Landmark for the spawning of Japanese eel

Shingo KIMURA and Katsumi TSUKAMOTO
Ocean Research Institute, Univ. of Tokyo

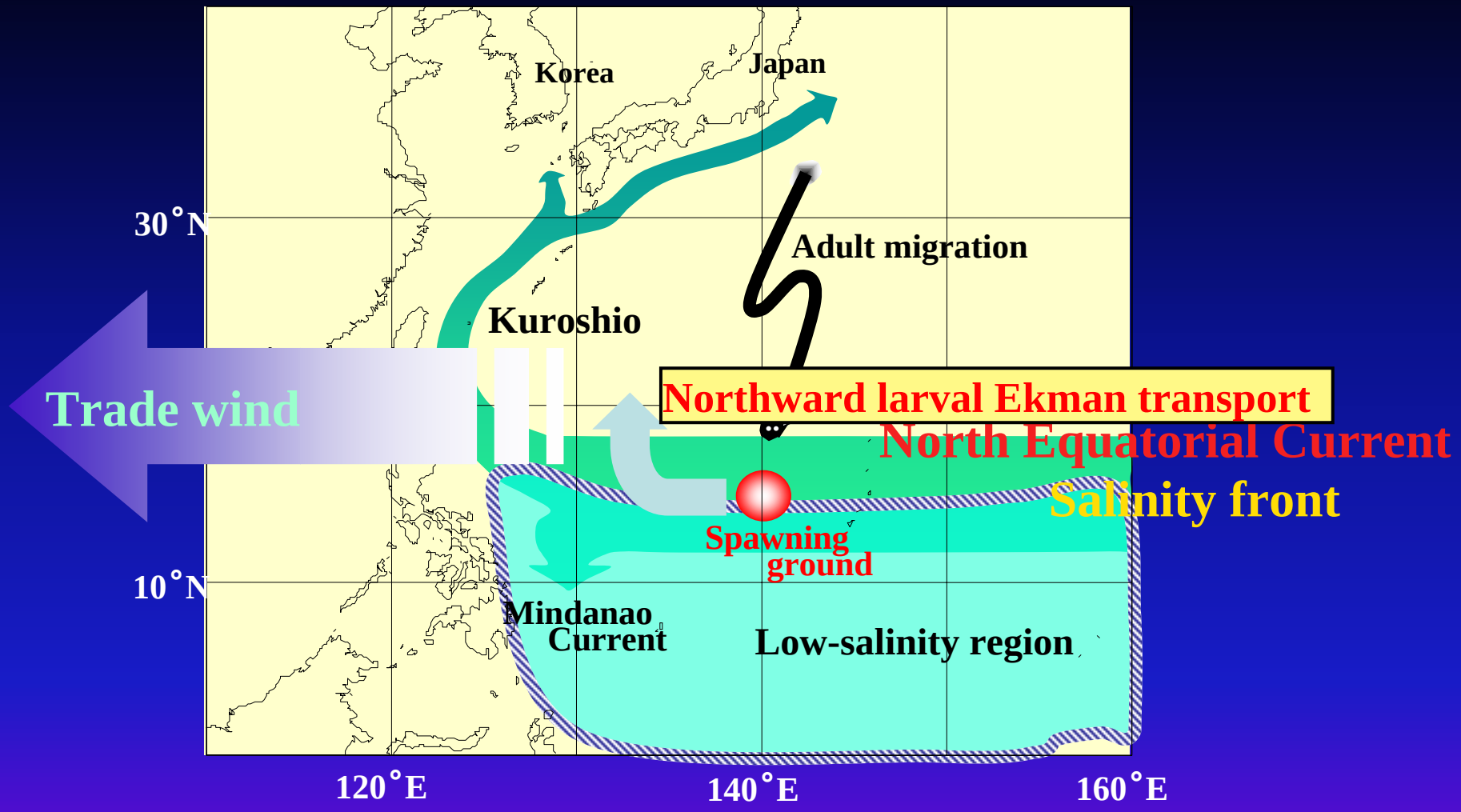
Salinity front in the North Equatorial Current

El Niño/Southern Oscillation Index

Difference of water property (Particulate Organic Matter)

Environmental factors ⟷ spawning behaviors / larval transport

2002 (El Niño) &2004 (La Niña trend)
Hakuho-maru research cruises



Water circulation and distribution of water masses

North Equatorial Countercurrent

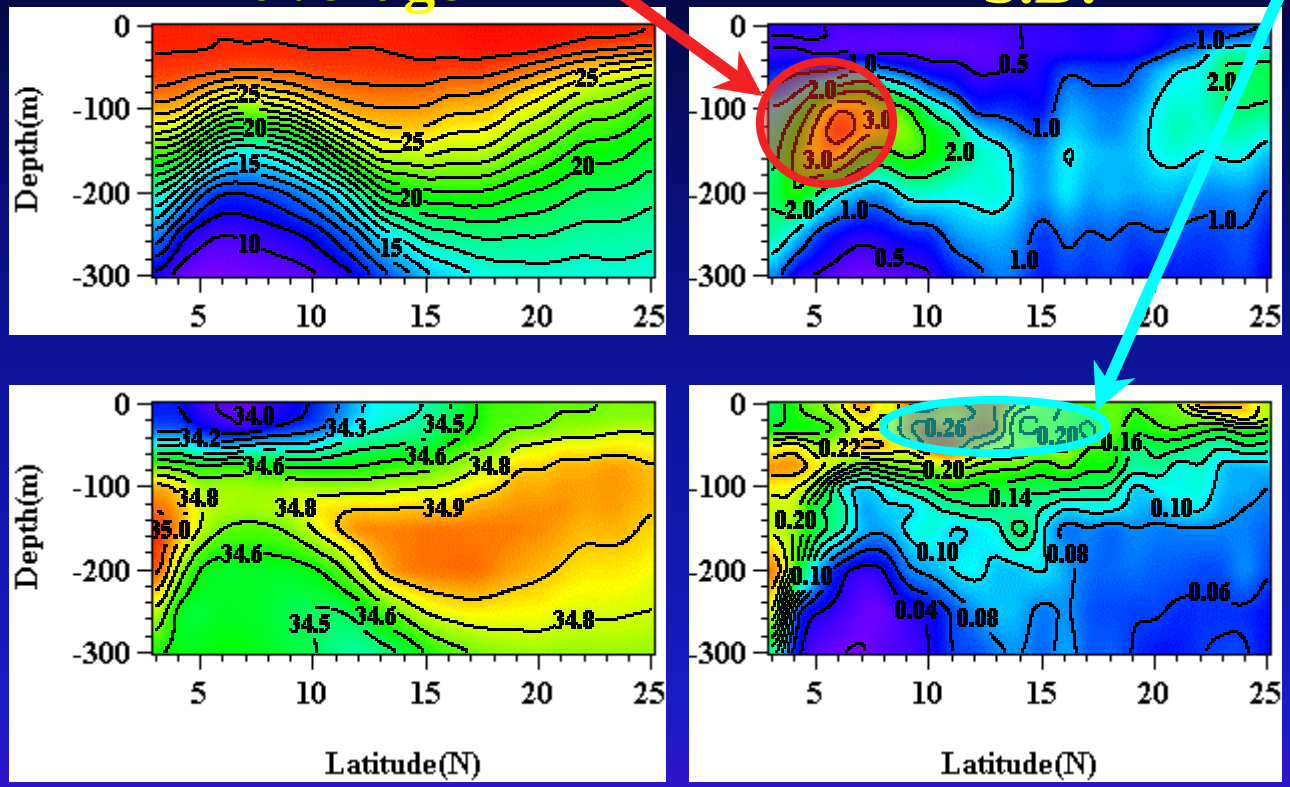
North Equatorial Current

average

S.D.

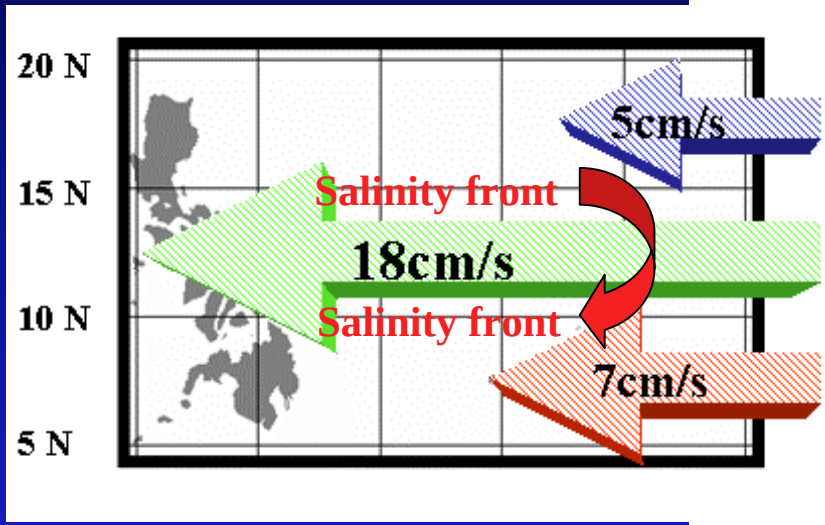
Temp.

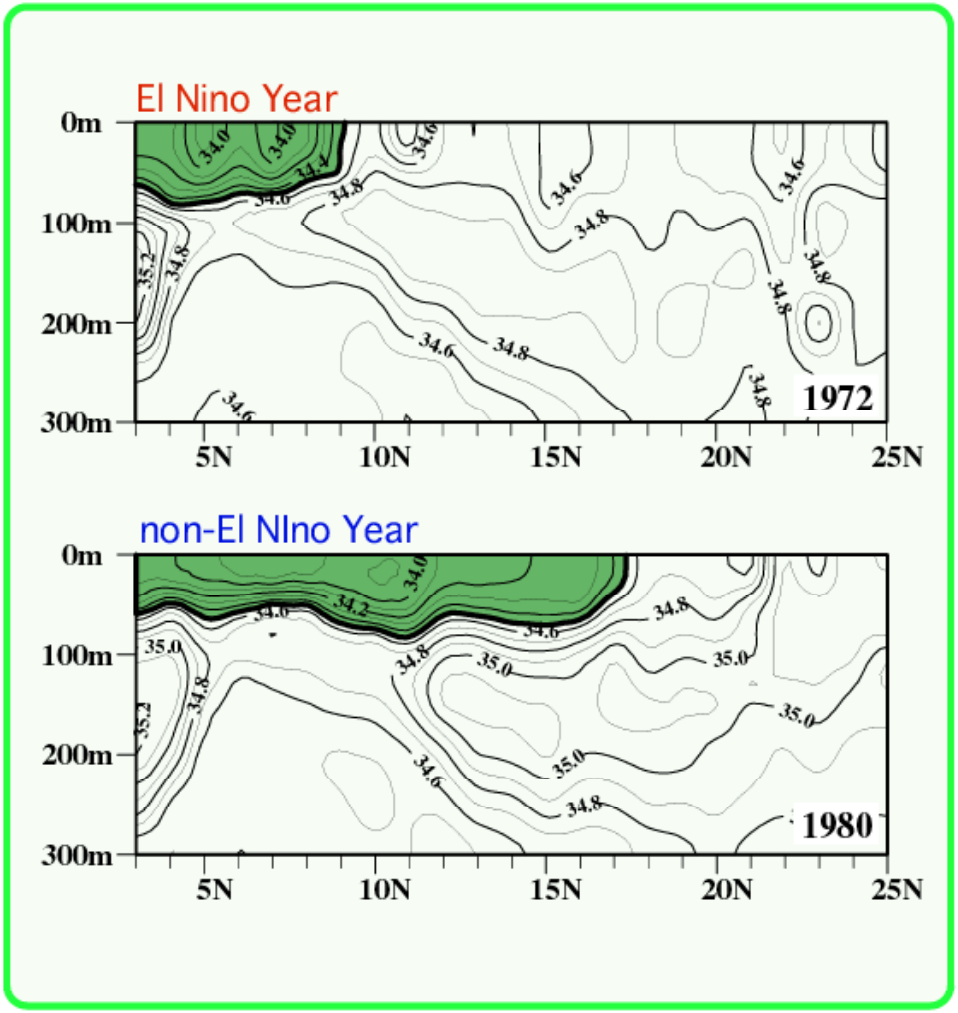
Salinity



27 year averaged temperature and salinity sections

Mean and standard deviation





Location of the salinity front depending on ENSO

Usual years

Strong current velocity south of the salinity front
Good condition for appropriate larval transport

Difference of water mass property

▼

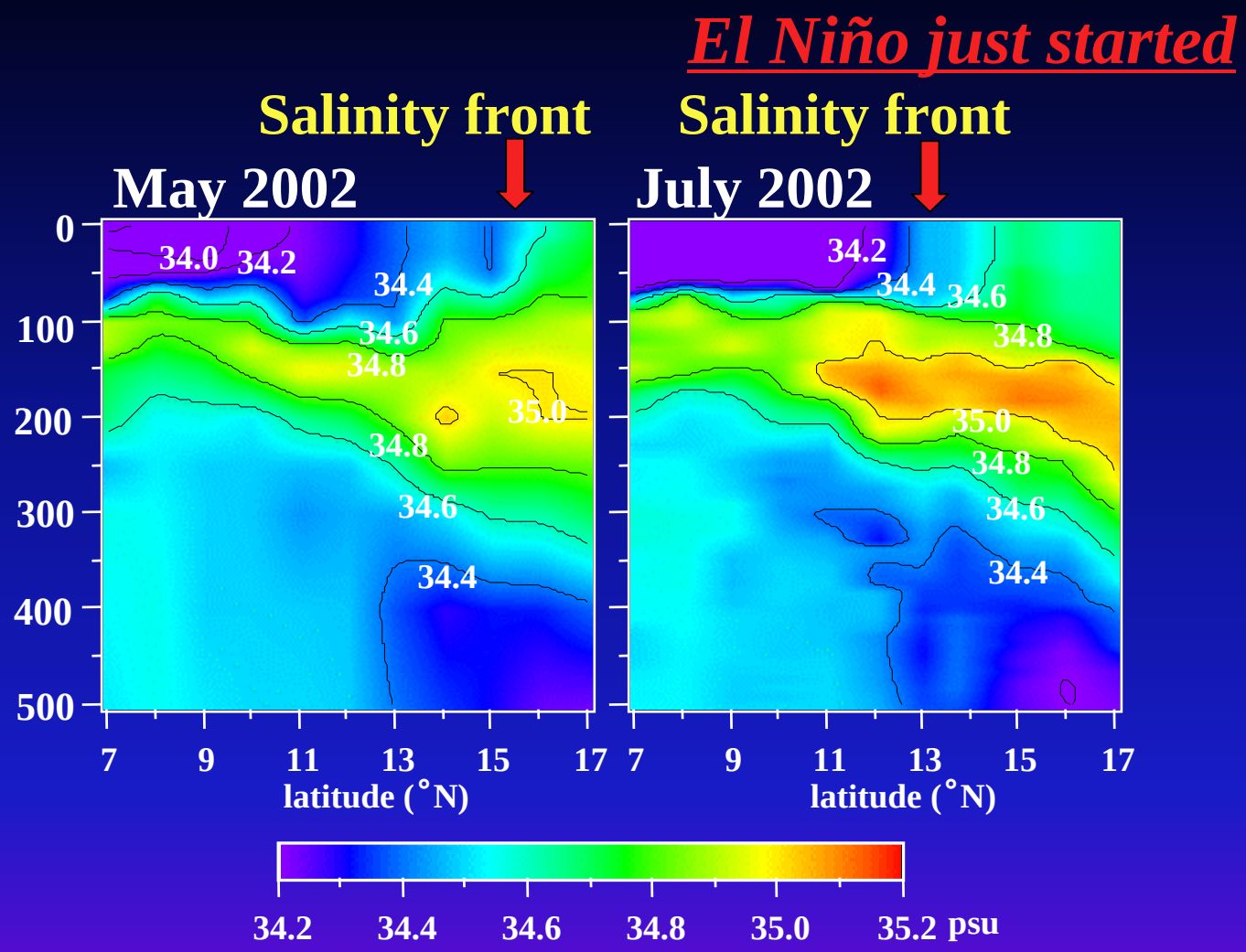
Landmark for detection of the spawning ground

El Niño years

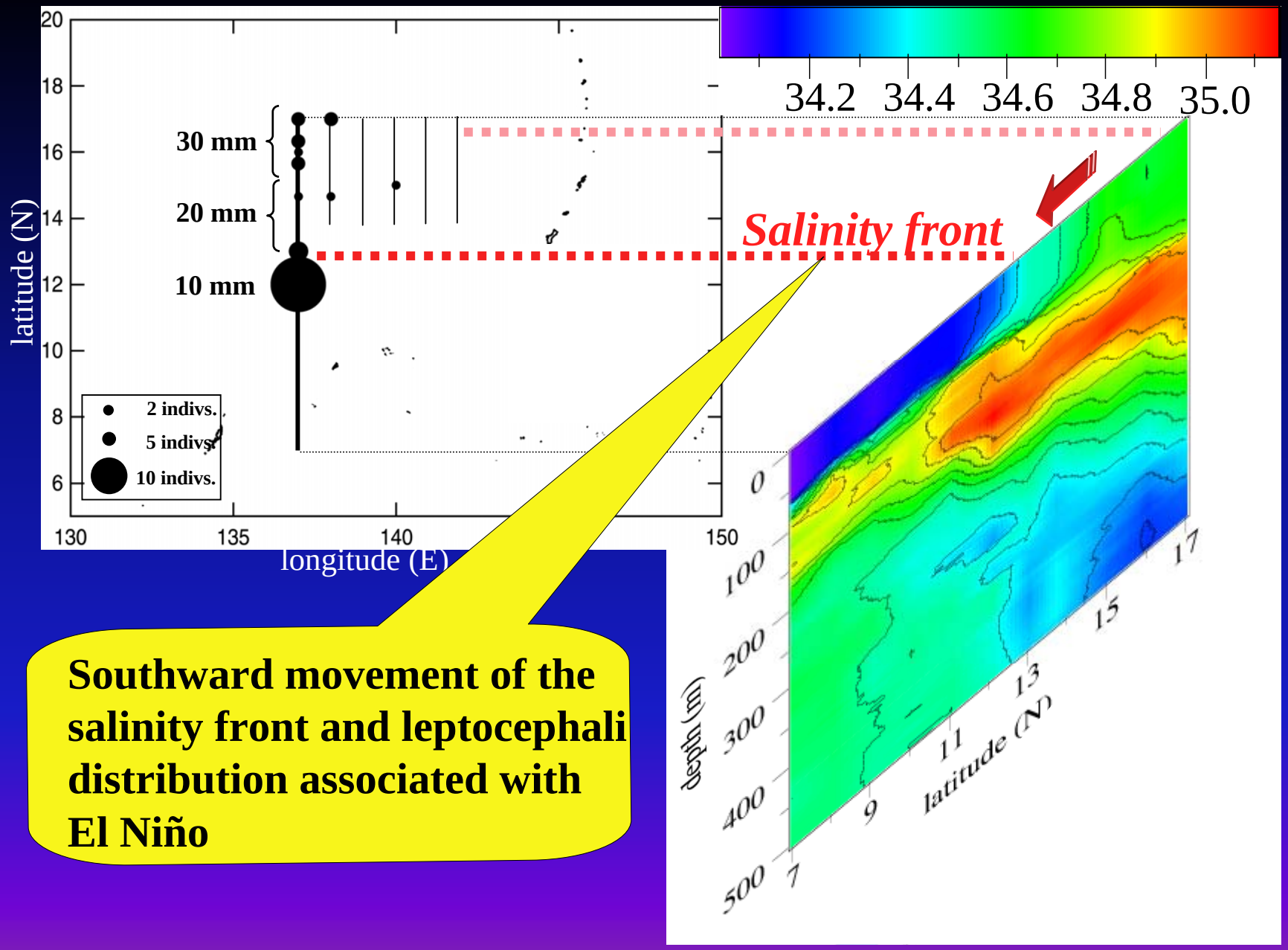
Southward movement of the salinity front
Bad condition for the larval transport
Decrease of the glass eel catch in Japan

Next task

Confirmation of this phenomenon during El Niño
Detection of factor of water property

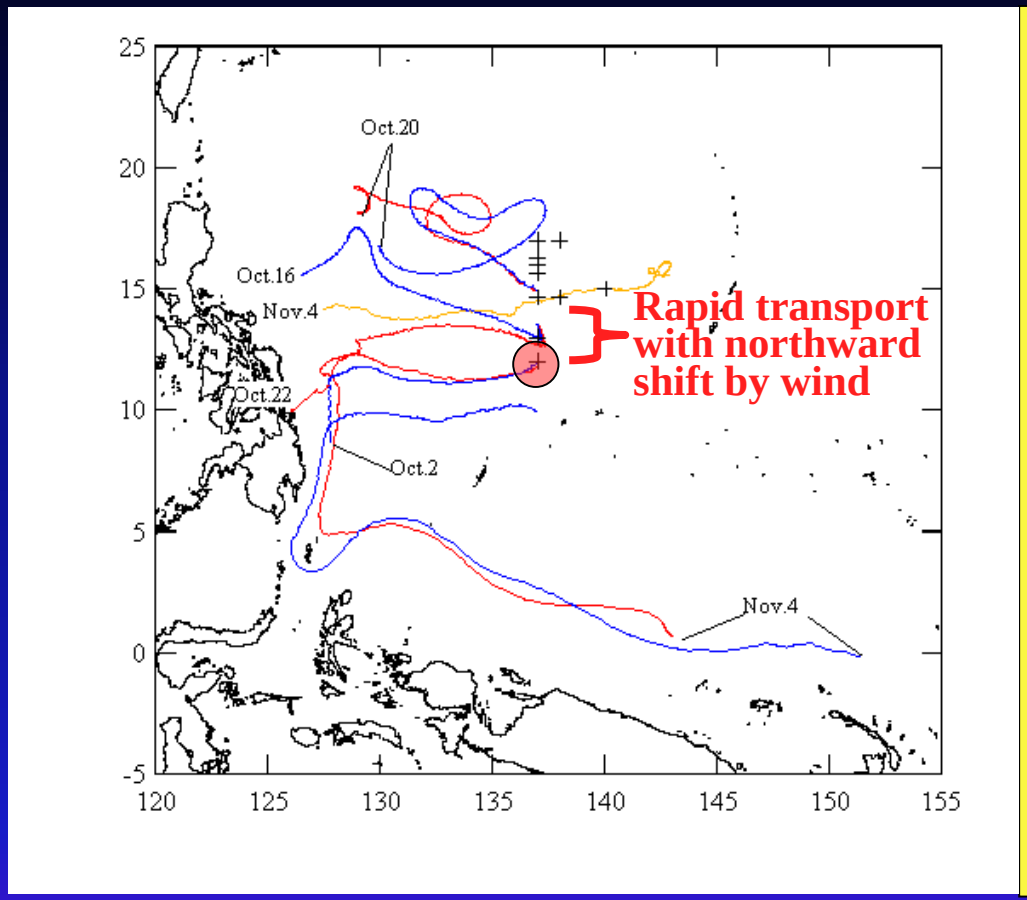


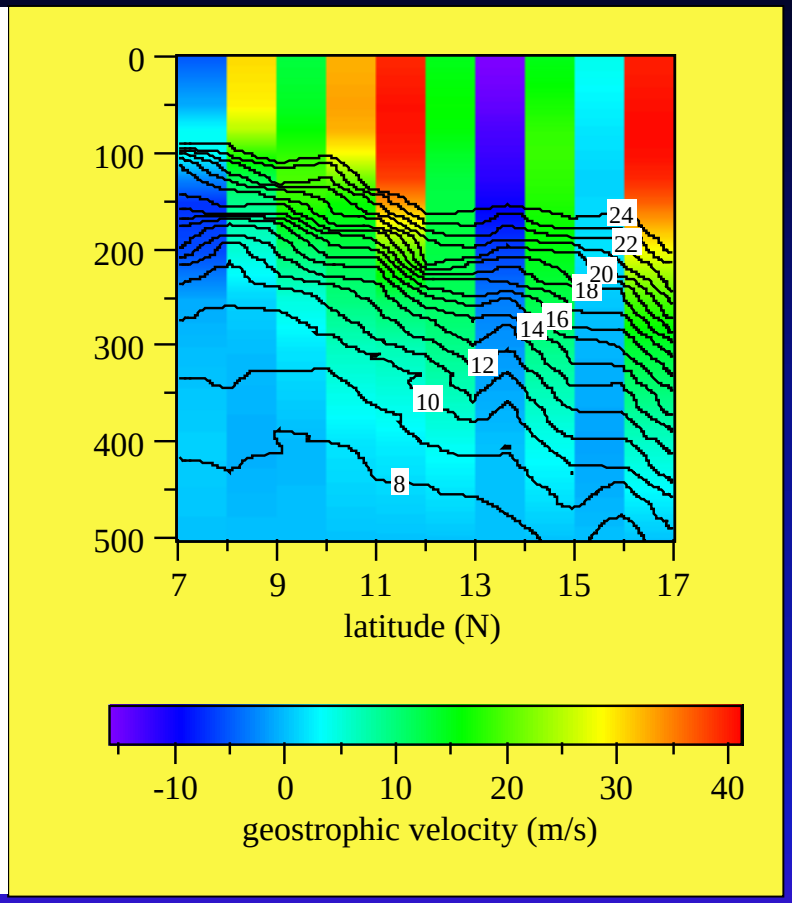
Difference of location of salinity before and during El Niño



Southward movement of the salinity front and leptocephali distribution associated with El Niño

Salinity section and leptocephali distribution in research cruise

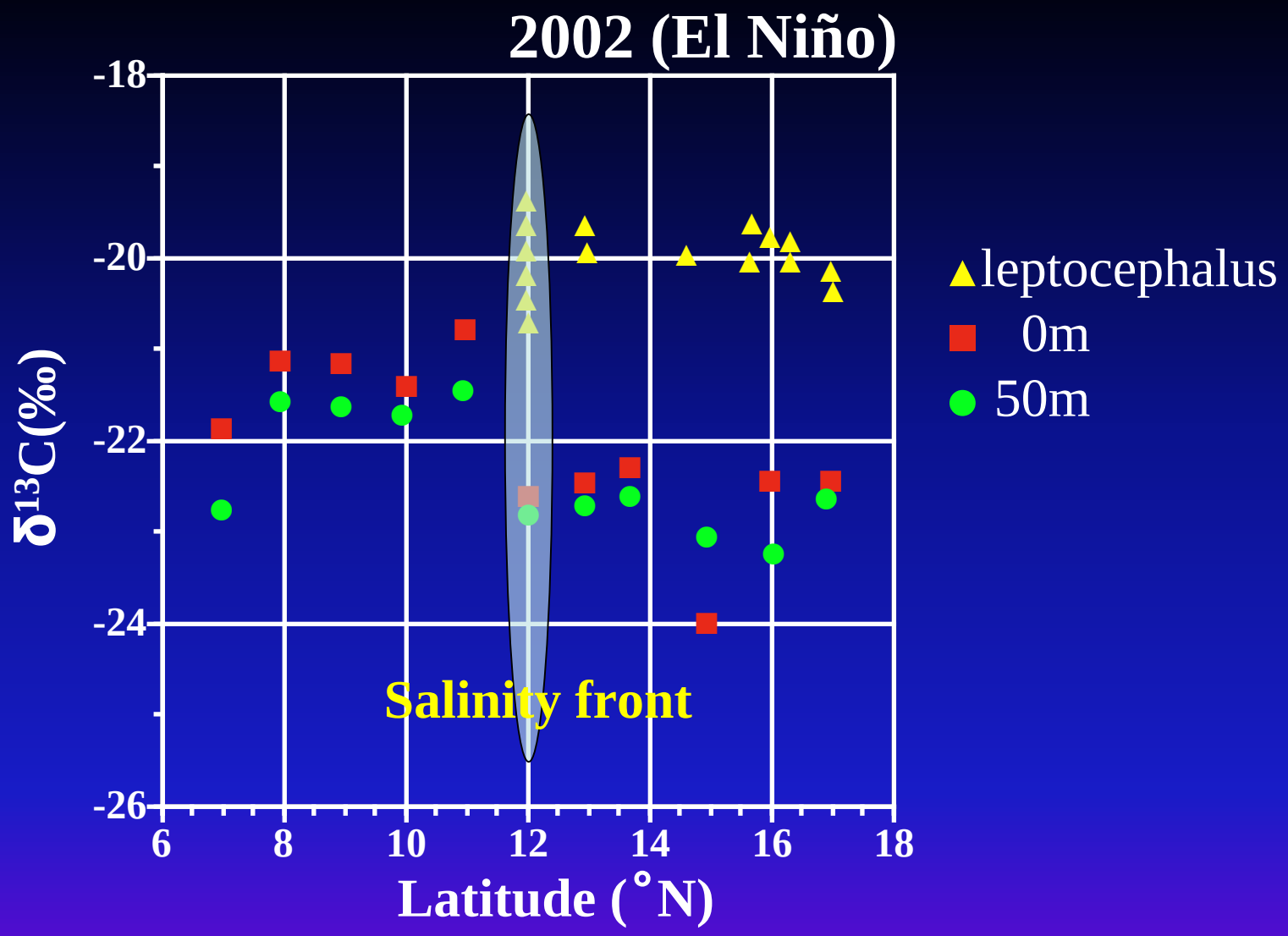




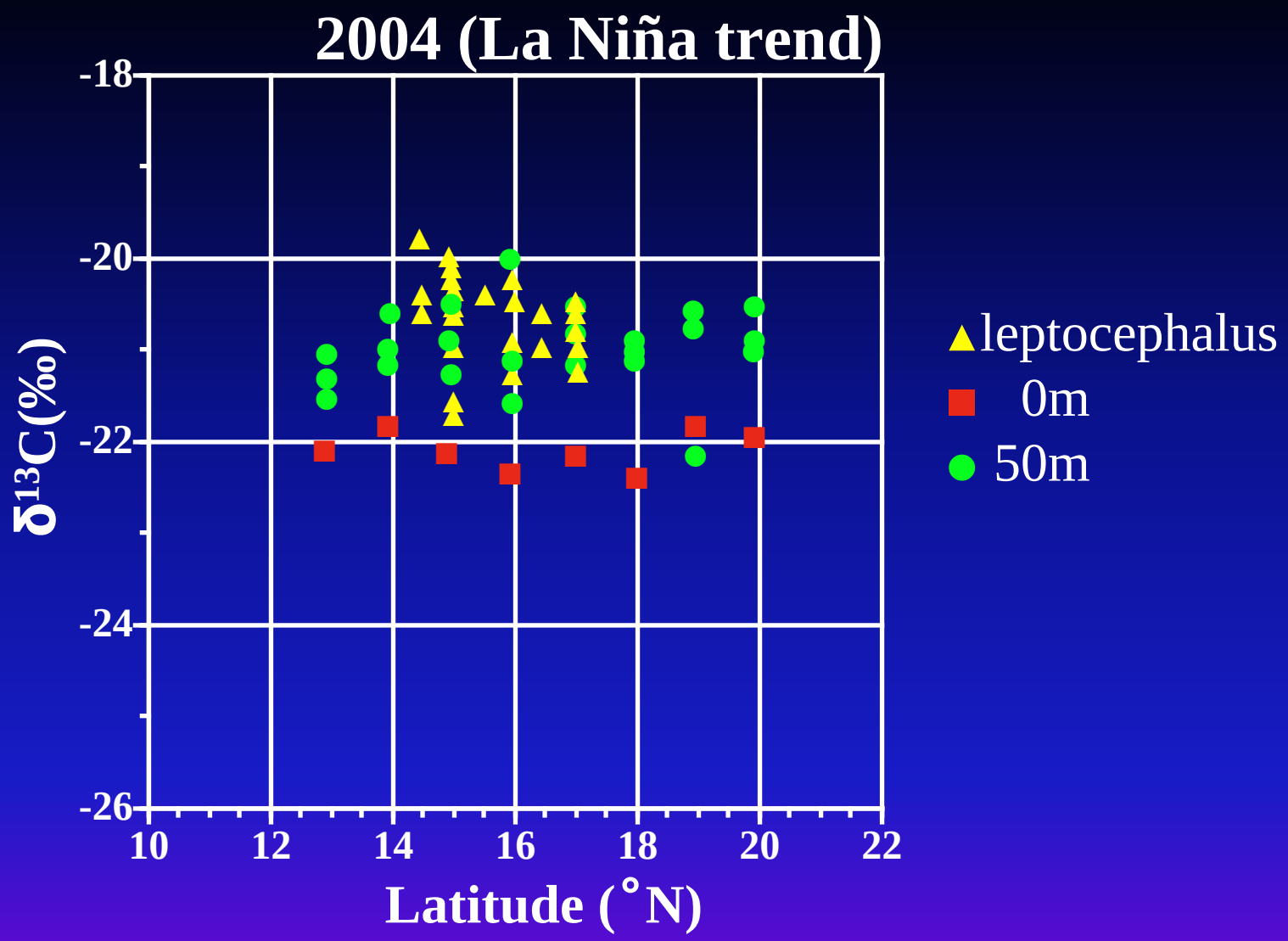
Tracks of Argos buoys

Current velocity

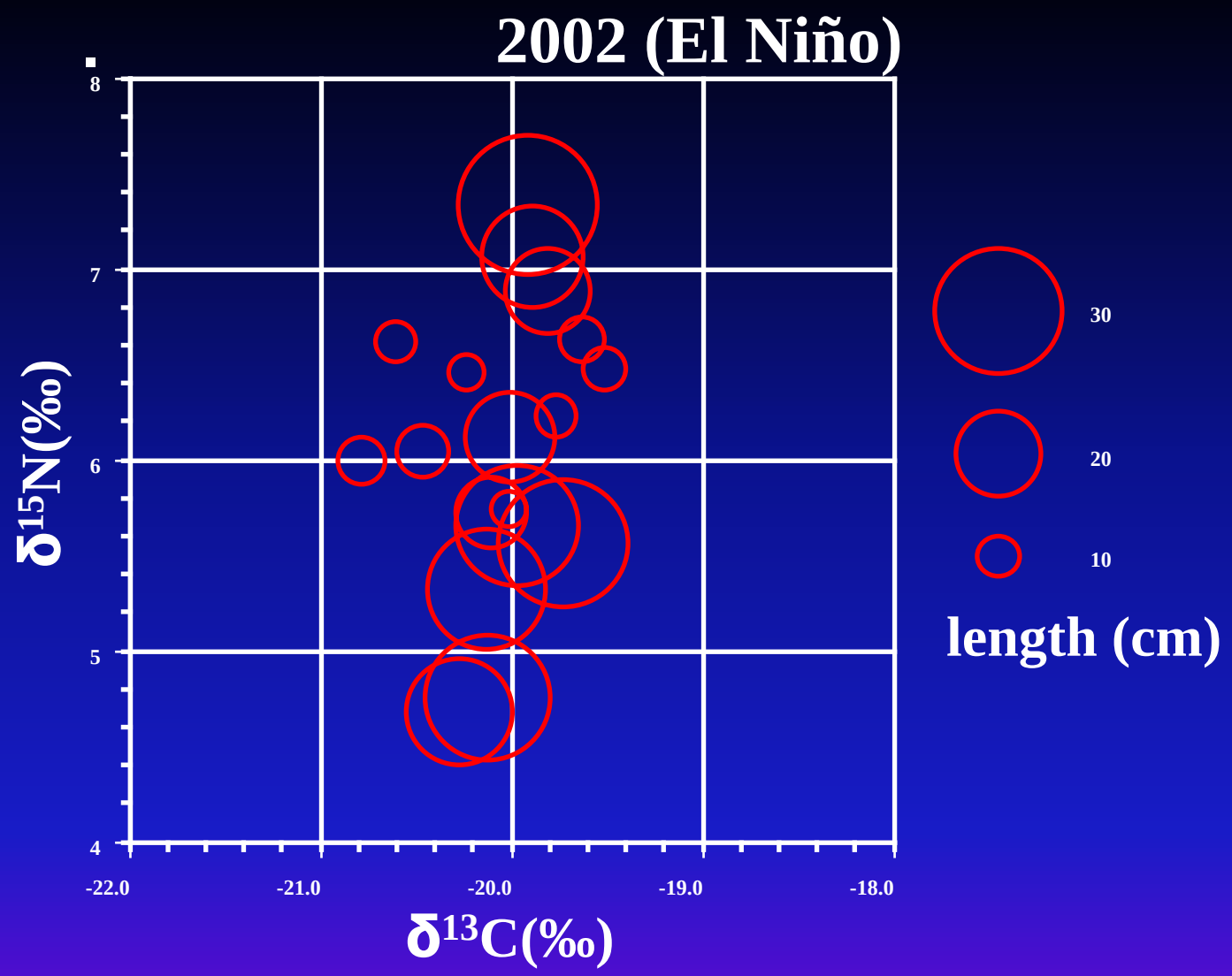
Water circulation in the North Equatorial Current



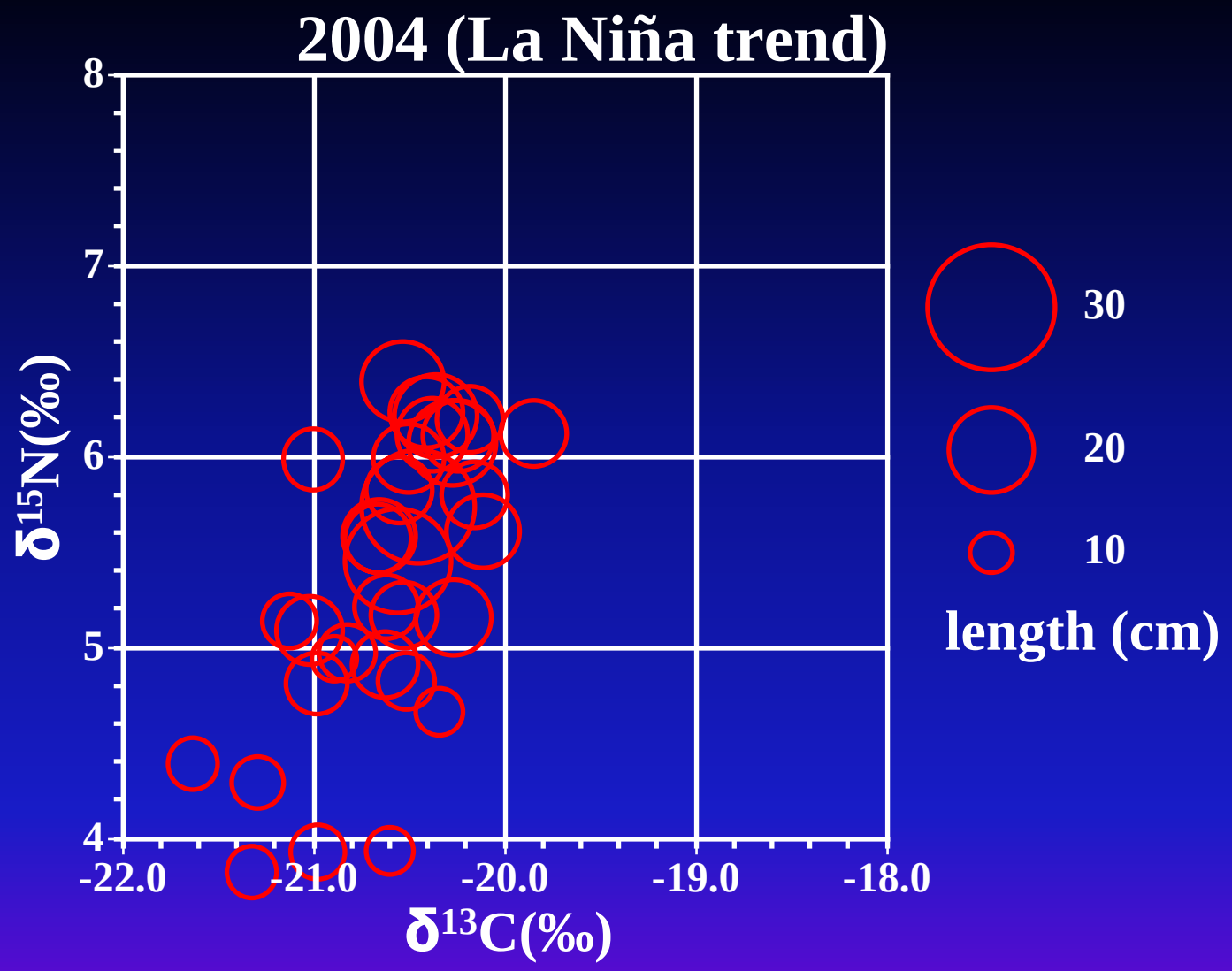
Carbon stable isotope ratio of leptocephali and POM



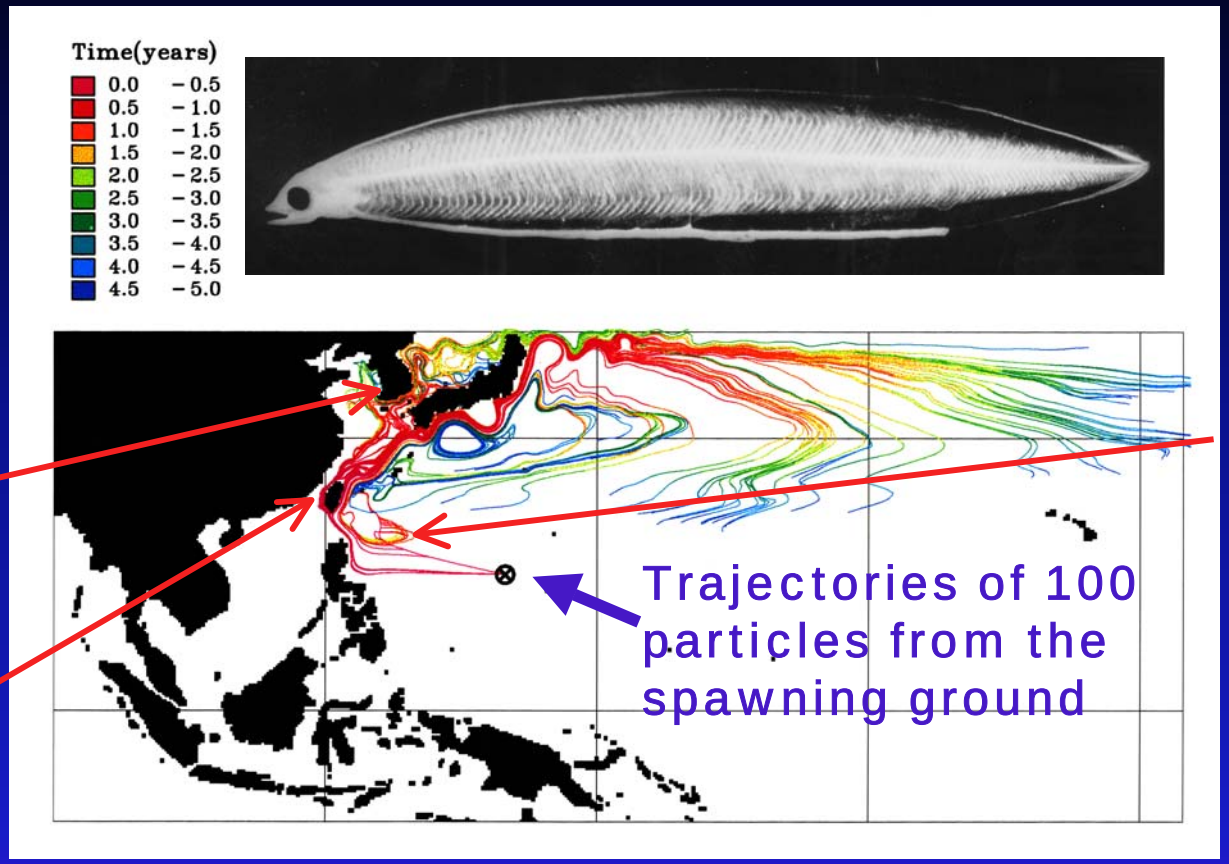
Carbon stable isotope ratio of leptocephali and POM



δ13C-δ15N map of the Japanese eel leptocephali



$\delta^{13}C$-$\delta^{15}N$ map of the Japanese eel leptocephali

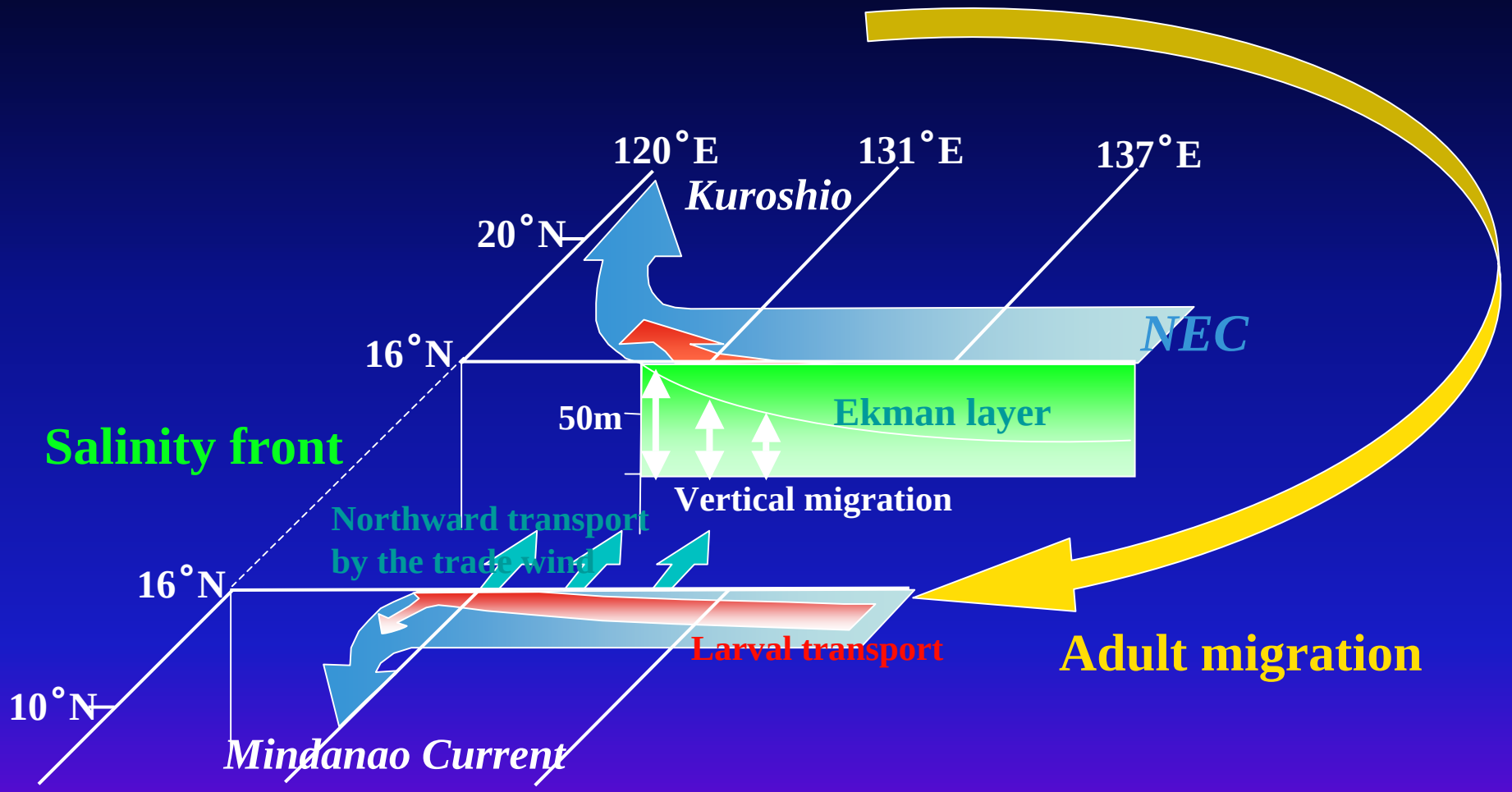


Delay of arrival in Korean coasts

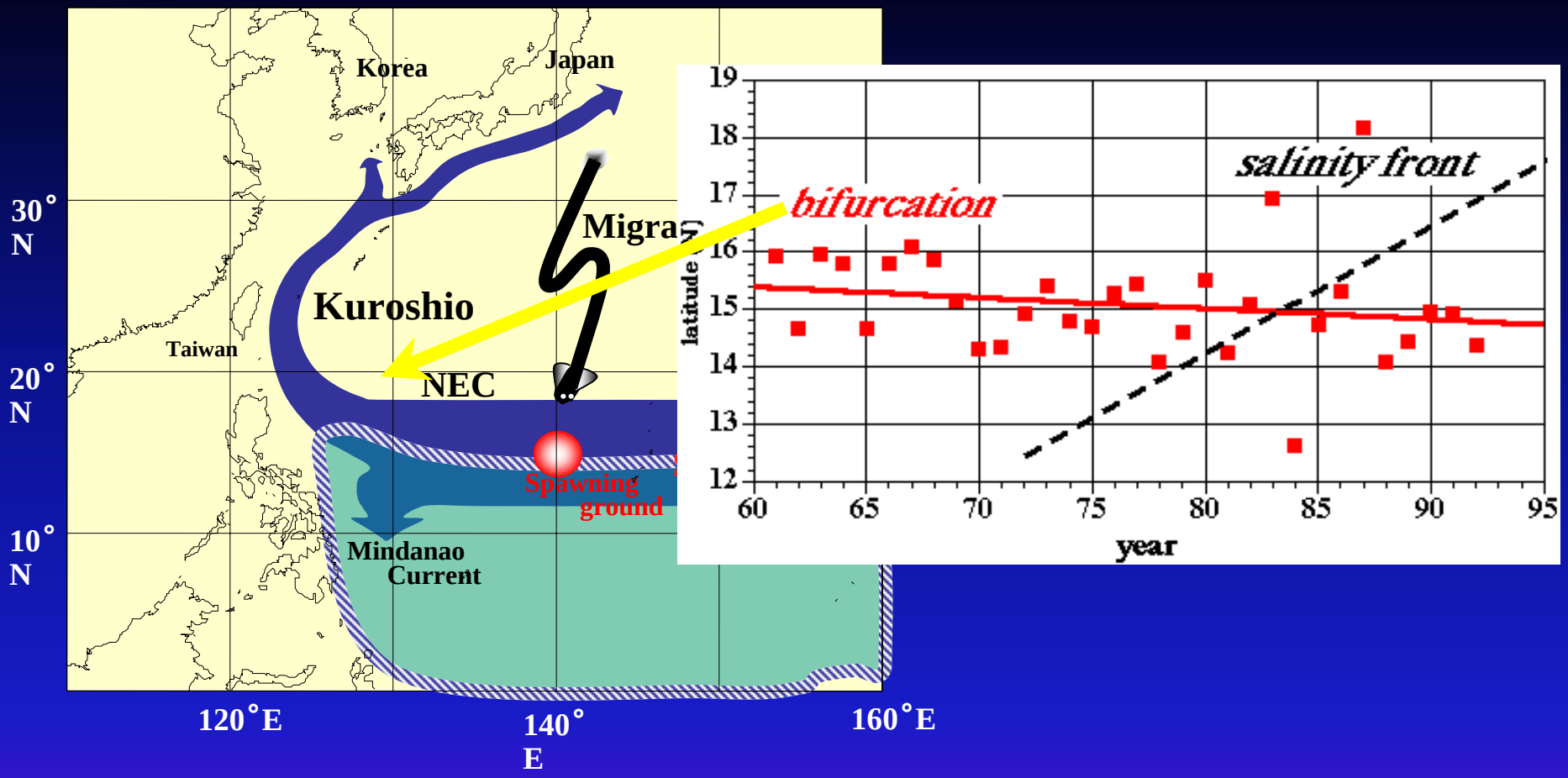
Wind-driven transport to west coast of Taiwan

Entrainment into gyre

Results of numerical simulation of larval transport

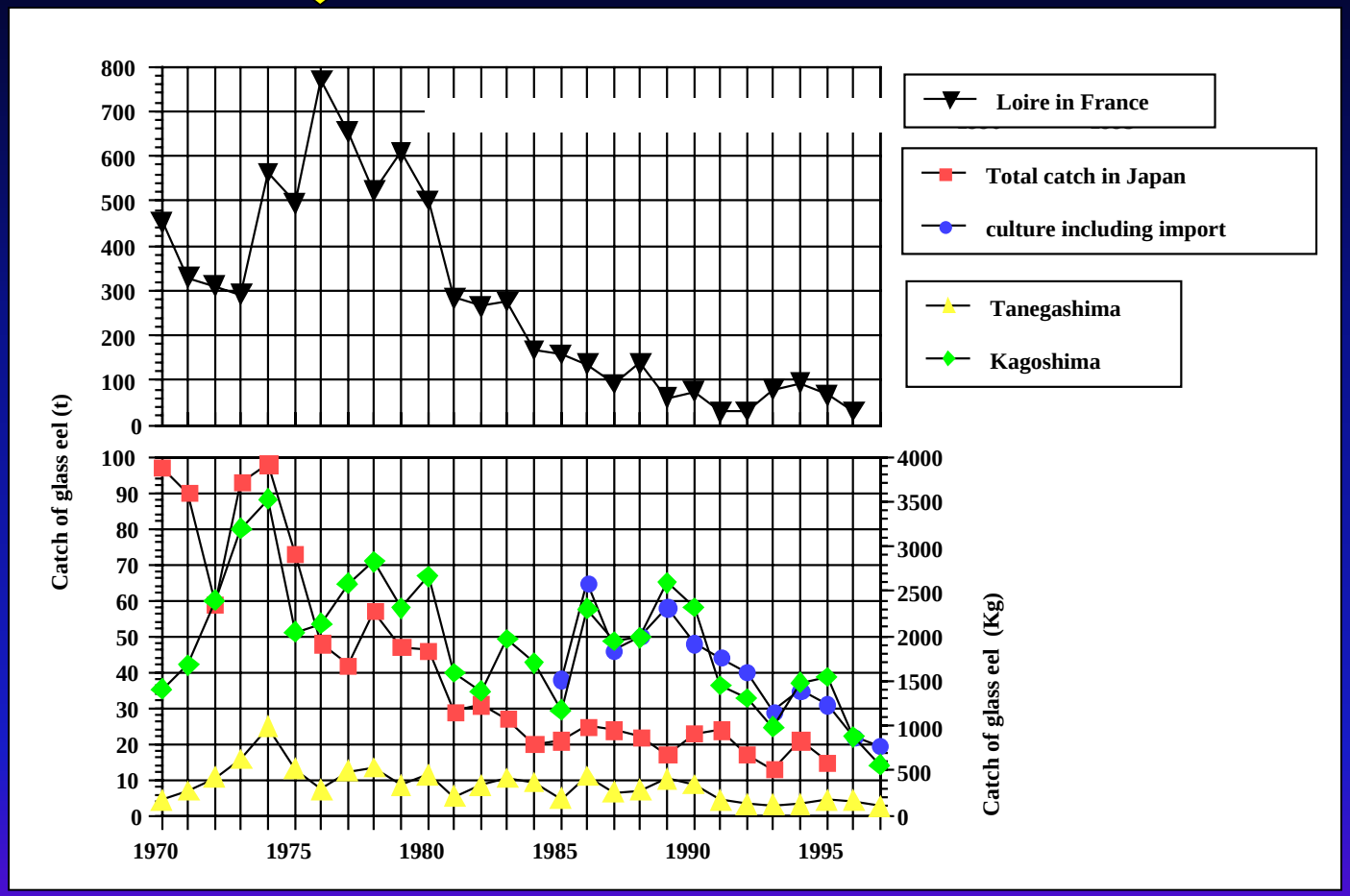


Spawning migration of the Japanese eel

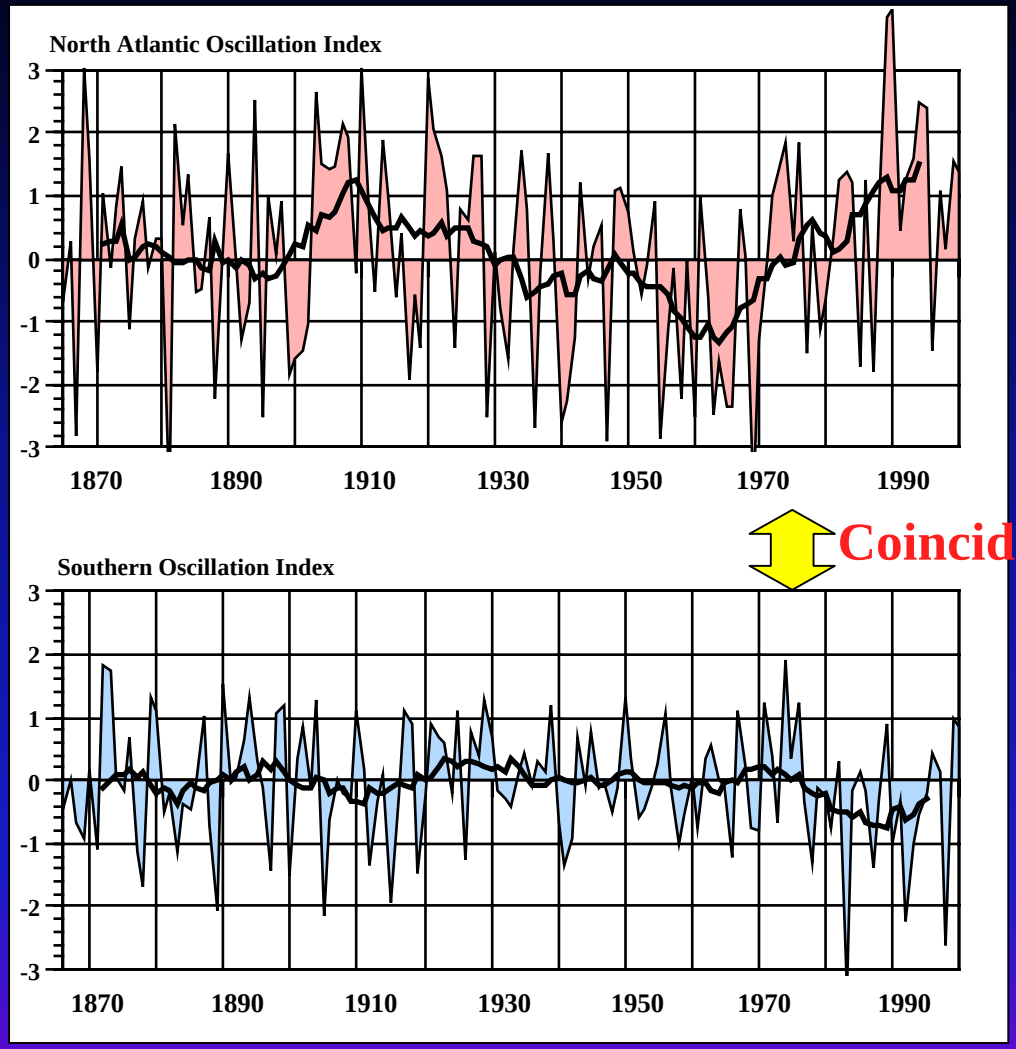


Latitude difference of bifurcation and salinity front

Correspondence to climatic regime shift



Glass eel catch in Japan and Europe



European eel case: unclear temperature gradient causes losing detection of hot spot

Coincidence of large change

Fluctuations of NAO index and SOI in last 130 years

Conclusion

- Hot spot for the Japanese eel is located in the NEC and related to salinity front
- Large southward displacement of salinity front associated with El Niño
- Narrow highway between 10°N and 15°N for appropriate larval transport
- Distribution of smaller leptocephali in south of the salinity front which moved southward associated with 2002 El Niño
- Difference of water mass south and north of salinity front is related to POM difference
- High possibility that leptocephali ingest food south of the salinity front
- Surface water property in the NEC is significantly different between El Niño year and La Niña year
- Decrease of European eel may be explained same as the Pacific case