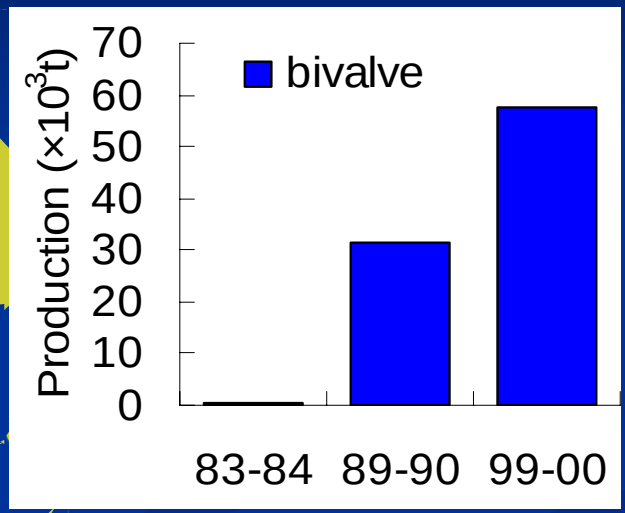
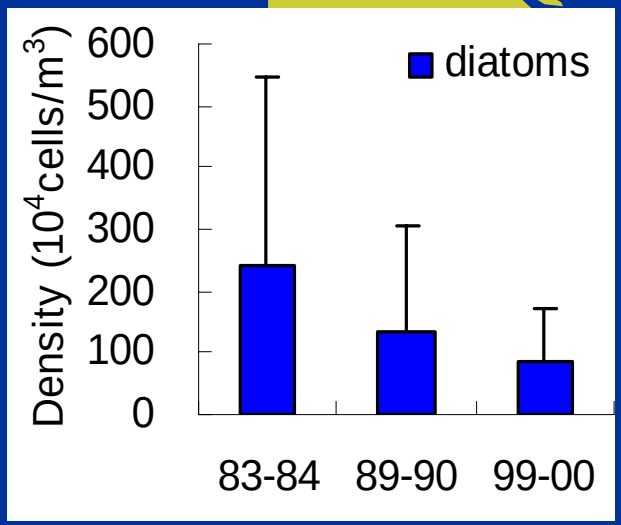
A First Exploration on Differential Impacts of Bivalve Mollusk on The Phytoplankton Groups, Diatom & Dinoflagellate

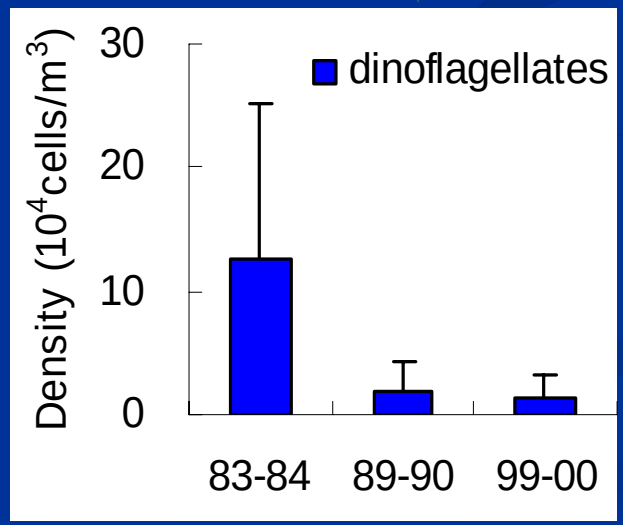
Xuelei Zhang, M.Y. Zhu, L.H. Zhang, D. Zhang

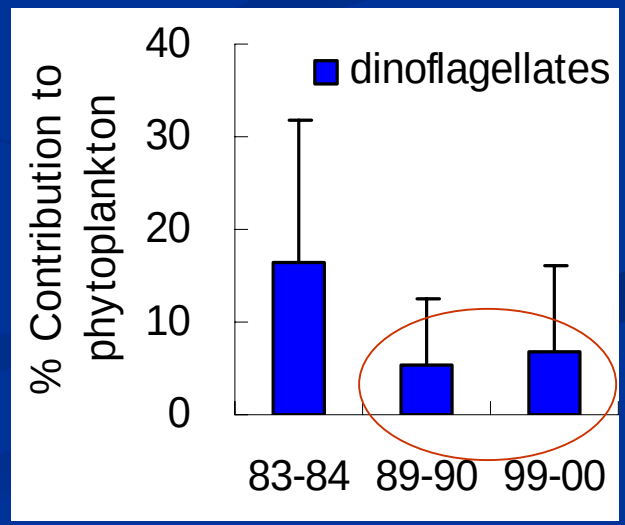
First Institute of Oceanography, SOA
E-mail: zhangxl@fio.org.cn

Bivalve production & phytoplankton abundance in Sanggou Bay, China



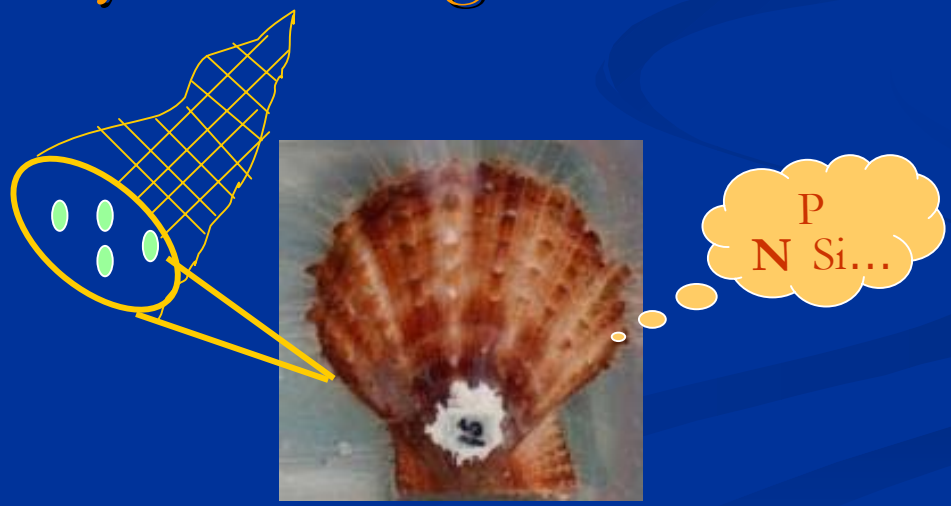


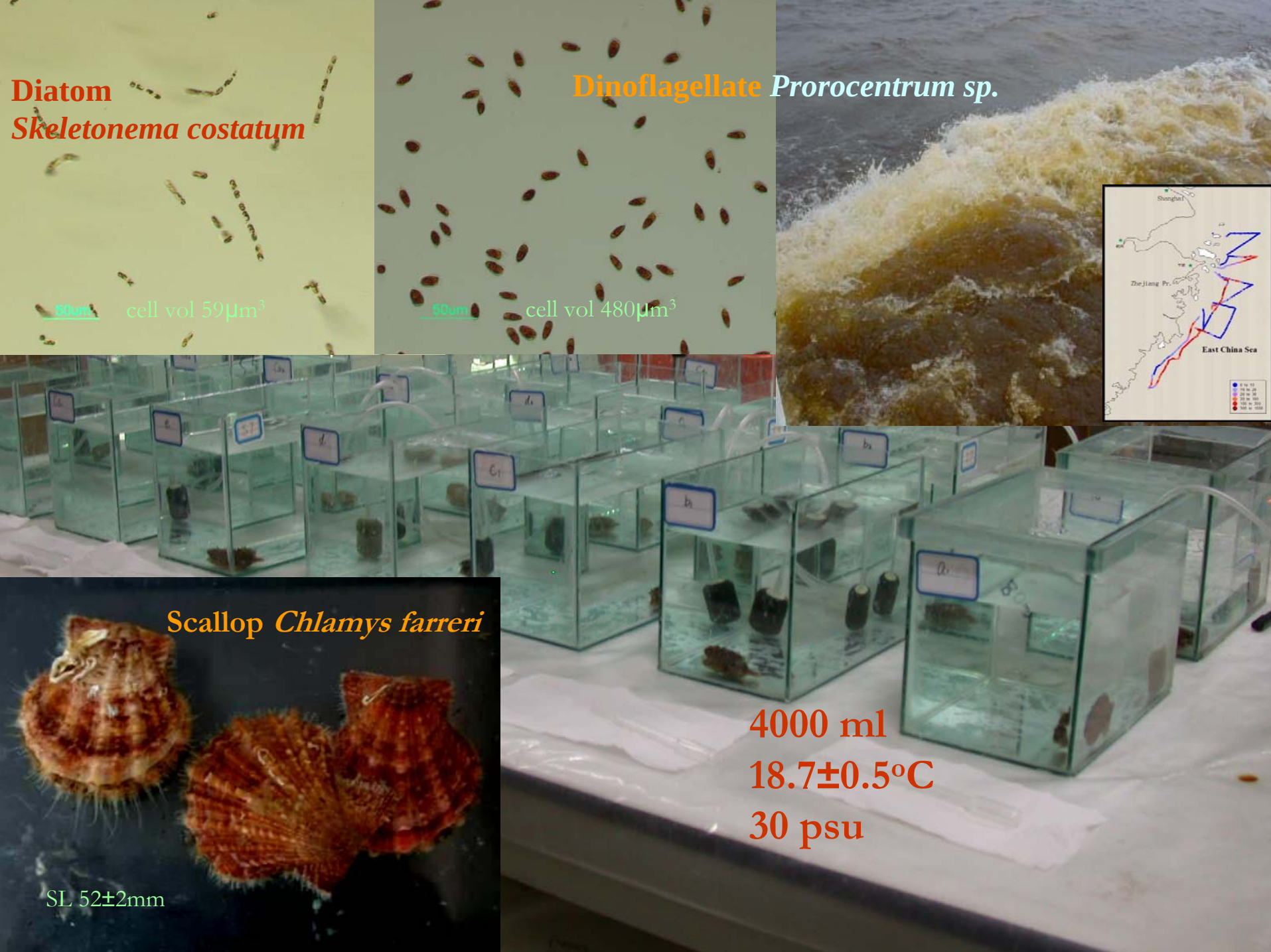




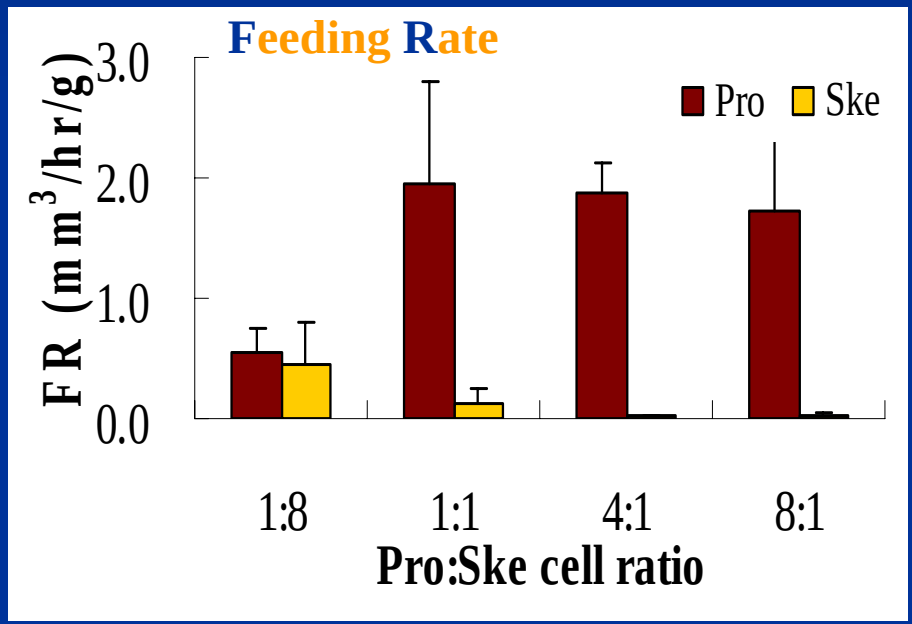
Hypothesis

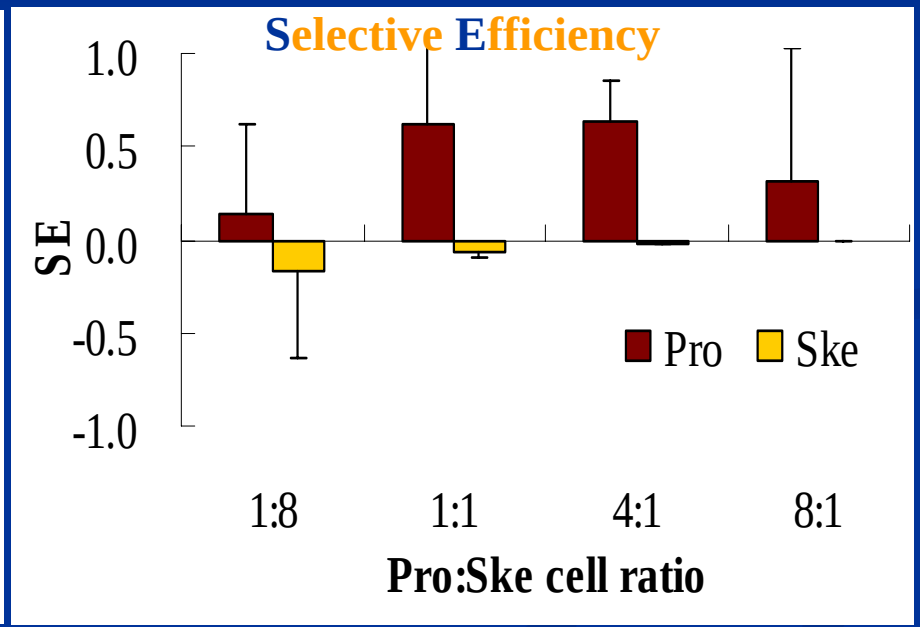
- Do the bivalves preferentially feed on dinoflagellate cells?
- Do the bivalve-regenerated nutrients selectively enhance growth of dinoflagellate cells?



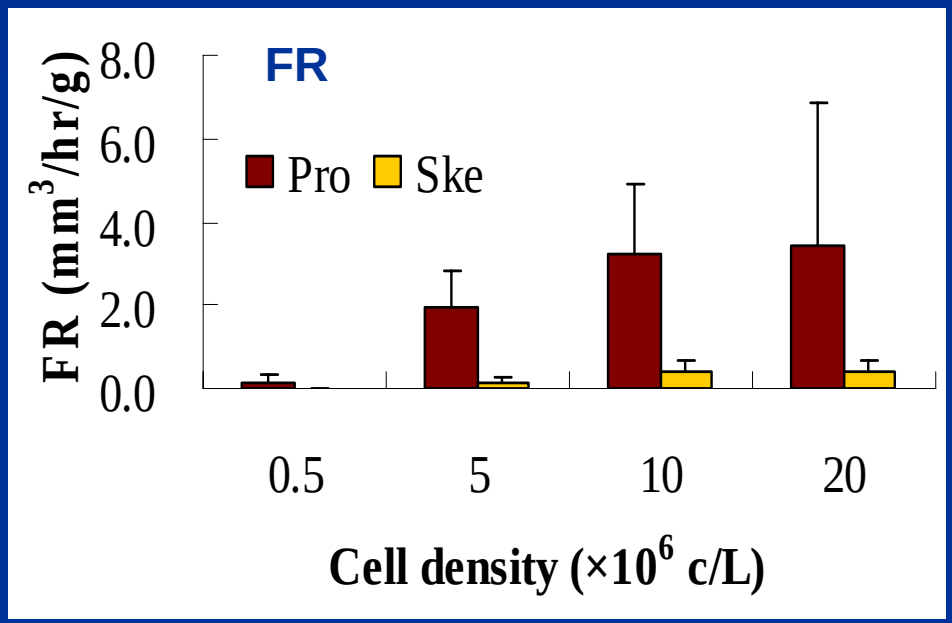

Diatom
Skeletonema costatum
cell vol 59μm³
Dinoflagellate Prorocentrum sp.
cell vol 480μm³
East China Sea
Scallop Chlamys farreri
SL 52±2mm
4000 ml
18.7±0.5°C
30 psu

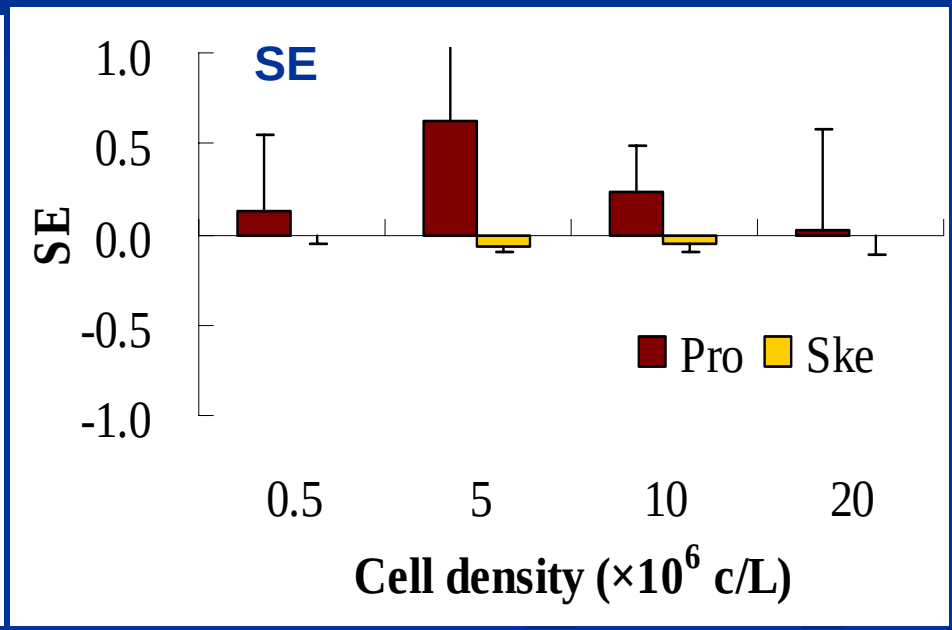
Scallop's selective feeding on mixed algae
I. Varying Ske:Pro cell ratio at cell density of 5.0×10^6 c/L





Scallop's selective feeding on mixed algae
II. Varying cell density at Ske:Pro cell ratio of 1:1

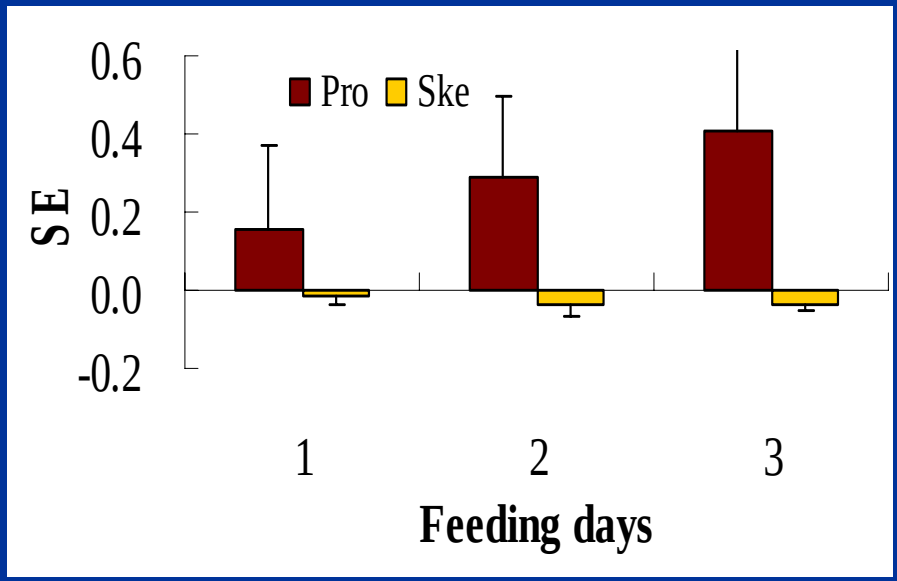




Sustaining of scallop's feeding selection efficiency

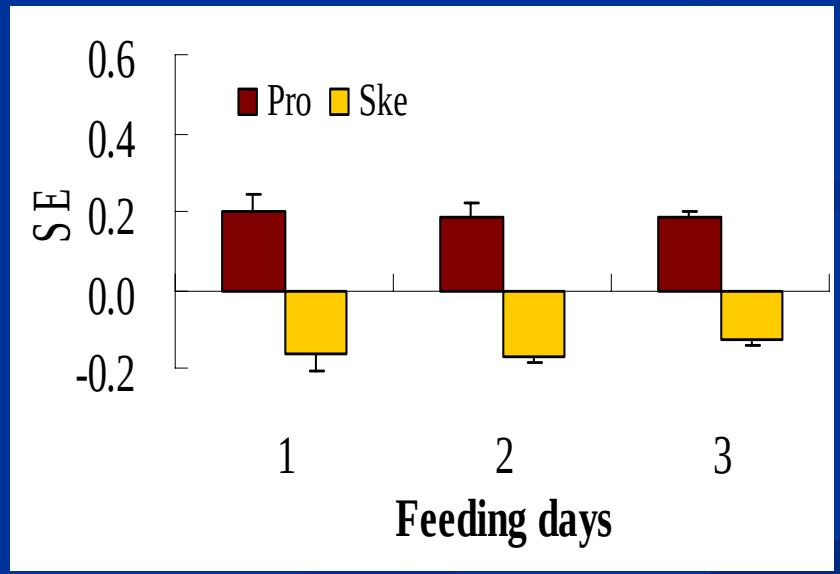
Pro:Ske cell ratio 1:1

cell density 5.0×10^6 c/L

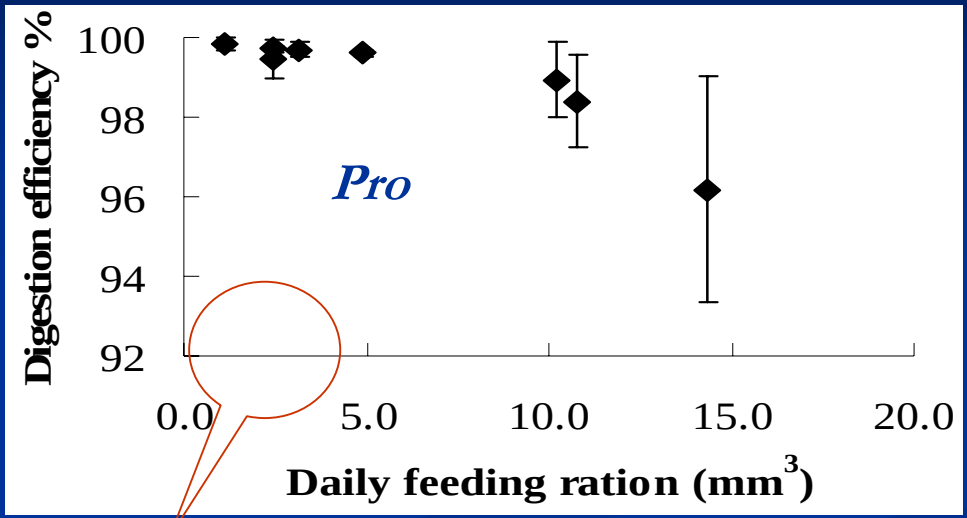


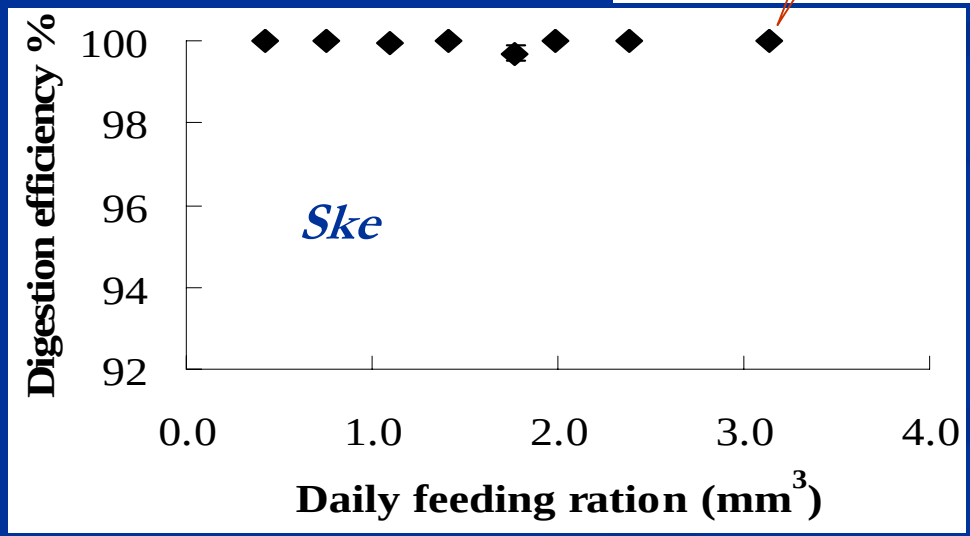
Pro:Ske cell ratio 1:8

cell density 5.0×10^6 c/L



Digestion efficiency by the scallop



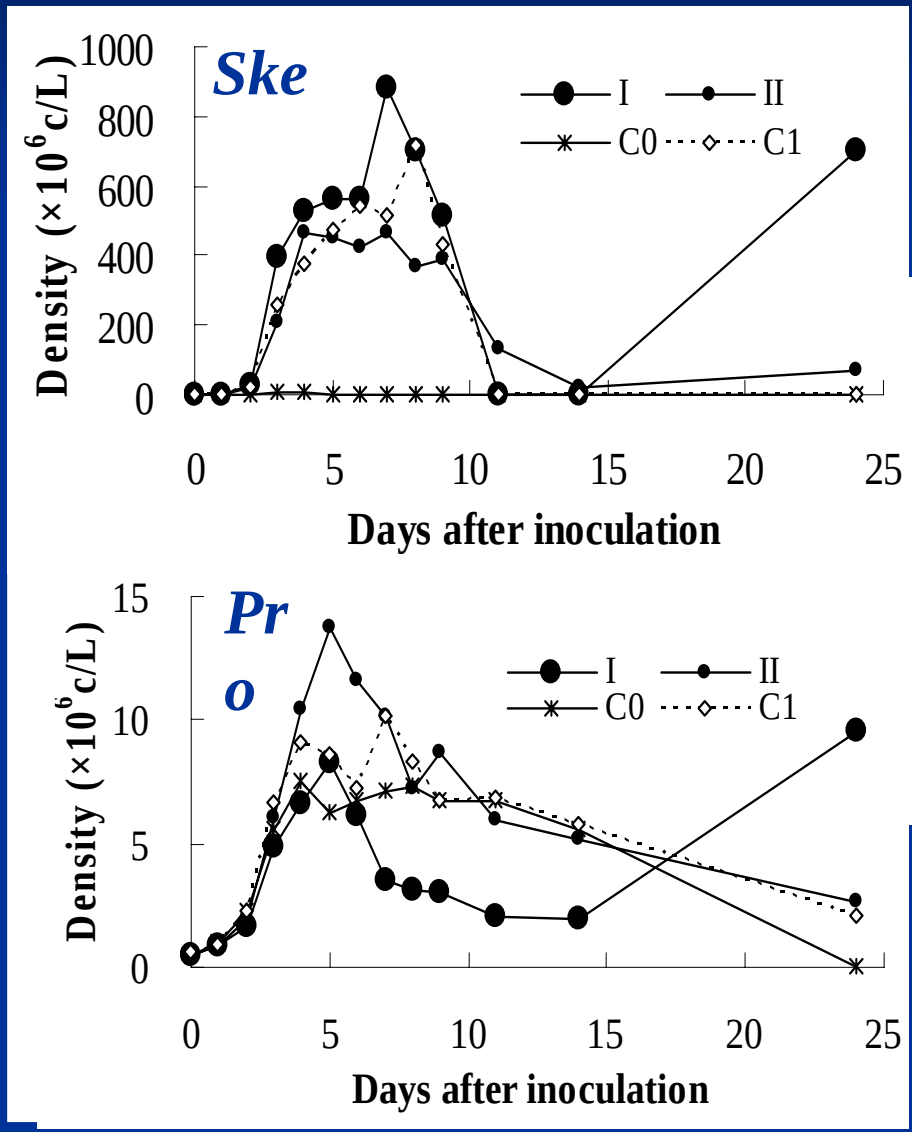


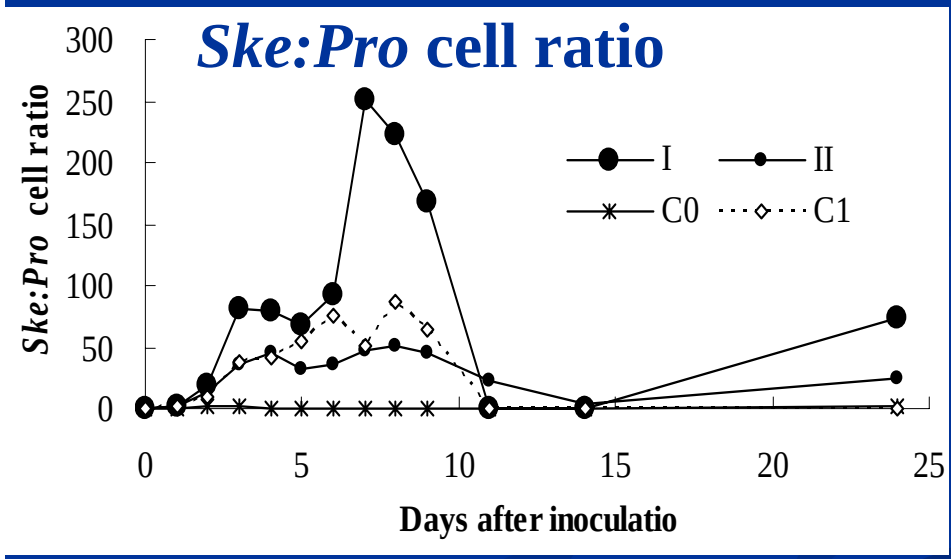
Effect of scallop excretion on growth of *Pro* & *Ske*
I. Experimental coding

Code	**SLS:NSW *** vol : vol	**Inoculation** ***Ske:Pro*** **cell ratio**	**Light** Lx
	1:0	**1:1**	**3000 4000**
	1:1	**1:1**	
C0	**0:1** (without algal incubation liquid)	**1:1**	
C1	**0:1** (with algal incubation liquid)	**1:1**	

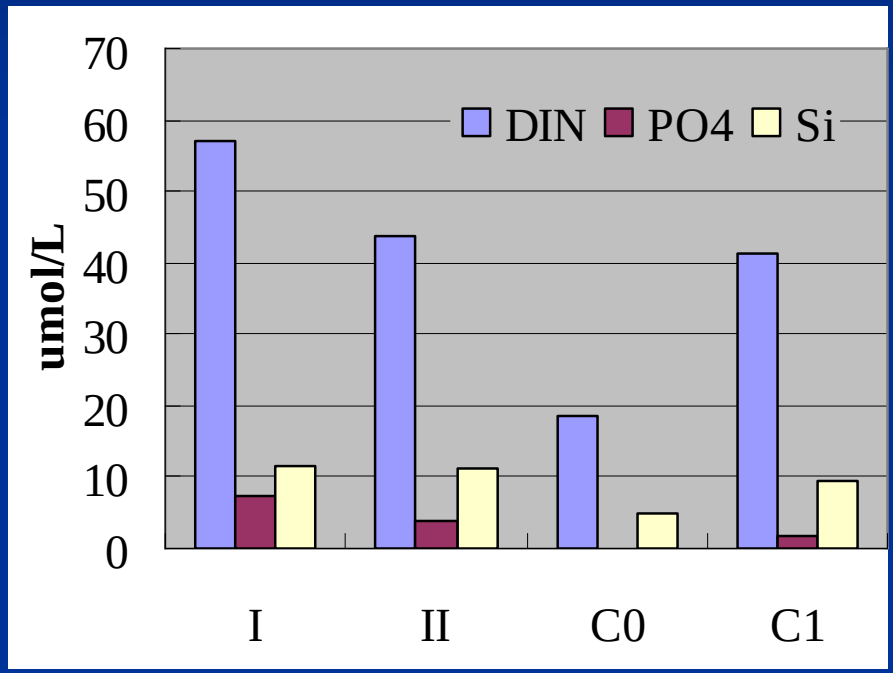
* SLS: natural seawater where scallop (1 ind./4L) fed mixed algae for 3 days;
NSW: natural seawater; all seawaters for algal incubation were 0.45um filtered.

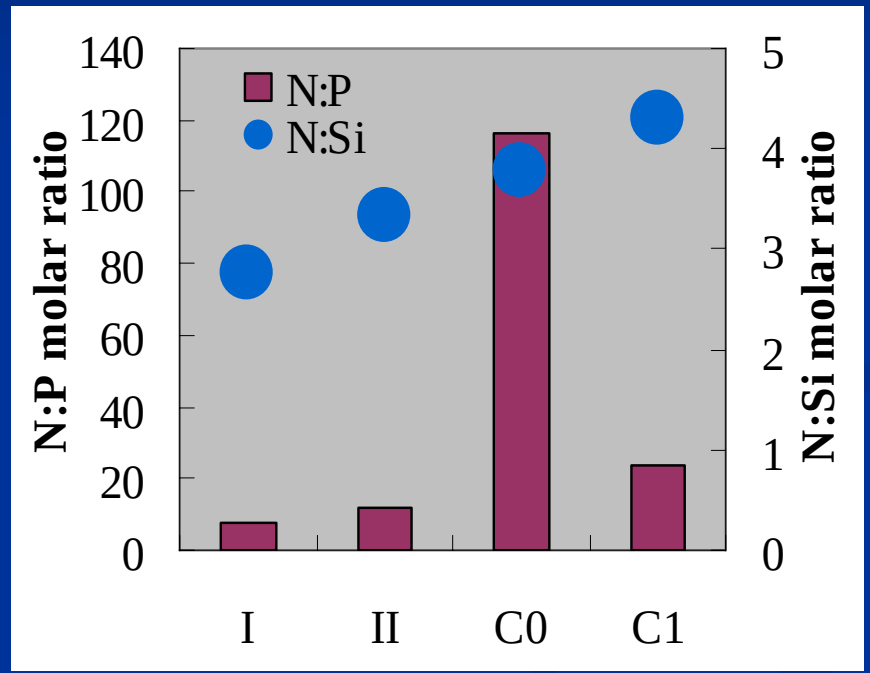
Effect of scallop excretion on growth of *Pro* & *Ske*
II. Experimental results





Effect of scallop excretion on growth of *Pro* & *Ske*
III. Nutrient Analysis





Summary

- Experiments indicated that the scallop fed off *Chlamys farreri Prorocentrum* sp. (dinoflagellate) more efficiently than *Skeletonema costatum* (diatom), regardless of the changes of algal density (0.5-20×10^6 c/L) and contribution to the algal mixture (*Pro*:*Ske* cell ratio 1:8 - 8:1);
- Digestion efficiency for the ingested algal cells was high (>99%) and was similar for both algal species at a feeding ration up to 5 mm^3 d^{-1} $ind.^{-1}$, but decreased slightly (to 96%) at a ratio up to 15 mm^3 d^{-1} $ind.^{-1}$;
- Conc. of nutrients (N, P & Si) in scallop-lived seawater (SLS) were higher than those in natural seawater. When inoculated together in SLS, *S. costatum* out competed *Prorocentrum* sp. both in growth rate & quantity.
- These results indicate that the scallop *C. farreri* preferentially feeds on *Prorocentrum* sp. compared to *S. costatum*, and reduces the competitive capacity of *Prorocentrum* sp. in scallop-dwelled seawater. These effects may contribute to the preferential control by cultured bivalve molluscs on dinoflagellate biomass in the field.

Thanks for your attention