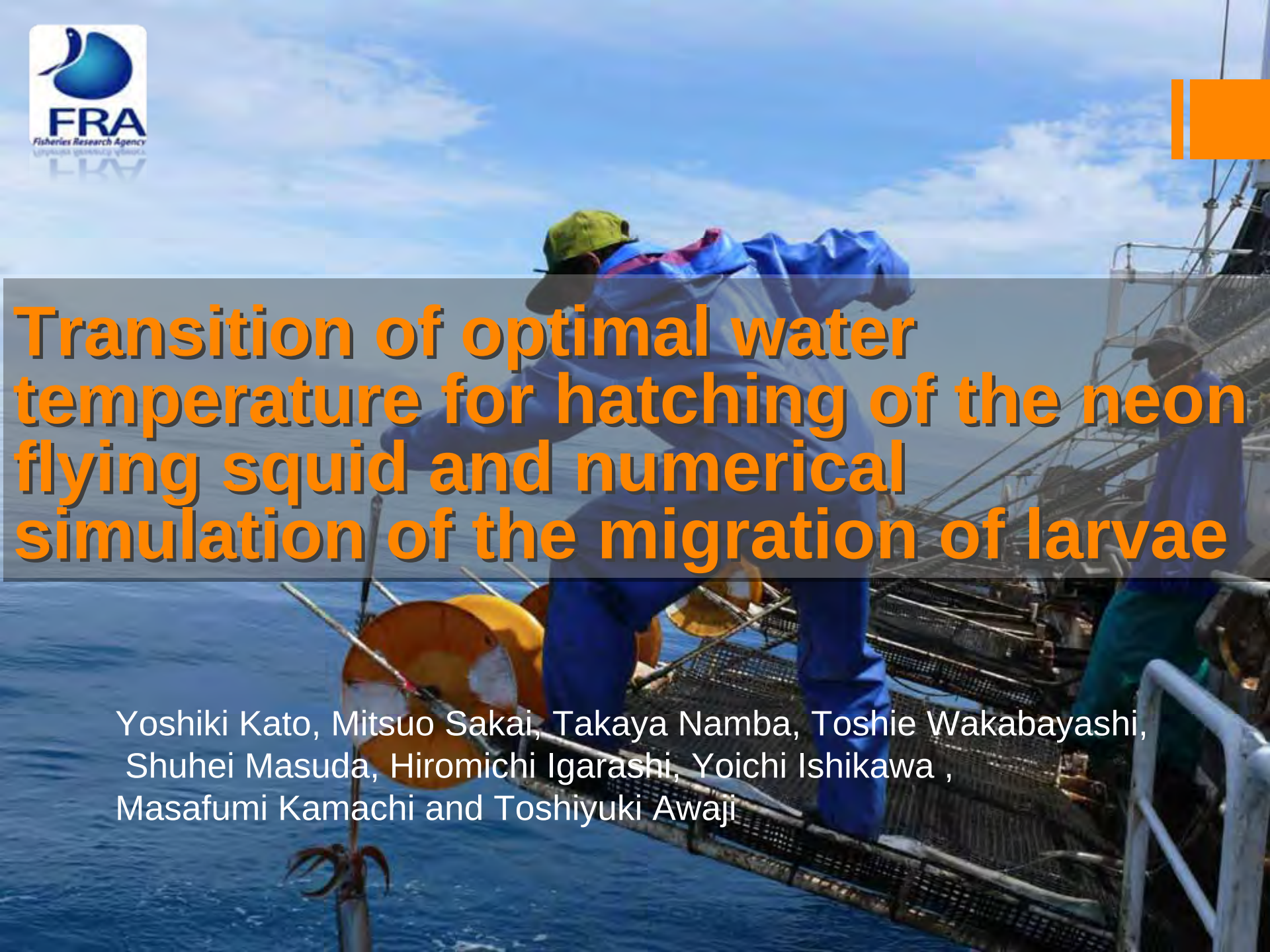

Transition of optimal water temperature for hatching of the neon flying squid and numerical simulation of the migration of larvae

Yoshiki Kato, Mitsuo Sakai, Takaya Namba, Toshie Wakabayashi,
Shuhei Masuda, Hiromichi Igarashi, Yoichi Ishikawa ,
Masafumi Kamachi and Toshiyuki Awaji

Neon flying squid
O. bartramii

- ☑ Distribution → North Pacific, South Pacific, North Atlantic, South Atlantic and South Indian Ocean
- ☑ Life Span → About one year
- ☑ Size → 500 - 600 mm (maximum M.L. of female in the North Pacific)

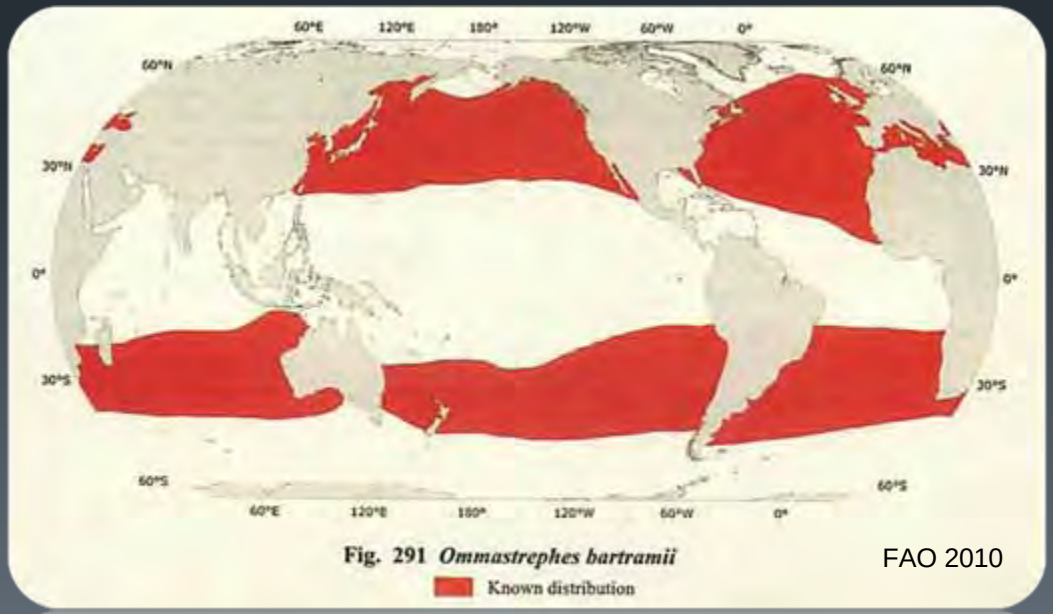

Fig. 291 *Ommastrephes bartramii*

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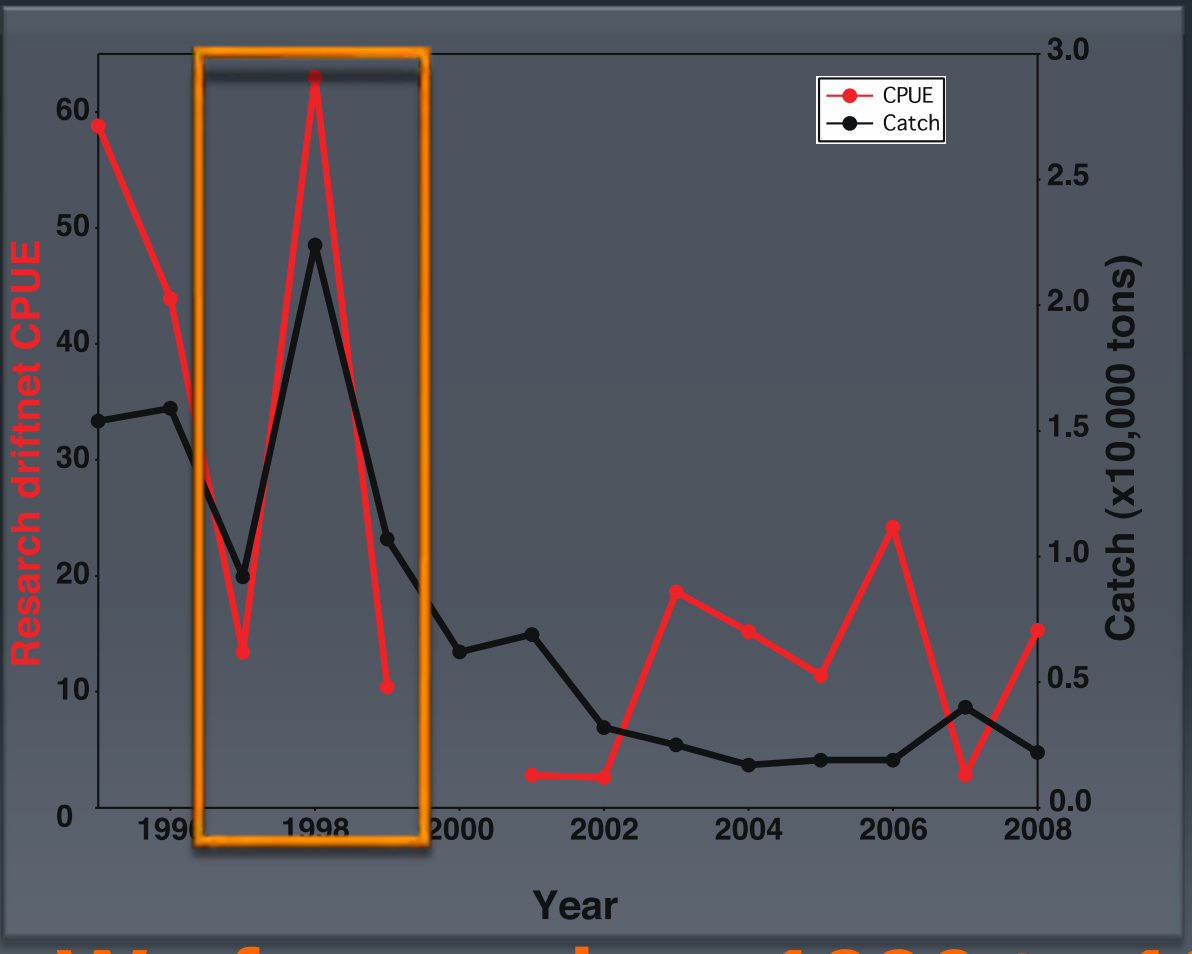
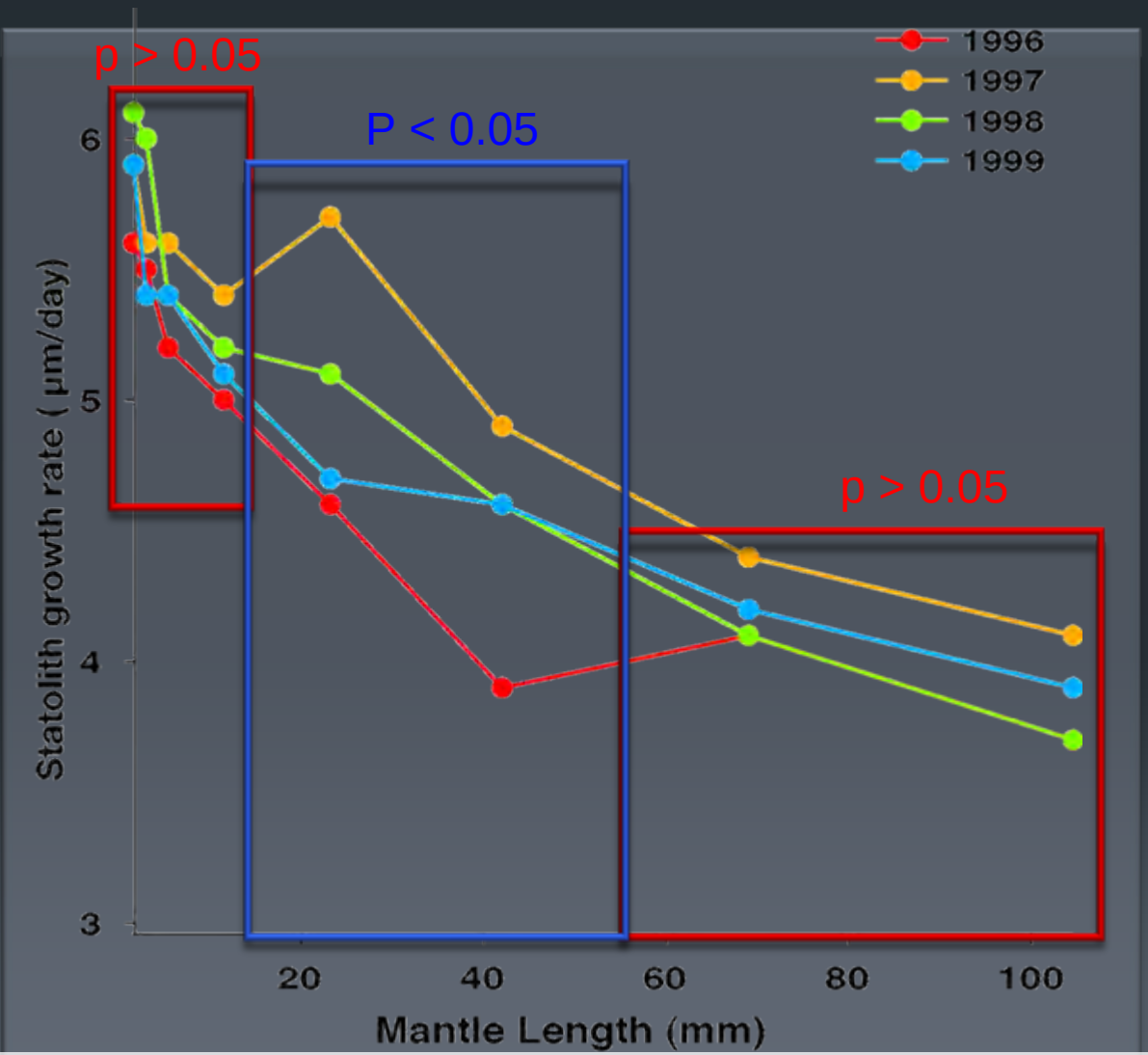
CPUE and Catch



- There were inter annual variation of CPUE and catch.
- CPUE and Catch was decreasing from 1998.
- The highest CPUE and catch was recognized at 1997 year class.

We focused on 1996 to 1999 year class.

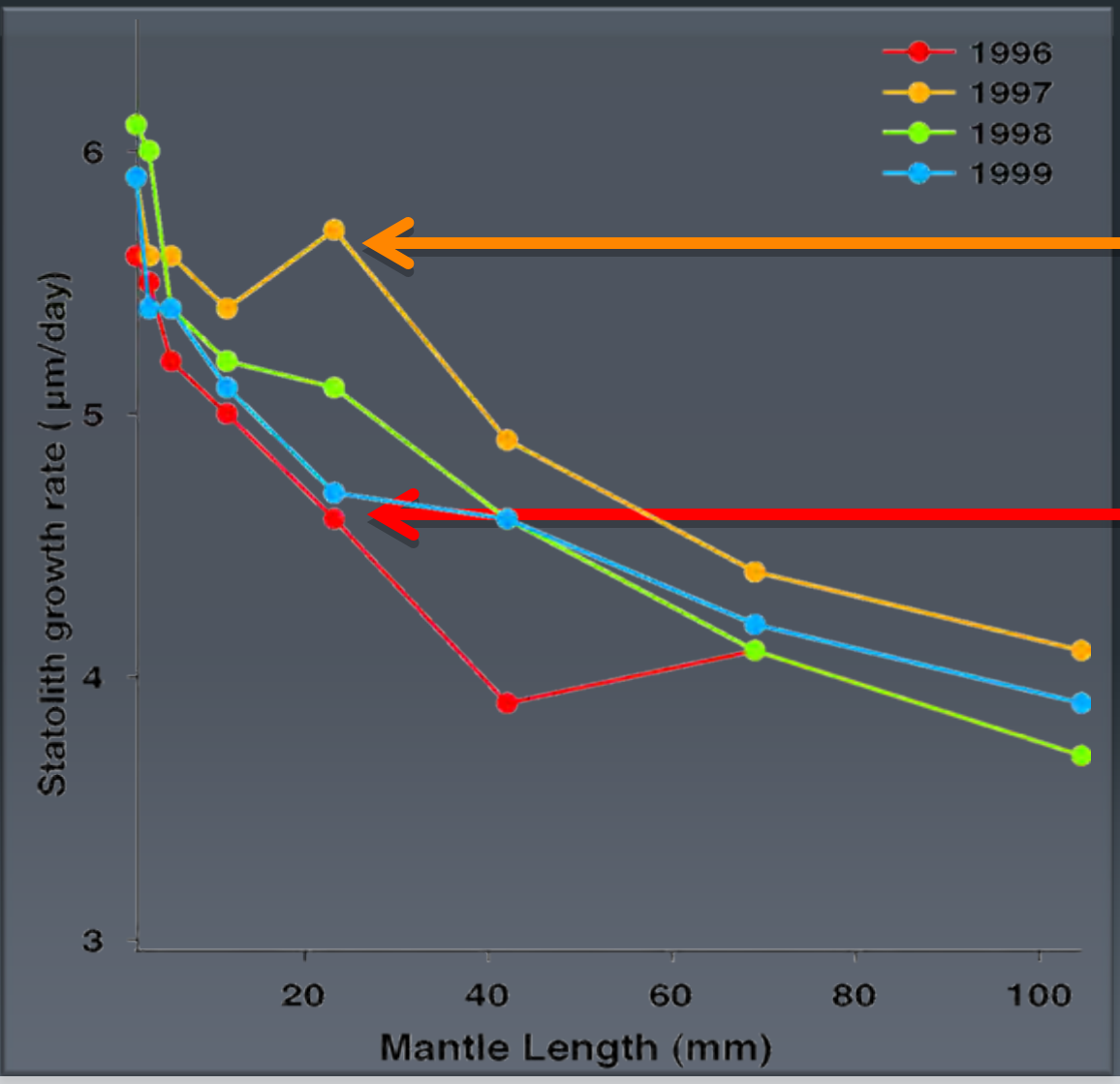
Growth rate

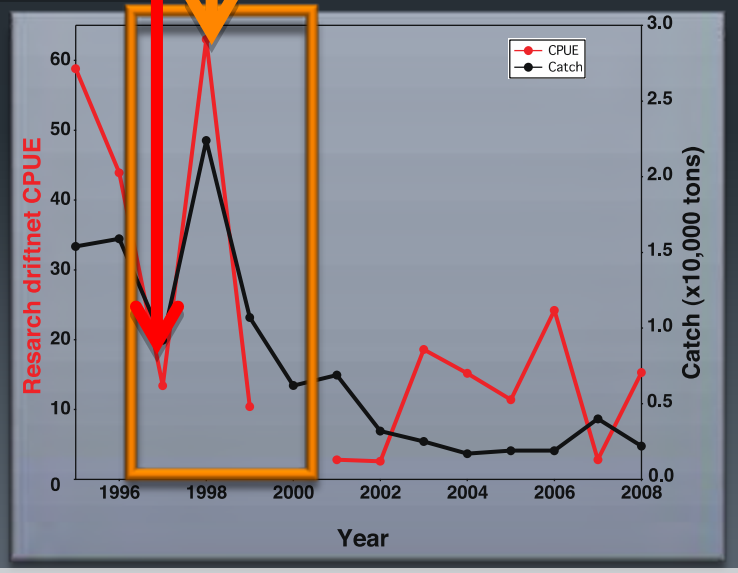


- There were no significant difference at initial period and third period.
- There were significant difference at second period.

Inter-annual variation in the growth until about 30 days

Relationship between growth rate and CPUE





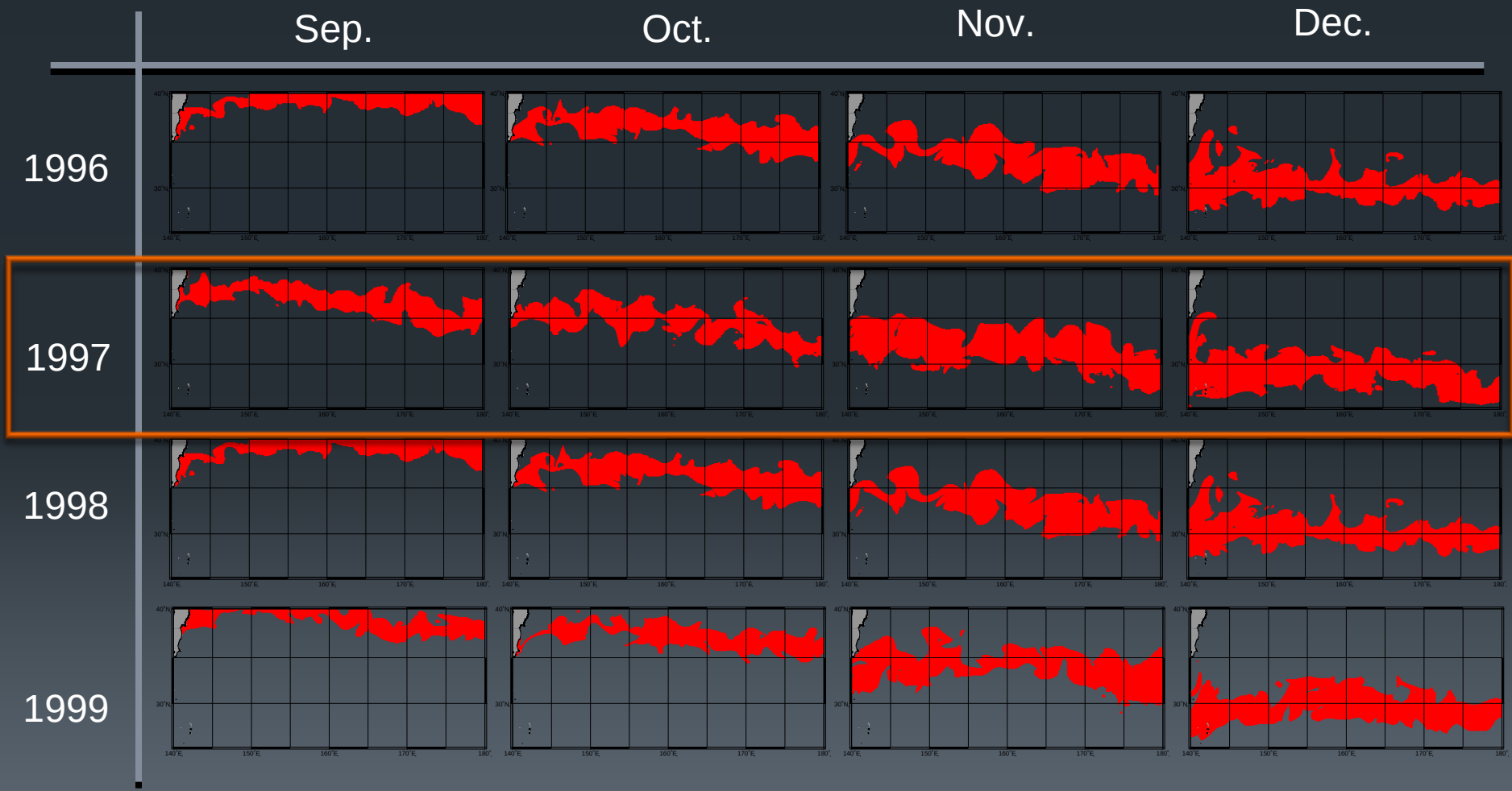
Close relationship between initial growth and CPUE

CPUE and catch have inter-annual variation.

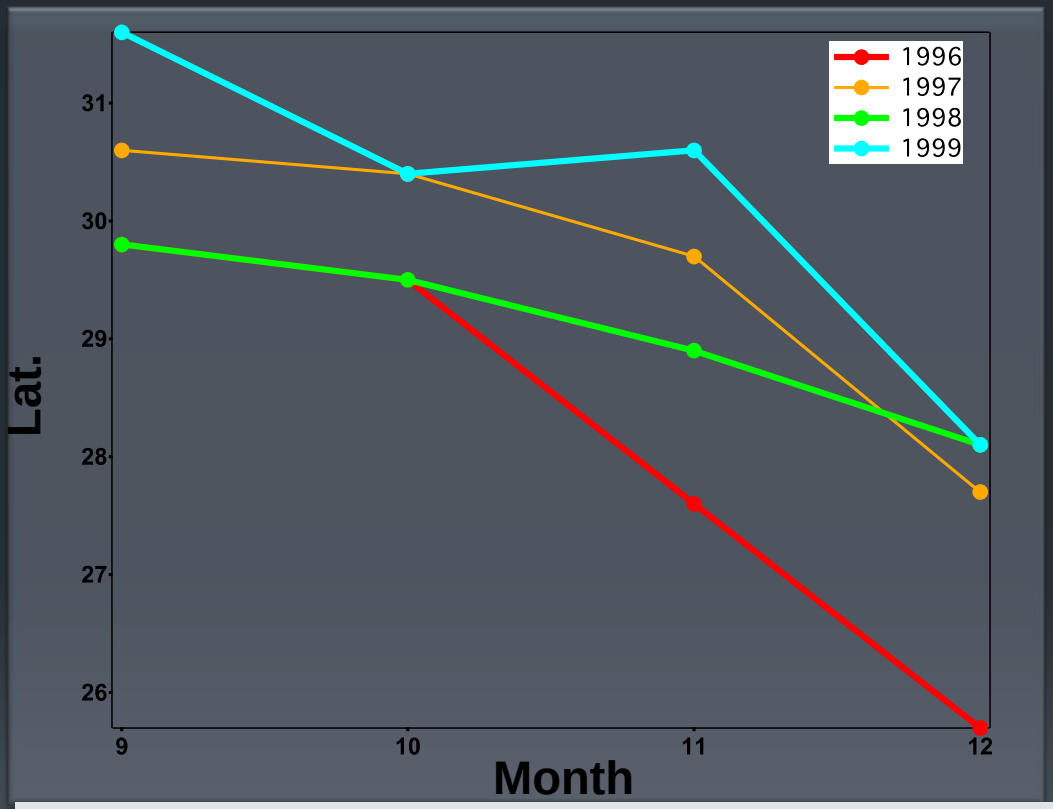
Initial growth

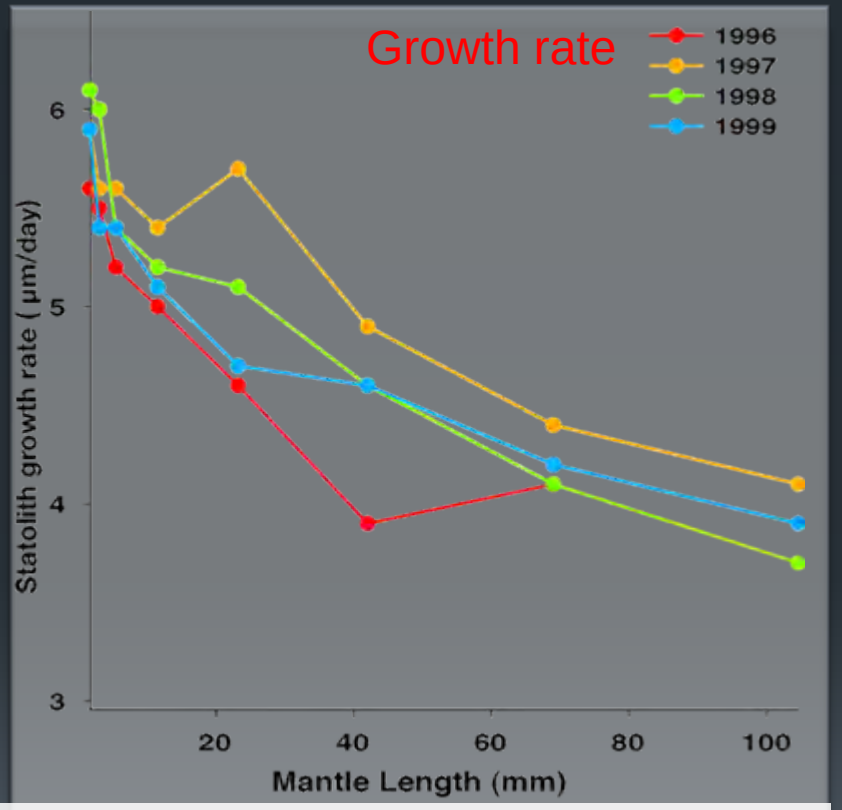
- Comparison between growth rate and the transition of optimal water temperature for hatching
- Estimation for transport and environmental temperature variability of eggs and larvae of the Neon flying squid via numerical particle-tracking experiments
- Comparison with growth rate and the trucking result

Transition of optimal water temperature for hatching



Transition of optimal water temperature for hatching





No significant relationship between location of optimum water temperature and initial growth rate.

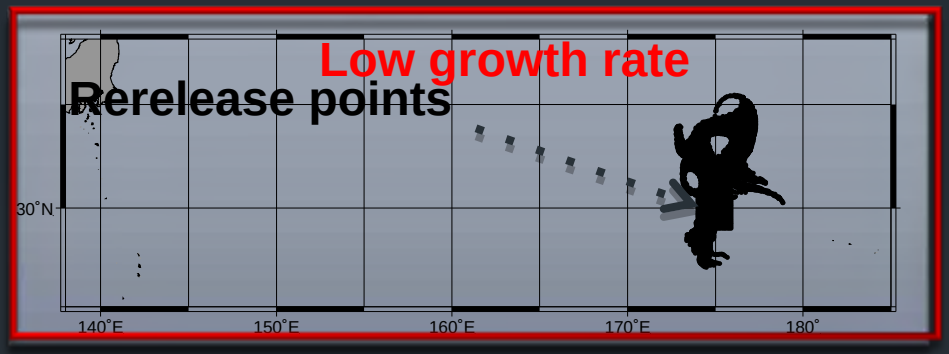
Need Larangian analysis

Numerical particle tracking model

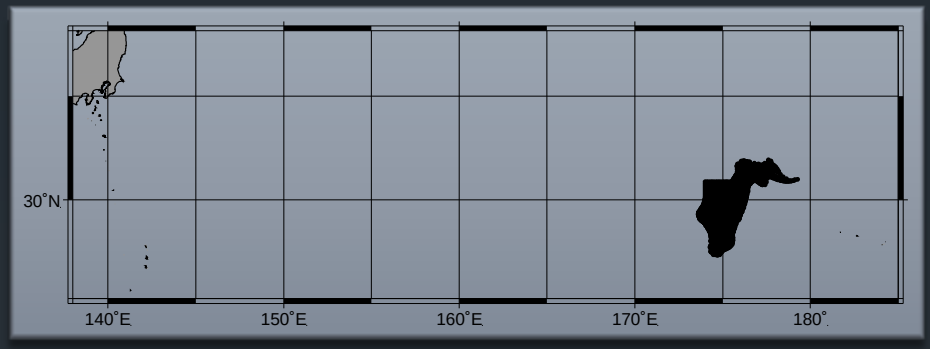
Physical environment Model	Ocean reanalysis data (MOVE·MRI.com)
Period	30 days (1996-2000)
Depth	5 m
Particle-tracking model	Horizontal advection + random walk
Horizontal diffusivity coef.	Smagorinsky scheme (1963)
Particle released date	9/1, 10/1, 11/1, 12/1
Release points	SST = 22.5 ℃ , 174-176 E Lon. (optimum water temp. for hatching)

Particle tracking simulation

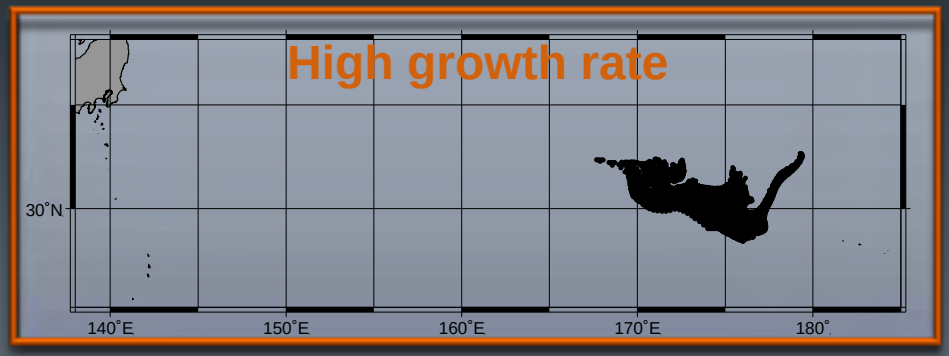
Trajectory (Nov. 1996)



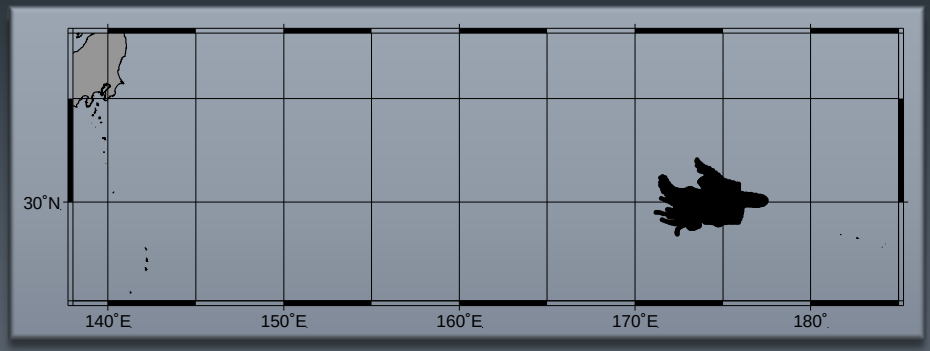
Trajectory (Nov. 1998)



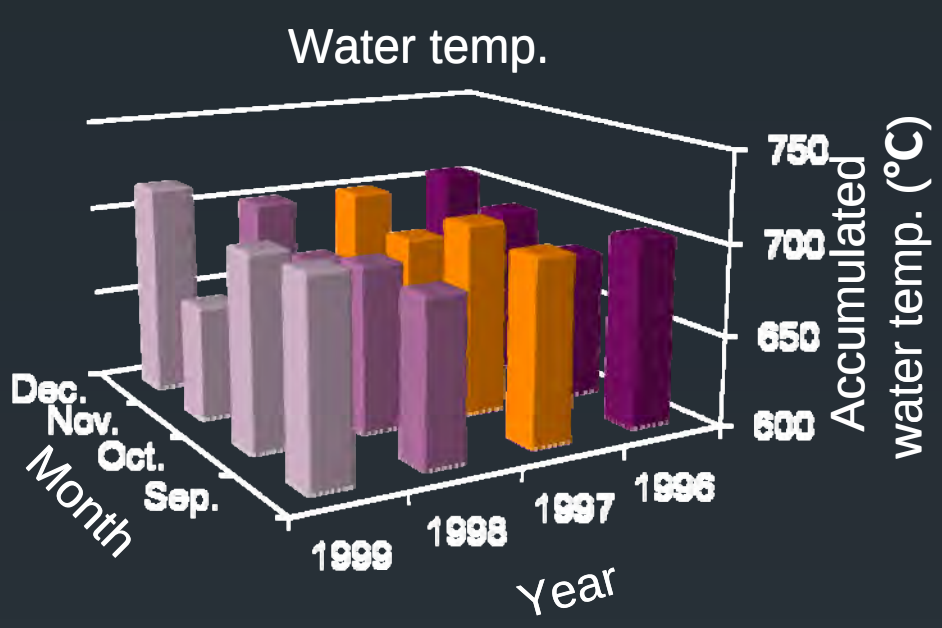
Trajectory (Nov. 1997)

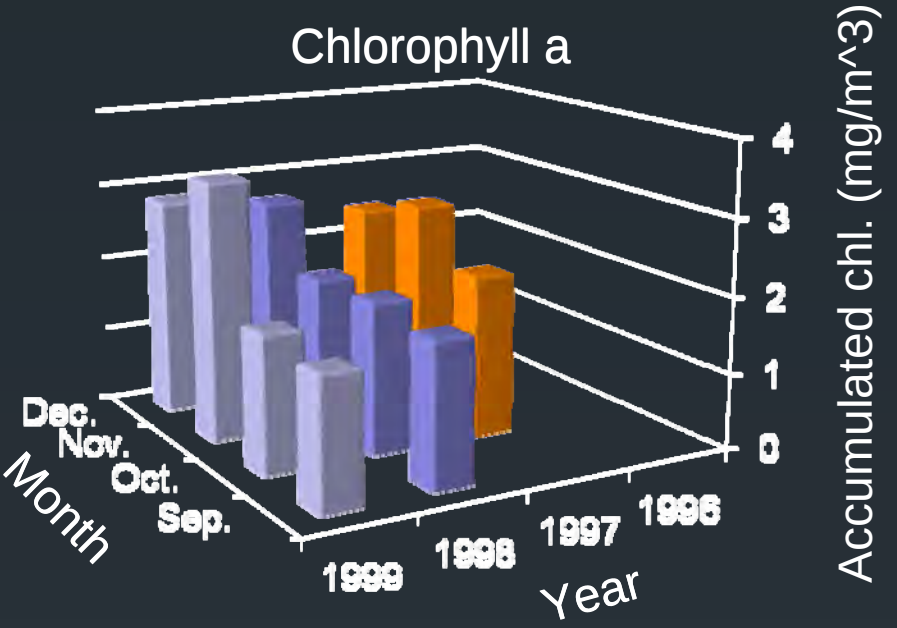


Trajectory (Nov. 1999)



Accumulated water temp. and Chl.





- No significant difference in accumulated water temp. was observed.
- In case of Chl., value of accumulated chl in Oct. 1997 and Nov. 1997 was higher than other years.

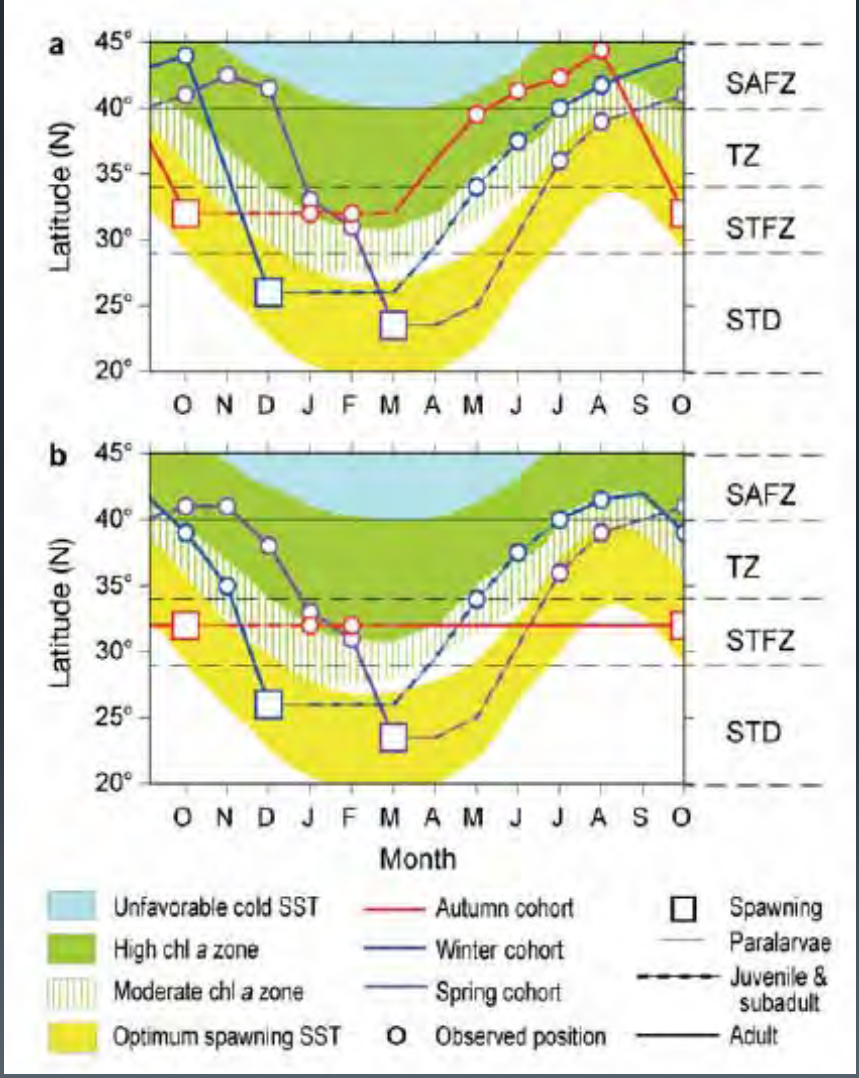
Value of accumulated chl. could play an important role of larval growth.

Summary

- Initial growth might be correlated with CPUE and catch.
- No significant relationship between location of optimum water temperature and initial growth rate.
- No significant difference in accumulated water temp. was observed in each year.
- In case of Chl., value of accumulated chl in Oct. 1997 and Nov. 1997 was higher than other years.

Value of chl during larval period could be close relationship with recruitment.

Future Study



Ichii et al. 2009

According to their stage, they use different zones ; optimum spawning zone and food rich zone.

We would like to develop IBM model coupled with squid bioenergetics to represent the geographical distribution.