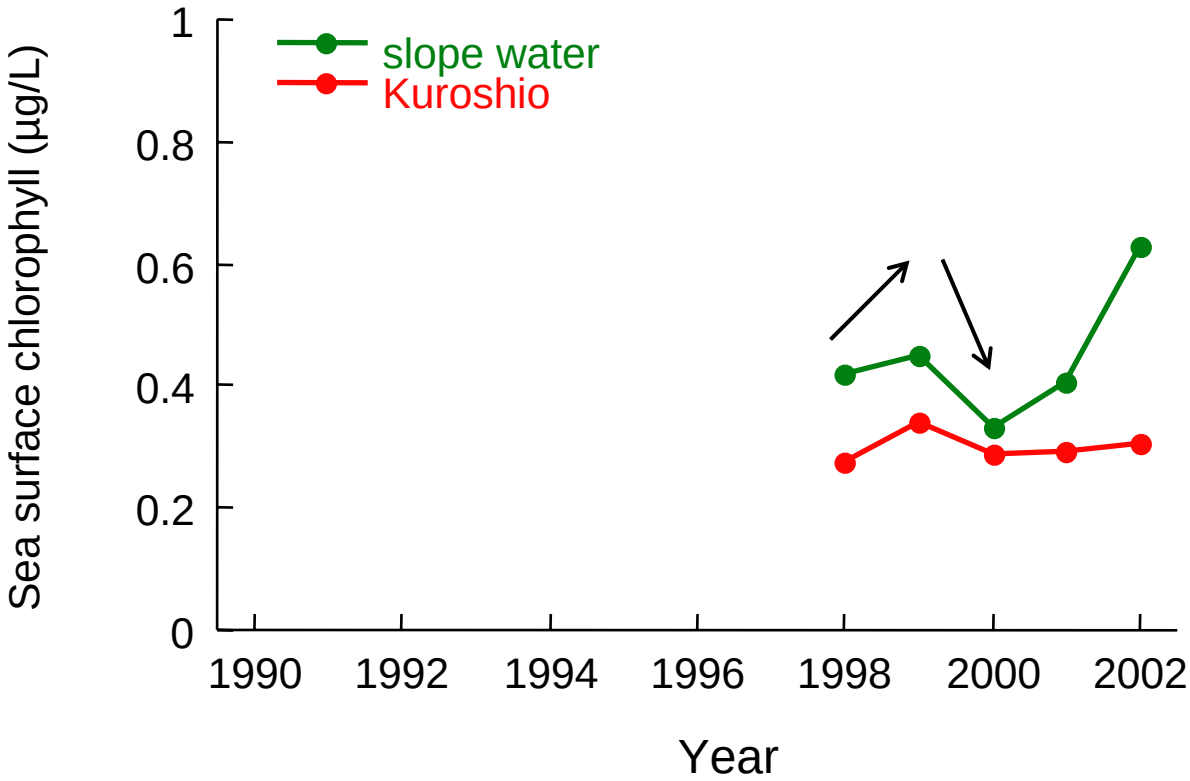
SST

AVHRR Pathfinder v5.0
135-137.5˚E
February-March average



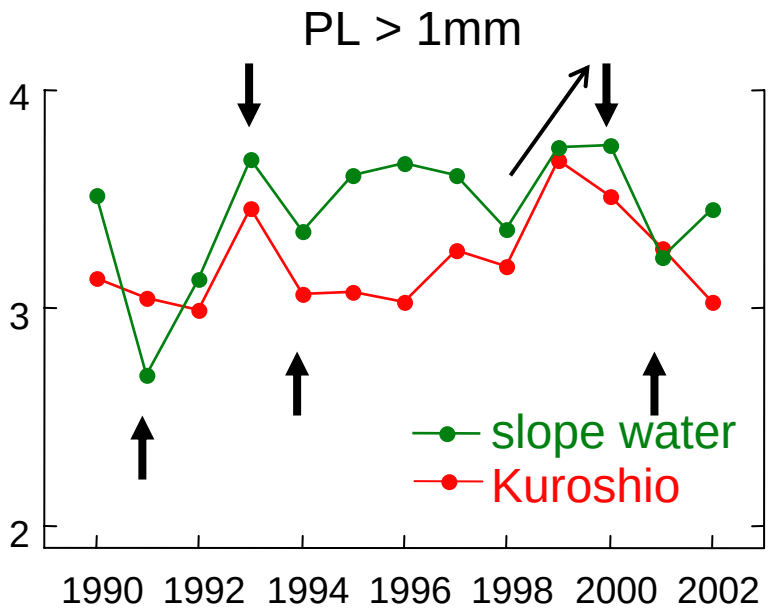
Sea surface chlorophyll concentration

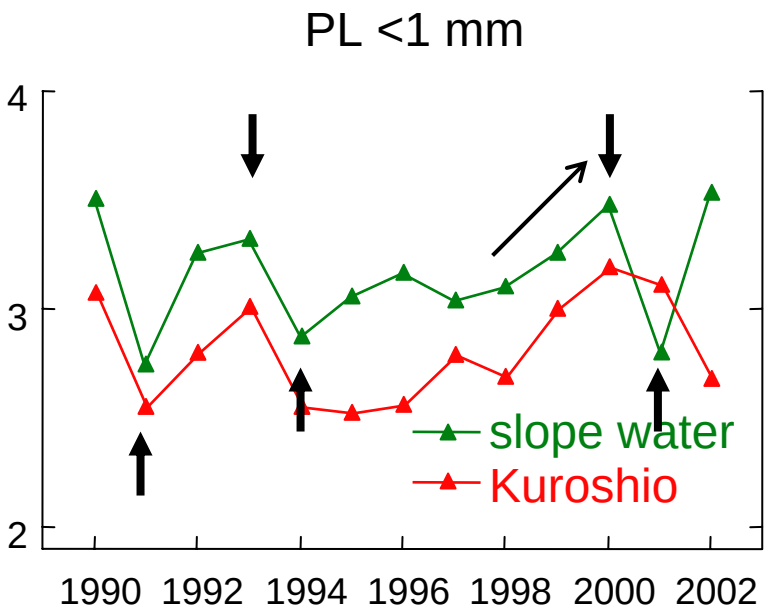
Level-3 SMI
135-137.5˚E
February-March average



Copepod biomass

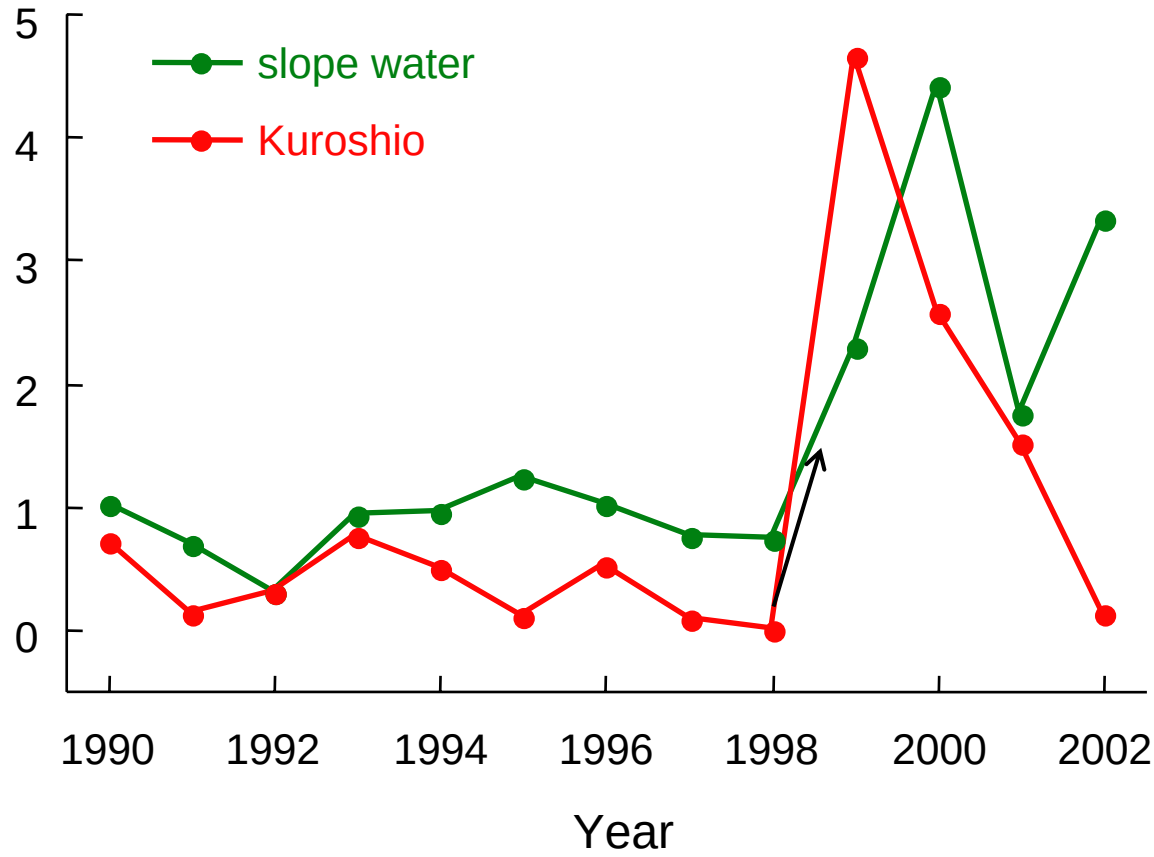
Norpac net, 0-150m vert. tow
135-137.5˚E
February-March





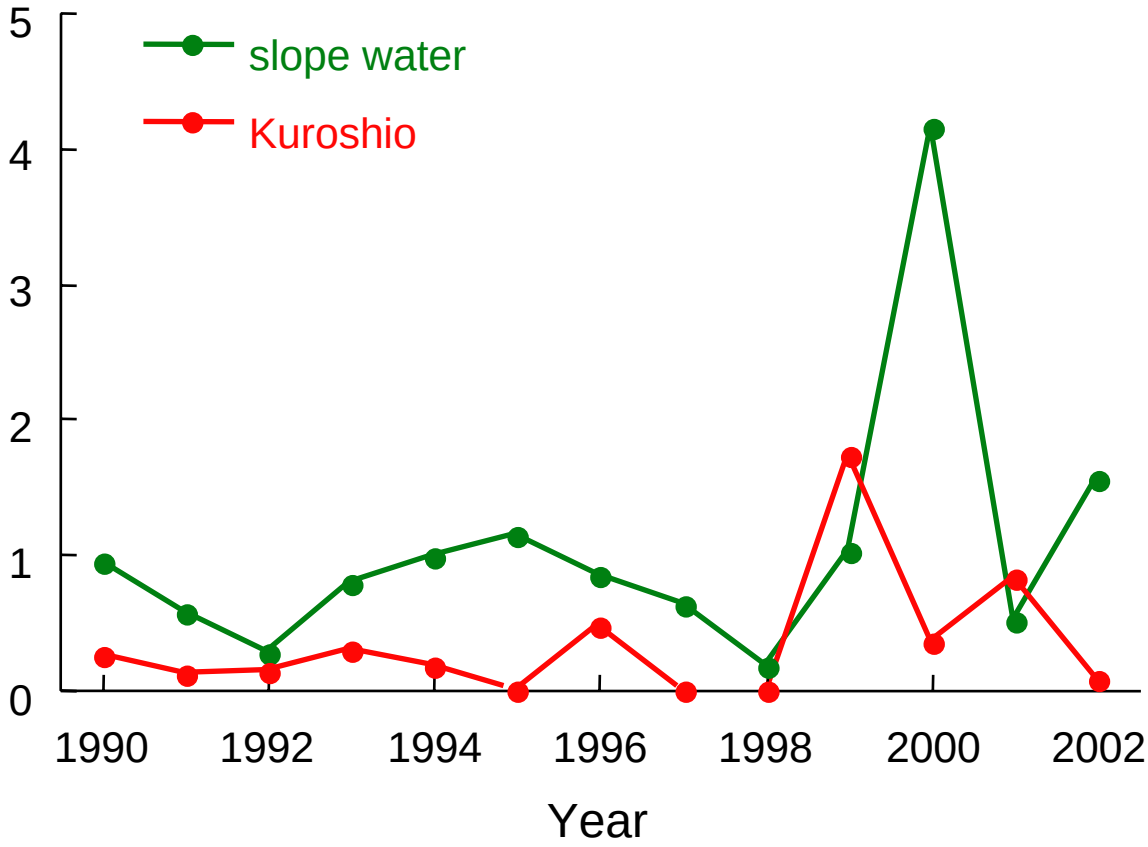
Abundance of *Calanus sinicus*

Norpac net, 0-150m vert. tow
135-137.5˚E
February-March



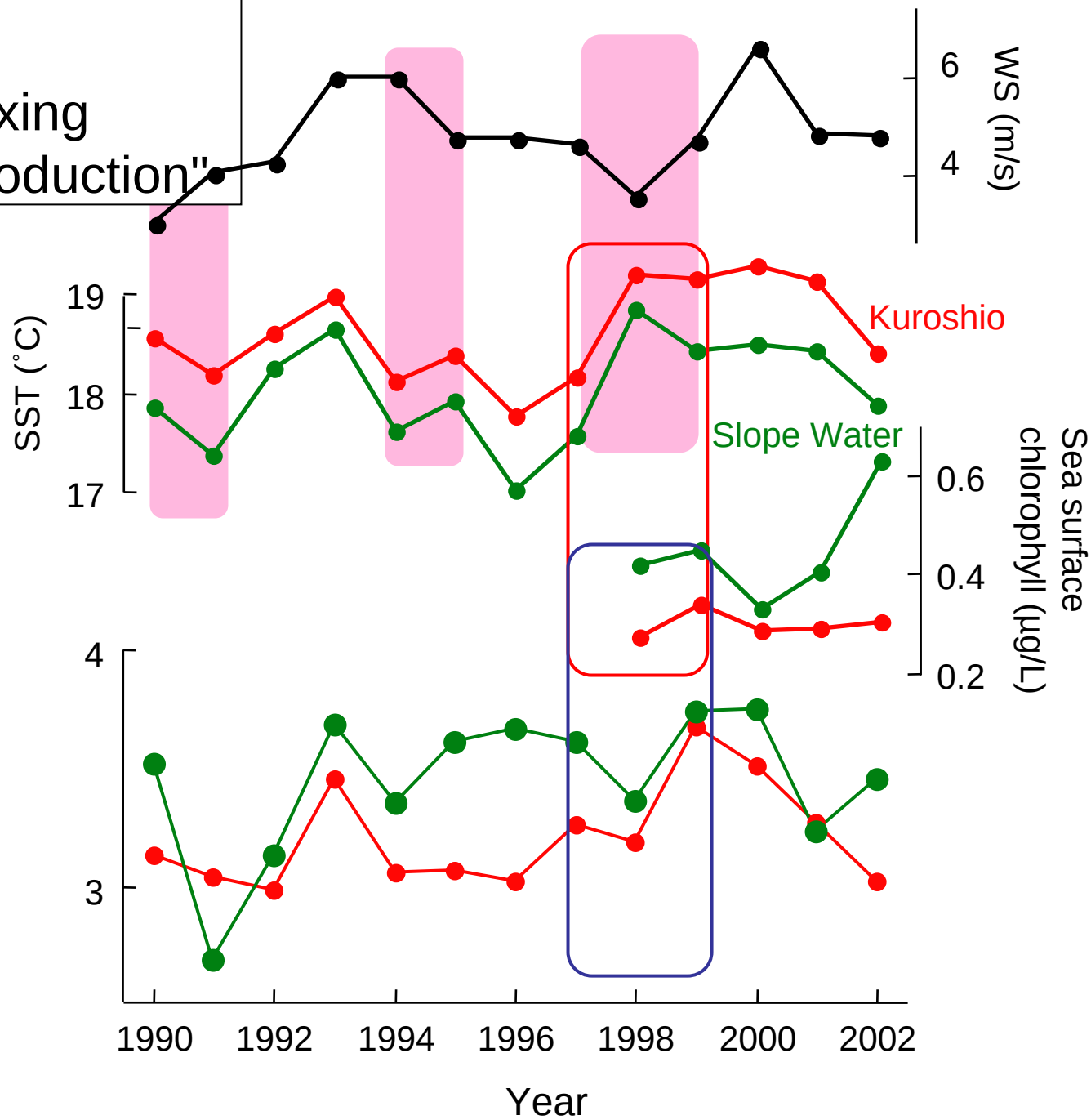
Abundance of *Calanus sinicus*

Norpac net, 0-150m vert. tow
135-137.5˚E
February-March



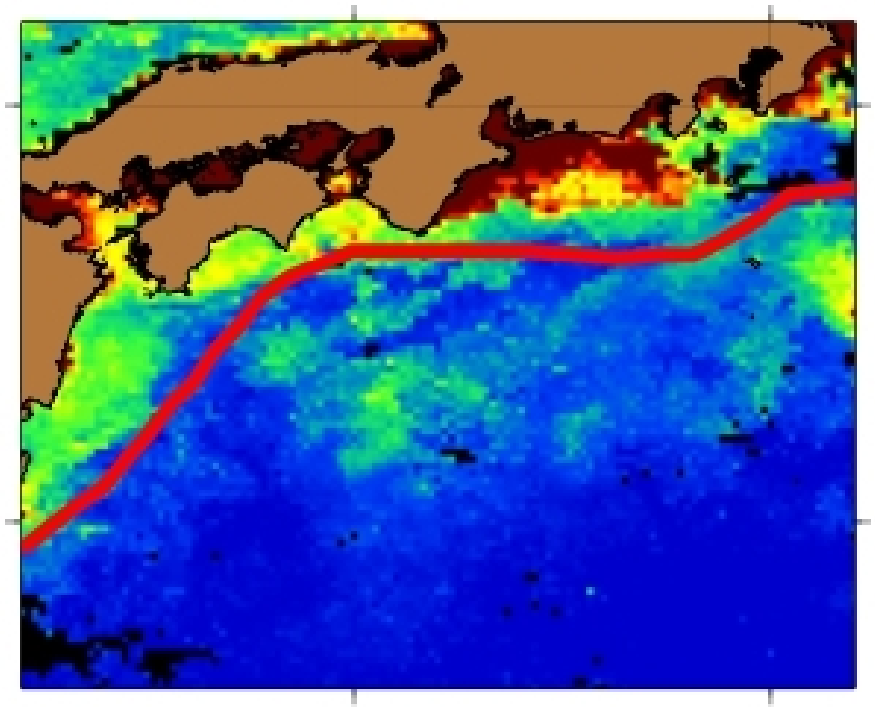
Scenario

"Enhanced mixing
- enhanced production"

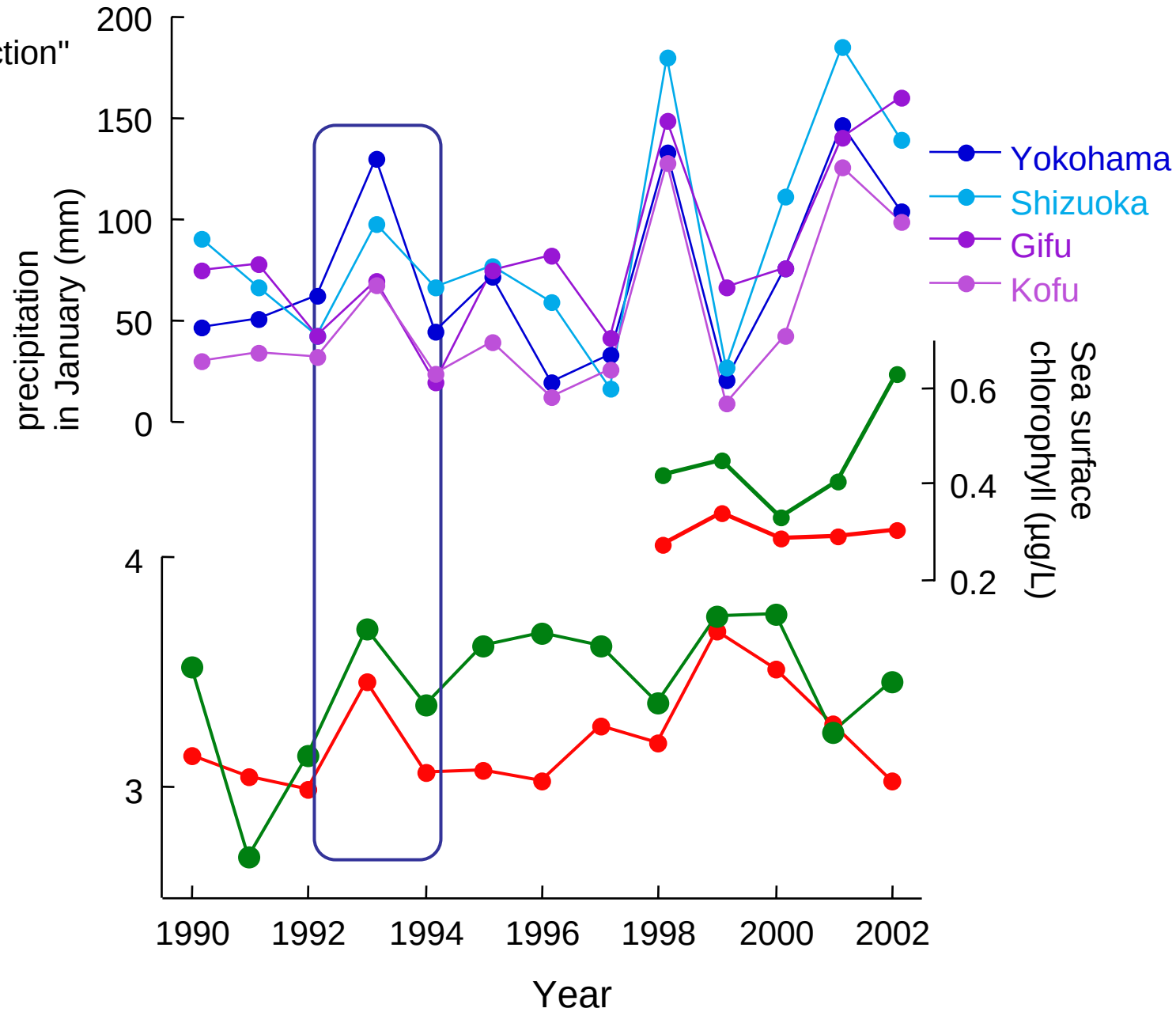


Scenario

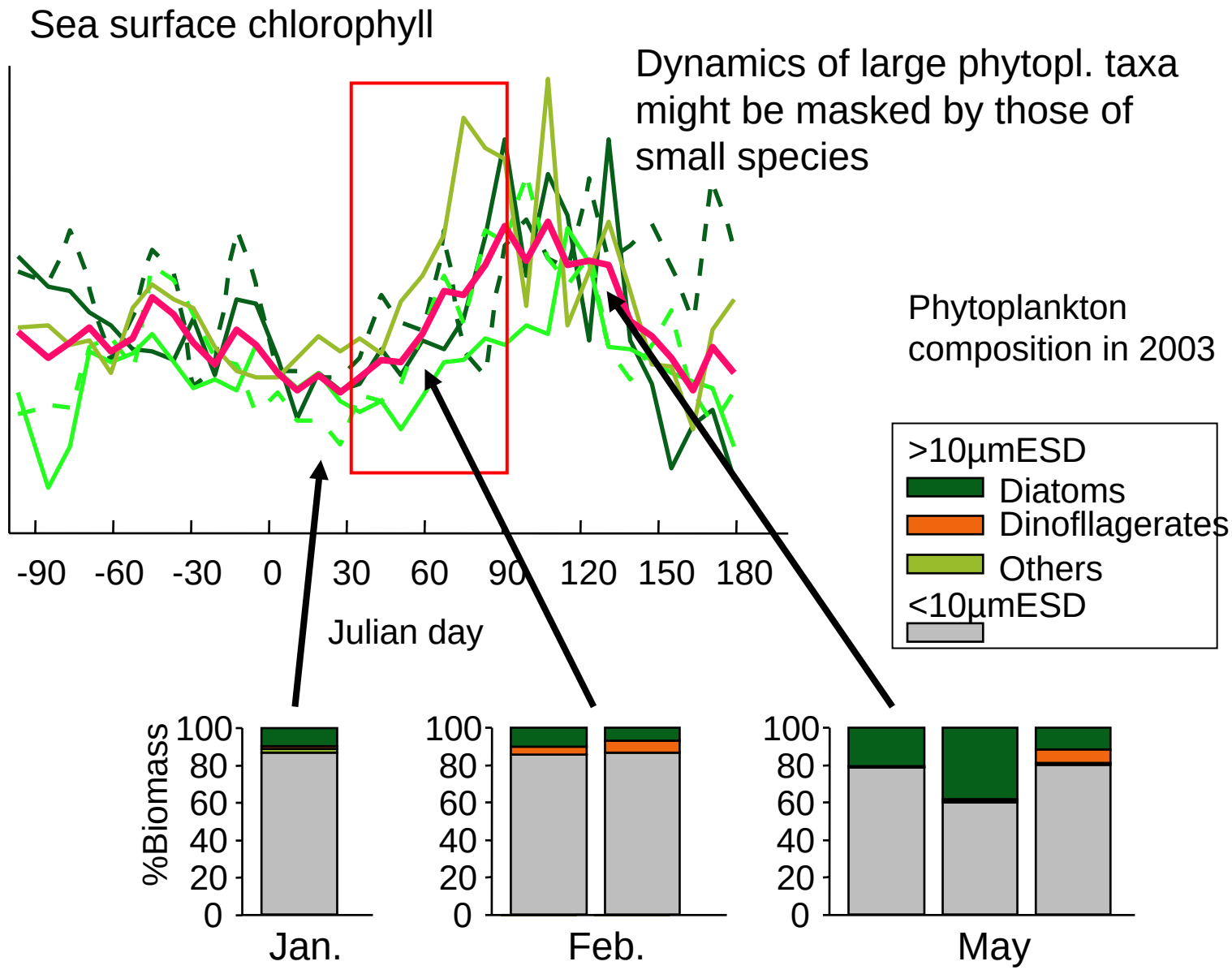
"freshwater runoff
- enhanced production"



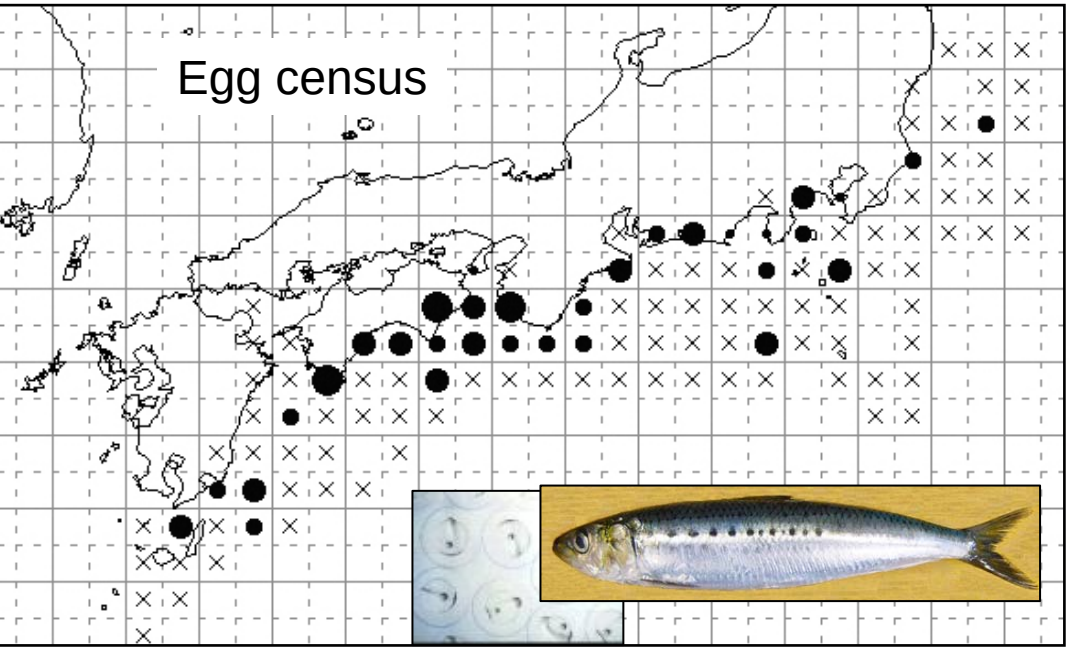
Scenario
"freshwater runoff
- enhanced production"

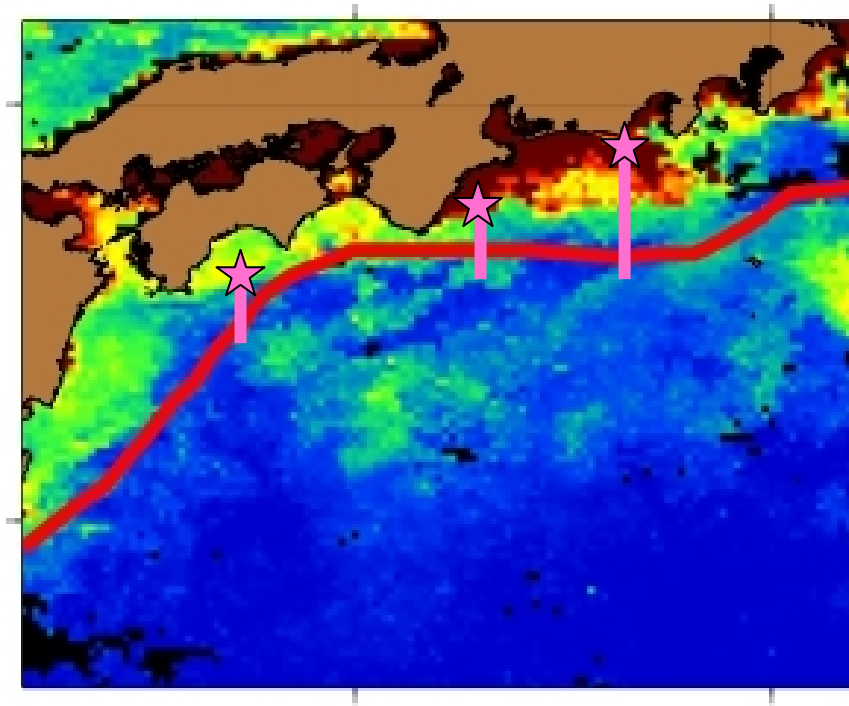


Phytoplankton composition



Monitoring strategy for plankton community





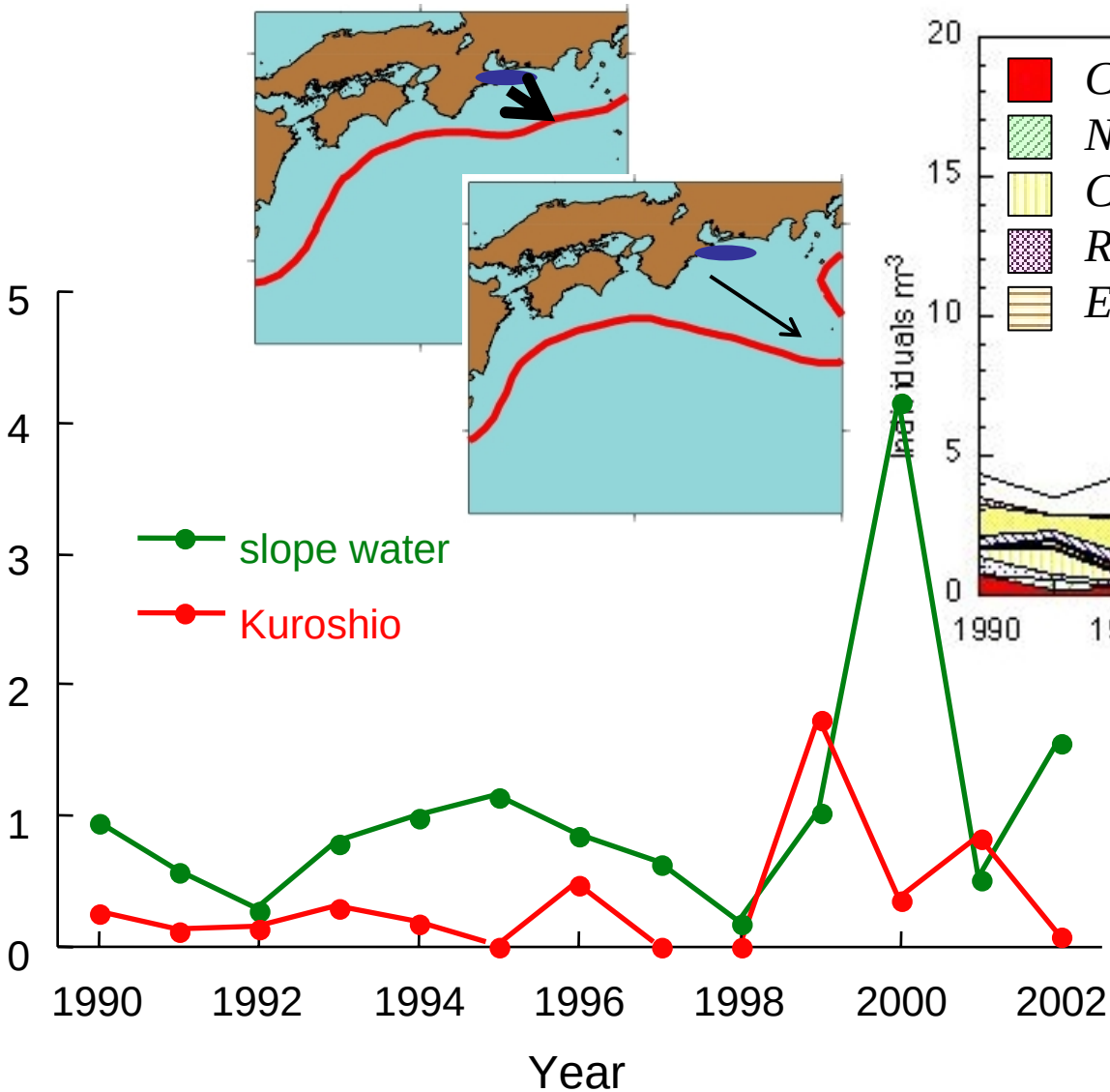
One population
One life cycle event (spawning) / year

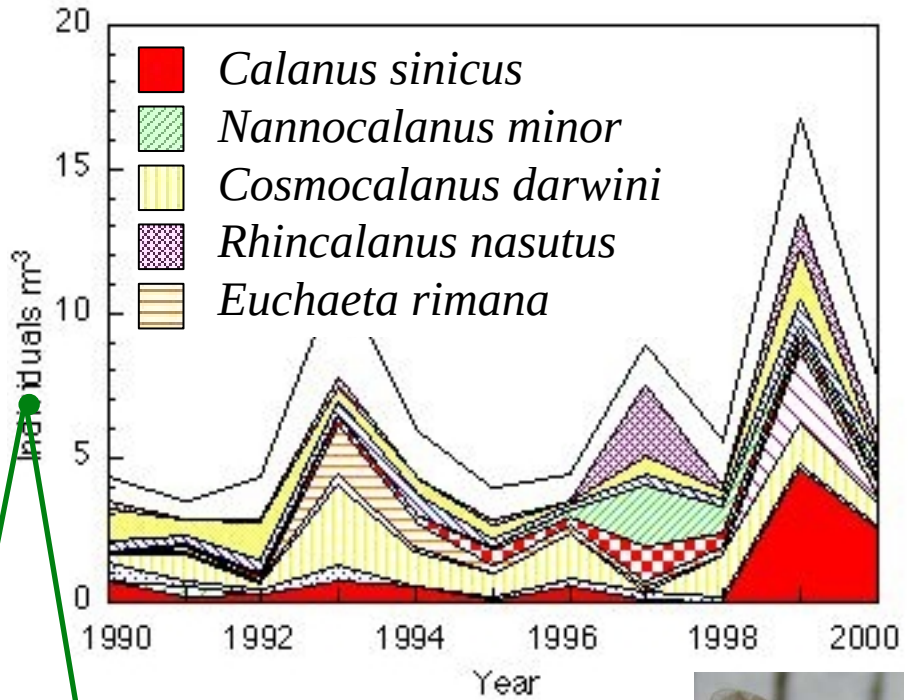
Broad area
Once / year

diverse community
short life cycles

selected small areas
frequent obsv. in critical period

Advection of plankters between slope water and Kuroshio





Conclusion

"Enhanced mixing - enhanced production" scenario was successfully applied to 1998/1999 ecosystem change and several SST trends in 1990s.

"Enhanced mixing - enhanced production" scenario failed to explain zooplankton biomass in early 1990s.

Among ecologycal factors,

fast life cycles and food web complexity

and

advective process between Kurosho and slope water

should be important in the ecosystem dynamics and should be observed with monitoring system designed adequately.