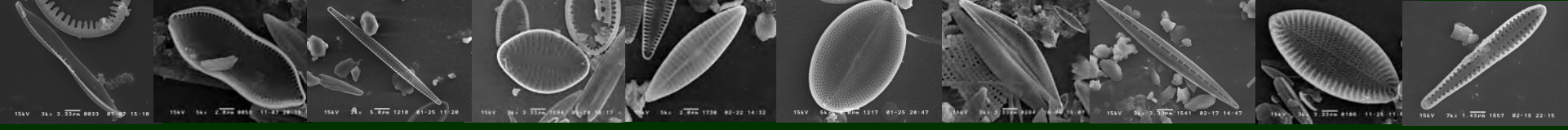
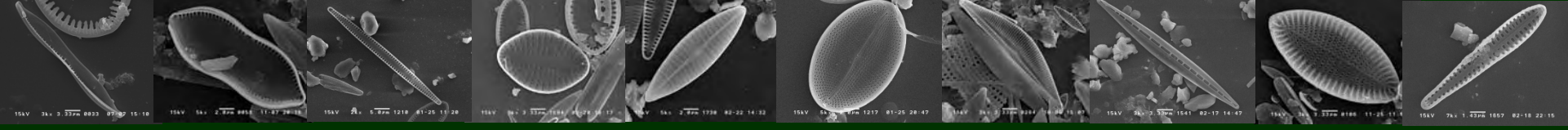


Variation of the epiphytic community and biomass on *Zostera marina*

2009. 10. 30

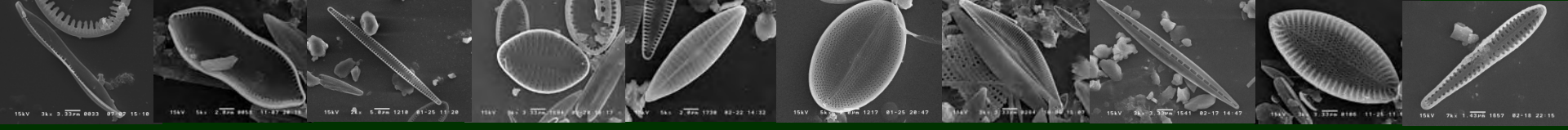
Mi Hee Chung, Won Duk Yoon

National Fisheries Research and Development Institute



Introduction

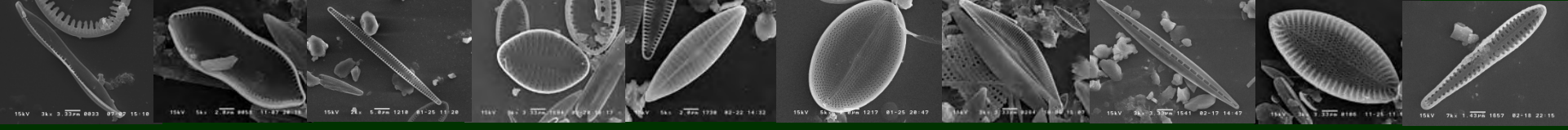
- **Kind of attaching organisms**
  - **Epilithic organisms, Episammic organisms, Epizoic... etc.**
- **Epiphytes ?**
  - **Organisms on plant leaf surface**
- **Composition of epiphytic algae**
  - **red, green, brown algae, diatoms, etc. (Sullivan, 1970; Thursby and Davis, 1984)**
- **Research trends of Epiphytic algae**
  - **functional aspects, pollution, etc.**



Introduction

- **Importance of epiphytic algae**
  - Primary producer
  - Formation of complex food web
  - Creating micro environment
  - Maintaining higher biological diversity
  - Affecting on host plant

- **Importance of epiphytic diatom**
  - Secondary attaching organism (“pioneer organism”)
  - Primary producer
  - Sensitive to environmental change
  - Biological diversity
  - Basic organism of food web



Objectives

- Relationships between epiphytes and environmental change
- Relationships between epiphytic algae and *Z. marina*
- Biomass of epiphytic diatoms and succession of dominant species

Materials and Methods

- **Sampling site**

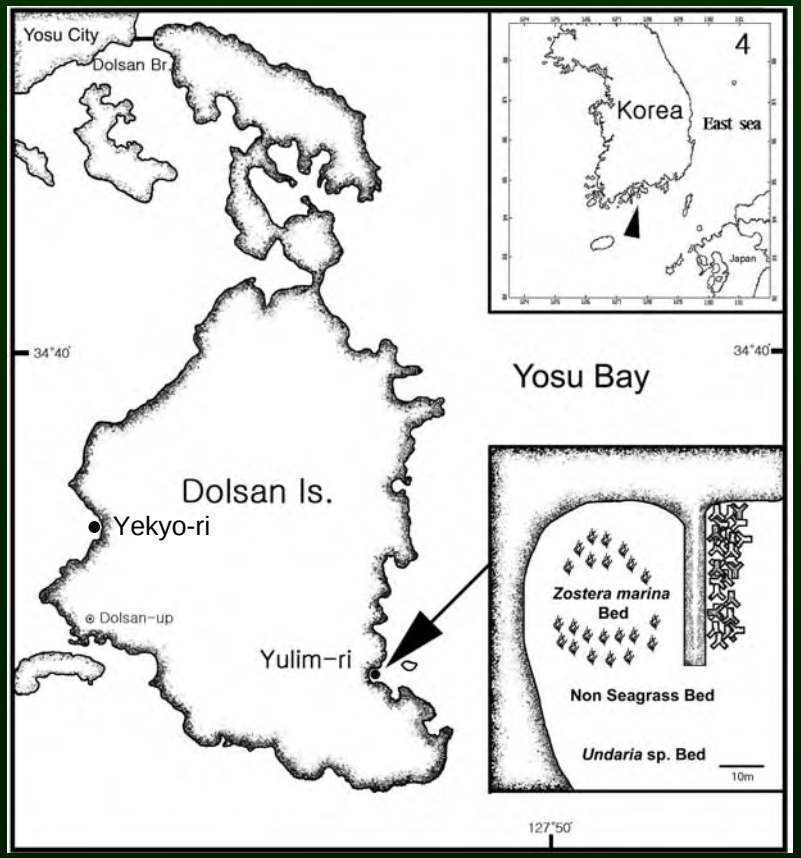
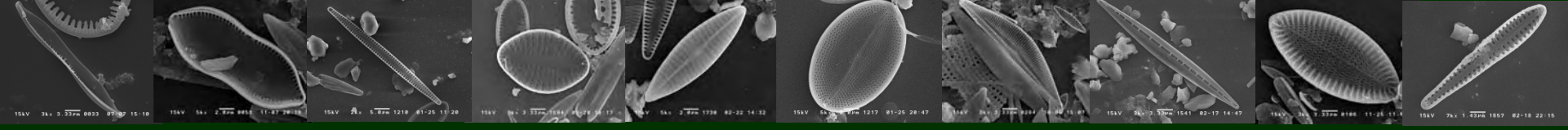


Fig. 1. The map of sampling site



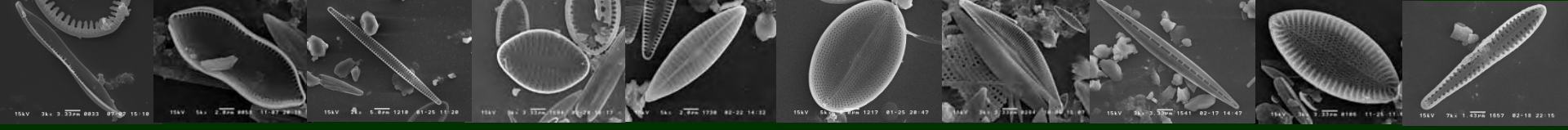
Materials and Methods

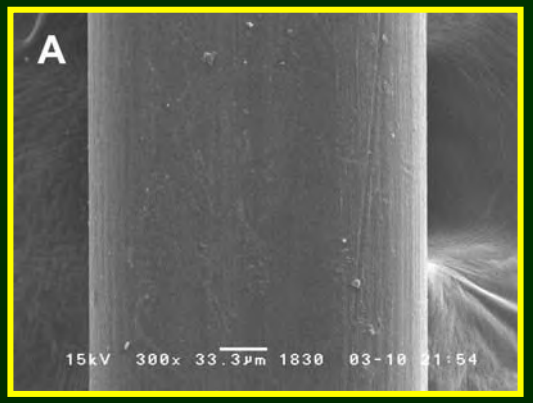
- **Epiphytic diatoms observation on seagrass leaf surface**

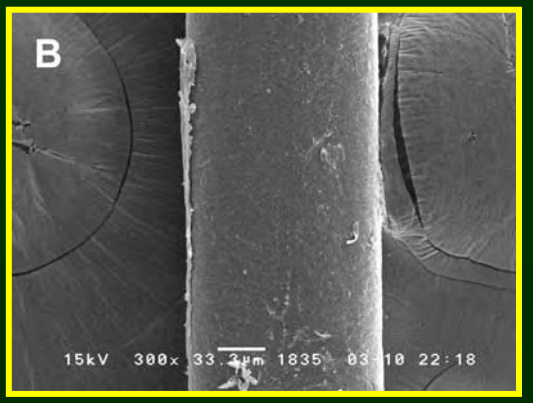
  - Observation of attaching structure and method
  treatment : diluted phosphate solution (5%)

  - Observation of spatial attaching biomass
  treatment : distilled water

- **Removal method for epiphytes**
  - Physical treatment : brush and rubber knife







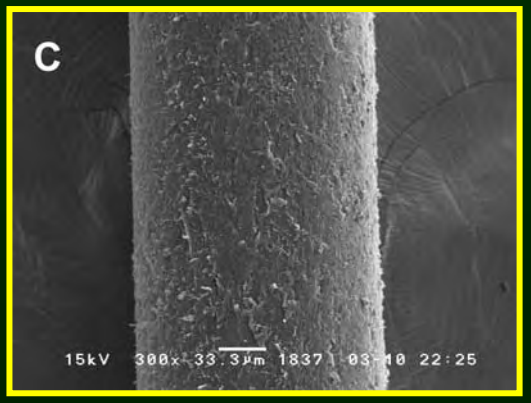
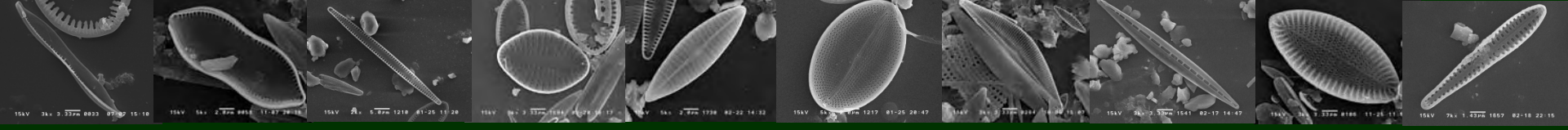


Fig. 2. Hand made remover of epiphytes from seagrass and comparison of brush surfaces used in the experiment

A. A surface structure of brush used.

B. A surface of commercial art brush.

C. A surface of commercial tooth brush.



➢Biomass mesurements (APPA, 1995)

- *Z. marina* : leaf length, area
- epiphytes : dry weight, ash free dry weight
- epiphytic algae : Chl.*a*

$$ug\ \text{Chl.}a\ cm^{-2} = \frac{Ca \times \text{volume of extract } (ml)}{\text{area of substrate } (cm^2)}$$

Ca : measured Chl.*a*

➢AI (Autotrophic Index) (APPA-AWWA-WEF, 1995)

$$AI = \frac{\text{Ash free dry weight}}{\text{Chl. } a}$$

➢Physico-chemical factors

- Strickland and Parsons (1972)

* APPA-AWWA-WEF, 1995: Standard method for the examination of water & wastewater

➢Epiphytic diatoms observation (modified after Snoijs, 1994)

Cleaning with H_2O_2

↓

Rinsing with distilled water

↓

50ml suspension

↓

0.2 ml dropped on coverglass (5 subsamples)

↓

Measurement of dropping area on coverglass

↓

Counting diatom frustules in SEM (X1000)
2 areas per subsamples randomly

↓

Conversion of dropping area

Results

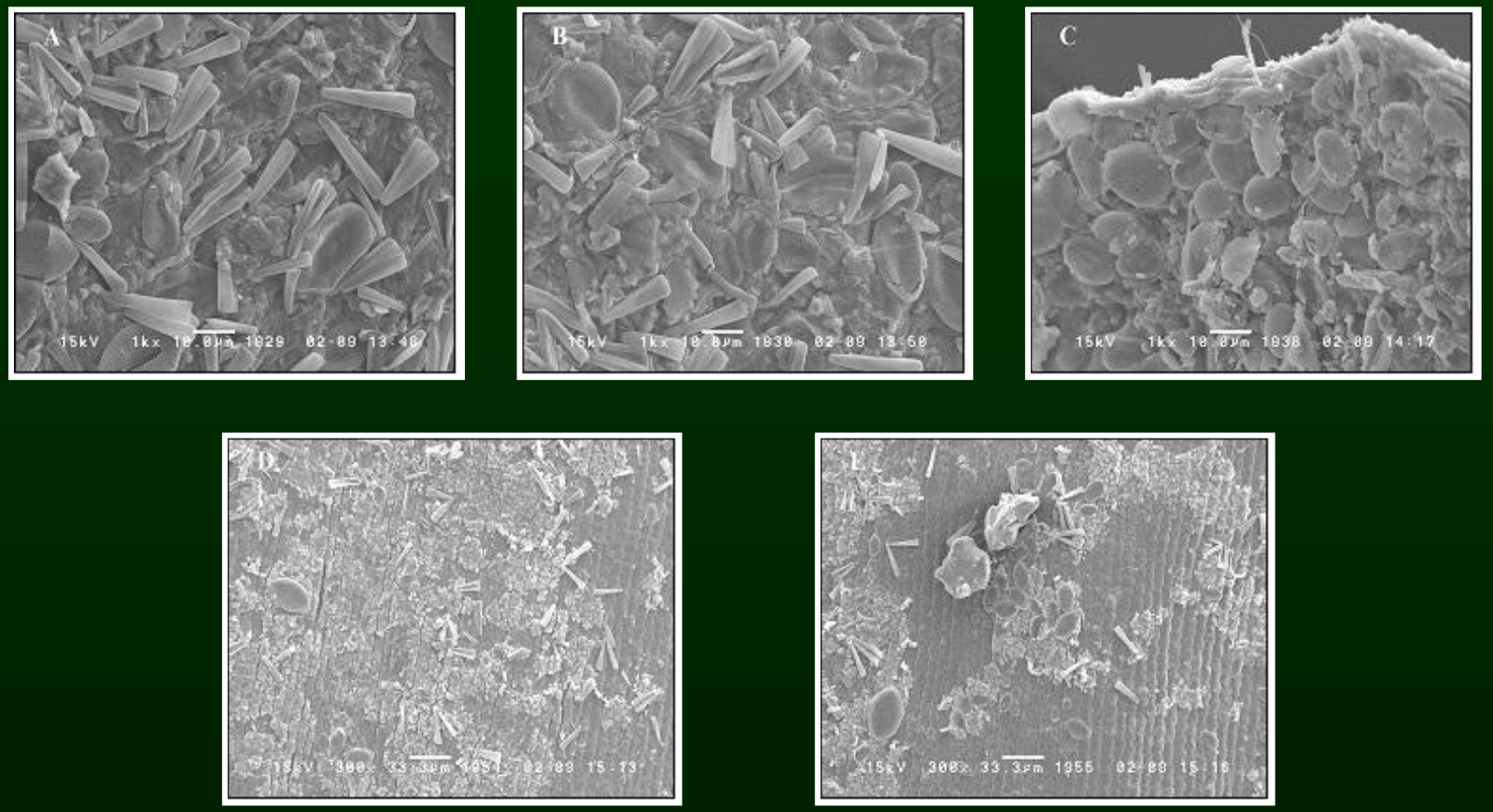
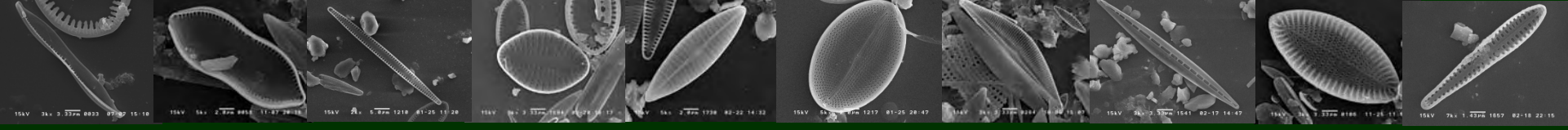


Fig. 3. Epiphytic diatoms on leaf end (A, B, C) and leaf middle (D, E). Epiphytic diatoms are composed naviculoid diatoms (A, B, D) and cocconical diatoms (C, E)



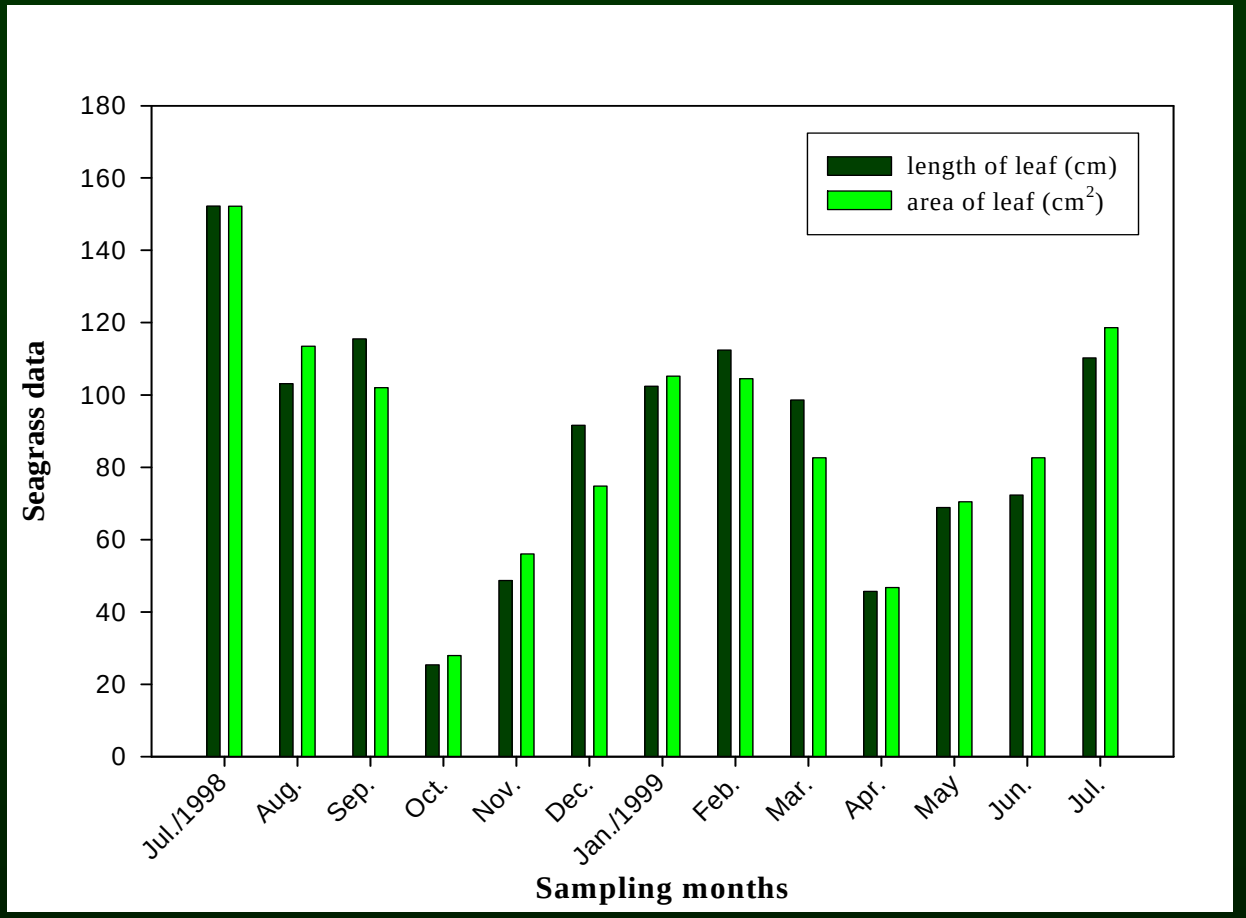
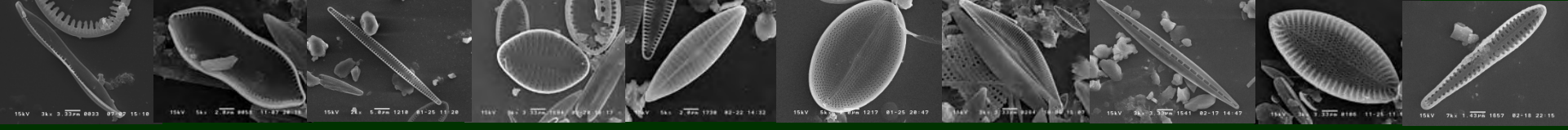
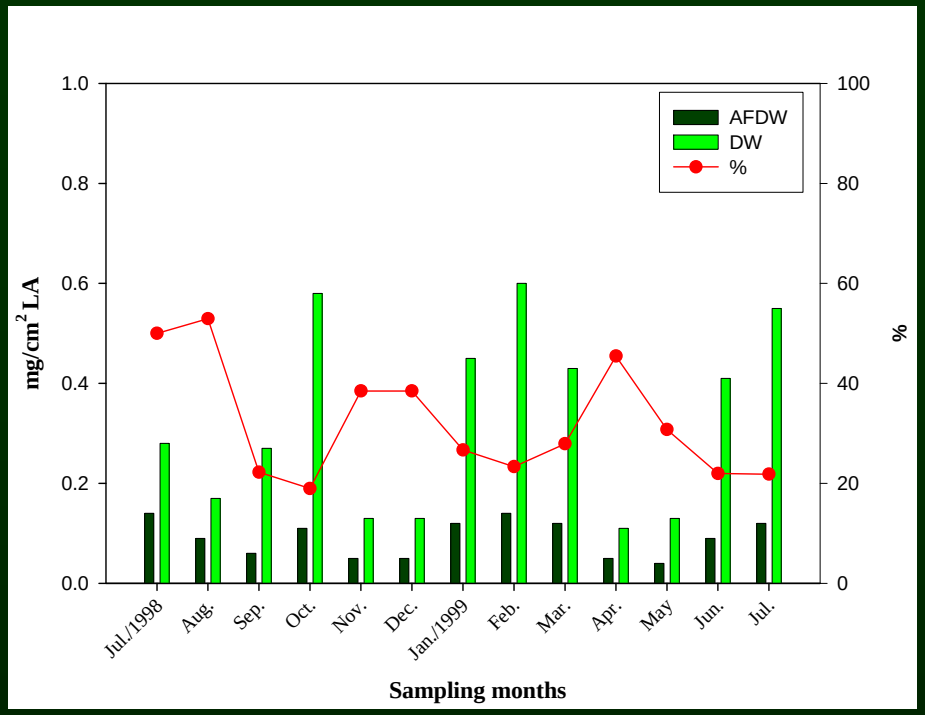


Fig. 4. Seasonal variation of leaf area and length of eelgrass (*Z. marina*) in Yulim from July, 1998 to July, 1999.





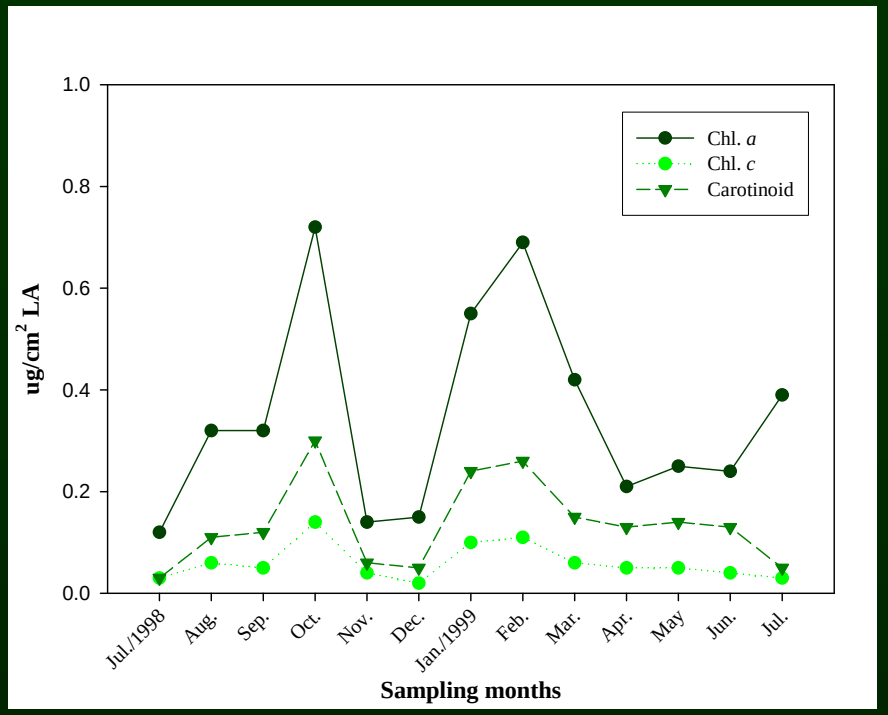
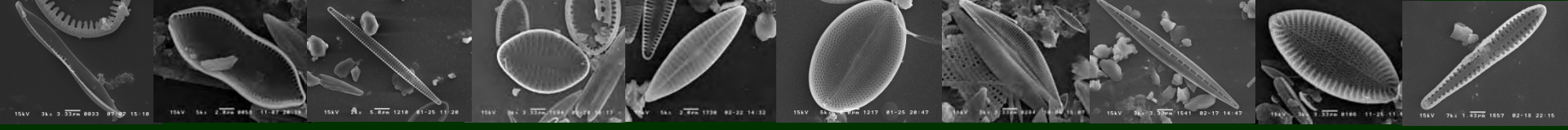
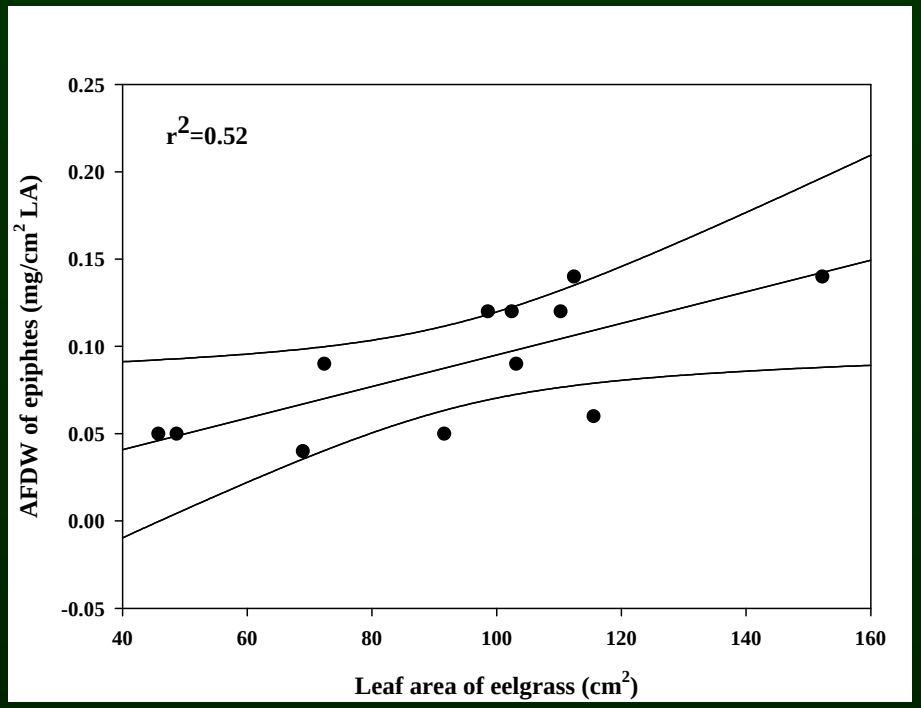


Fig. 5 . Seasonal variations of epiphytes biomass in Yulim from July, 1998 to July, 1999.

A : Ash free dry weight and dry weight of epiphytes and percent of ash free dry weight on dry weight.

B : Chl. *a*, Chl. *c* and carotinoid of epiphytic algae on seagrass leaf surface.





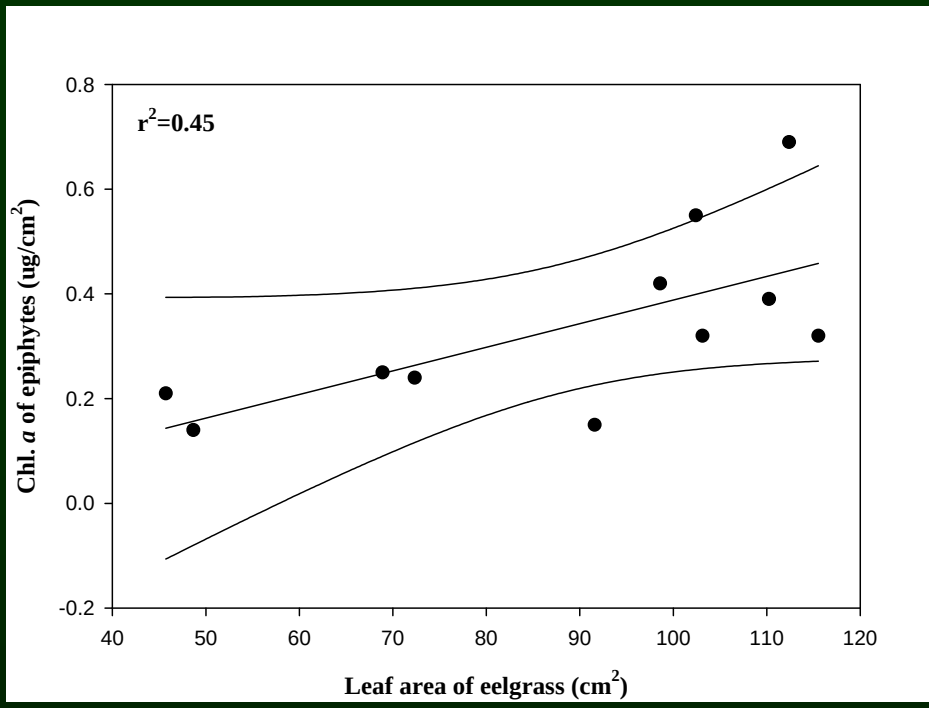
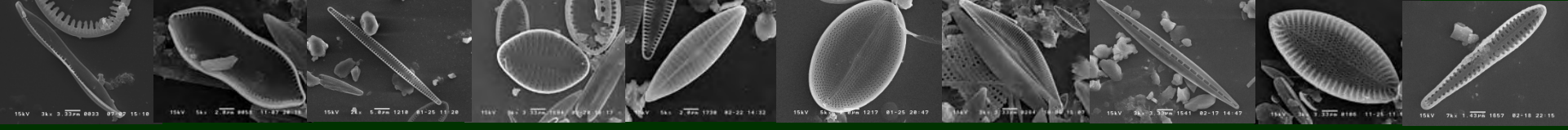
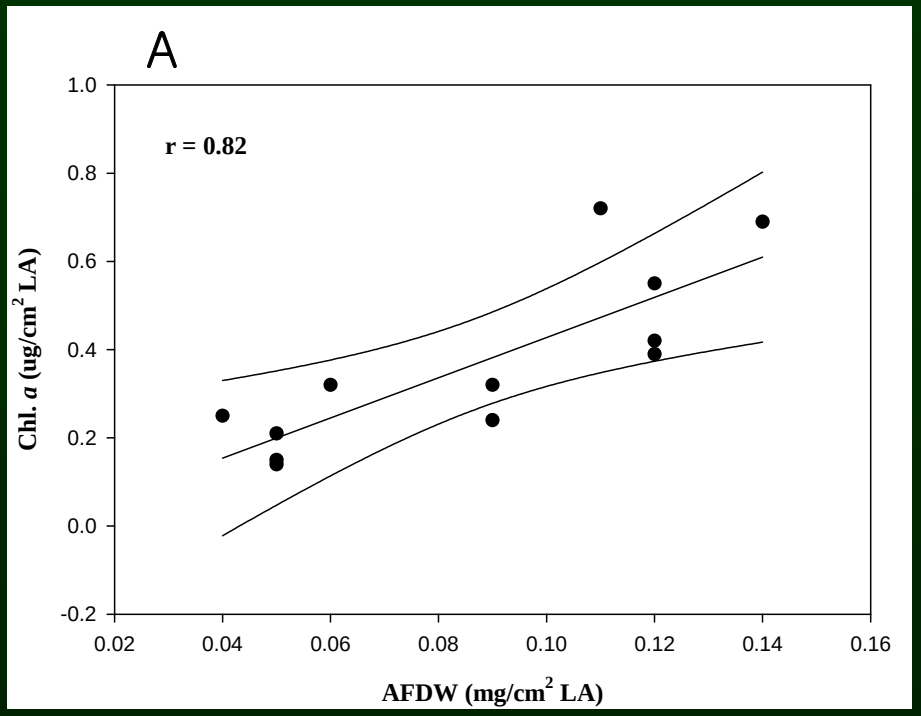


Fig. 6. Relationship between epiphytes and eelgrass.

A : AFDW of epiphytes and leaf area of *Z. marina.*

B : Chl. *a* of epiphytic algae and leaf area of *Z. marina*.





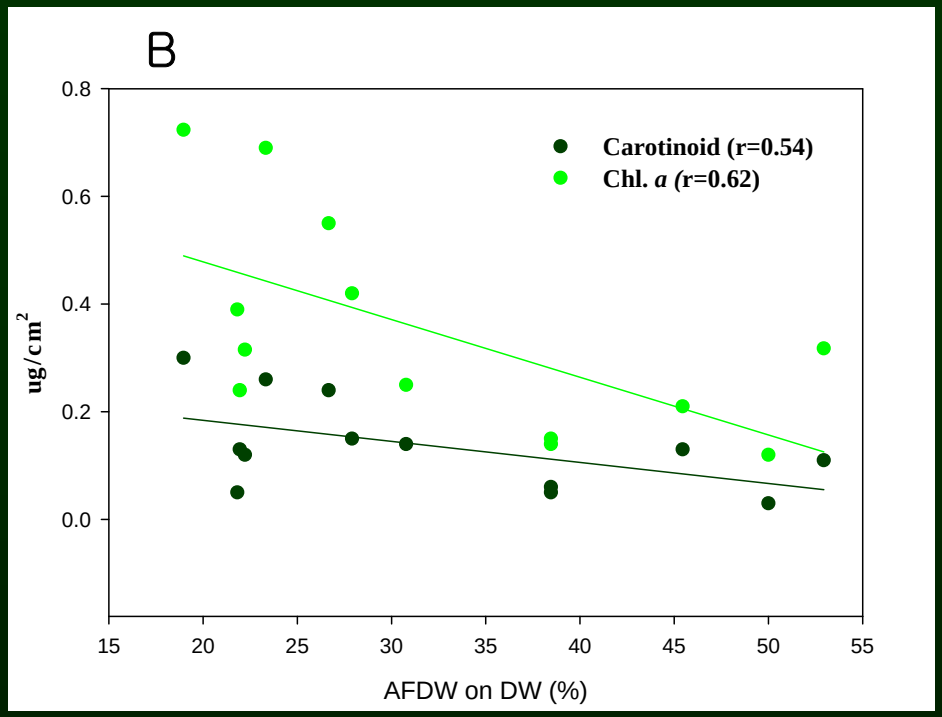
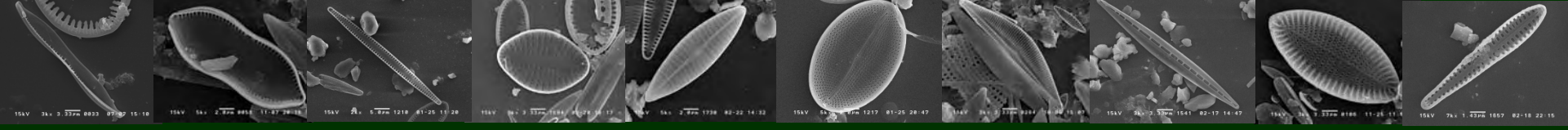


Fig. 7. Relationship between

A : chl. *a* and AFDW of epiphytes on eelgrass.

B : biomass of epiphytic algae and percentage of organic contents



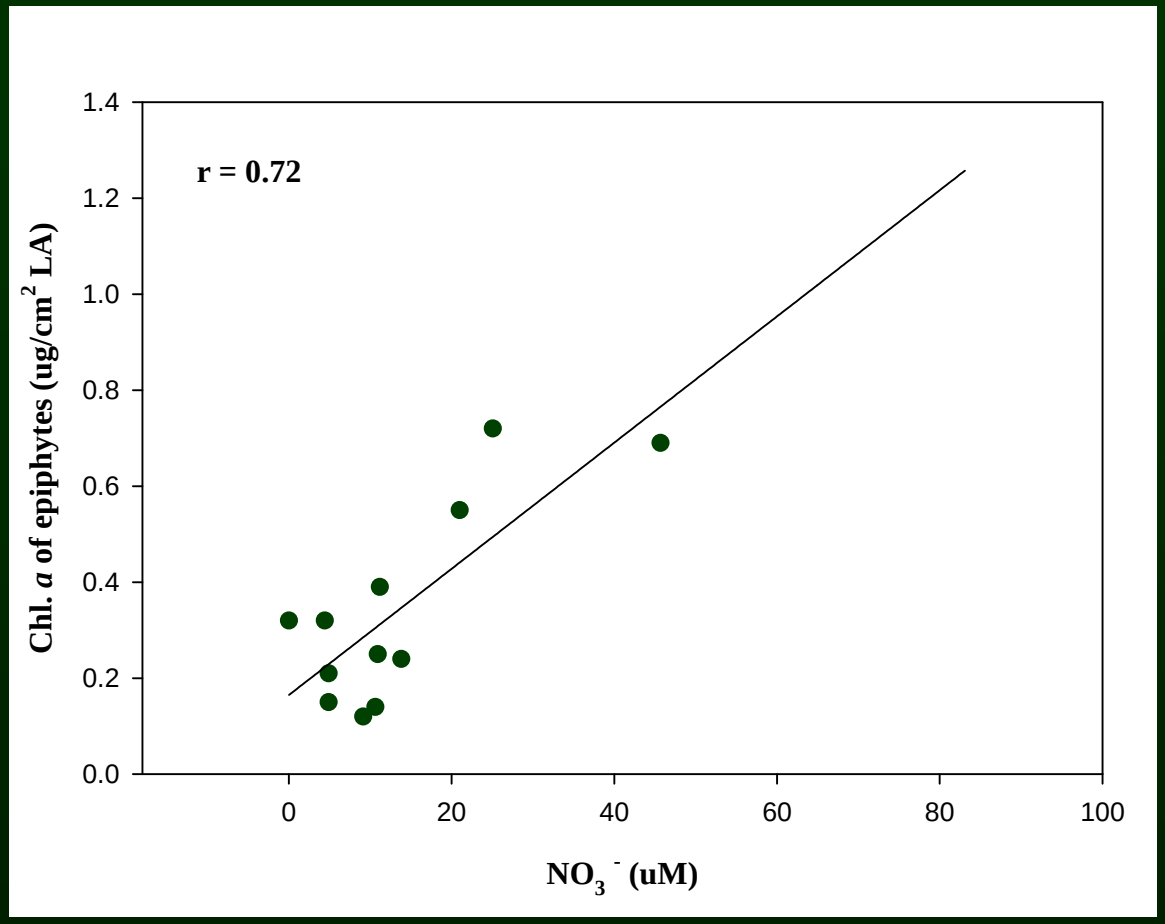
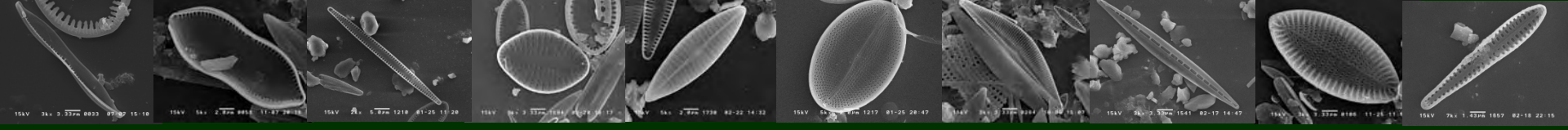
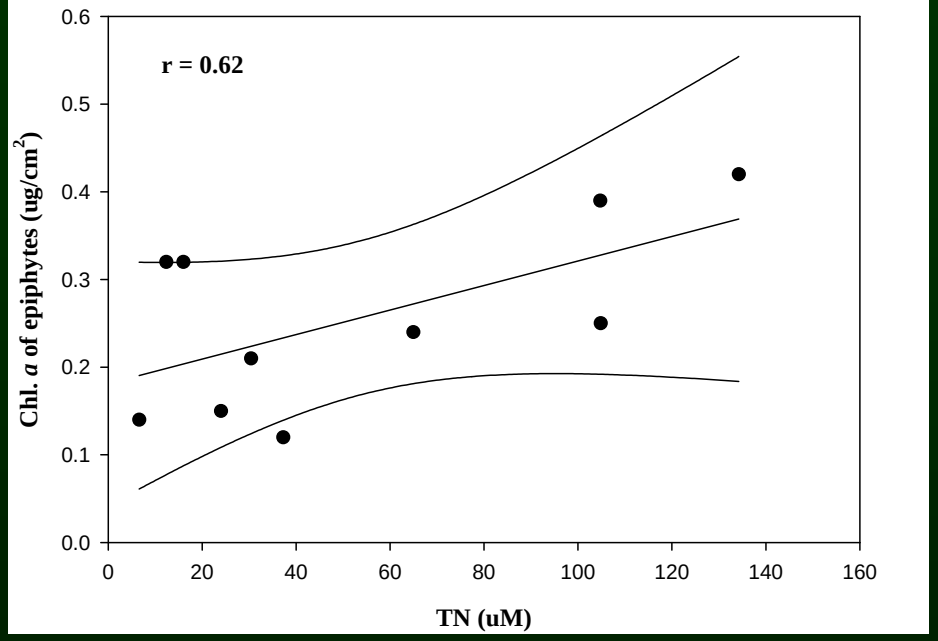


Fig. 8. Relationships between standing crop of epiphytes and epiphytic algae and NO_3^- of water column.





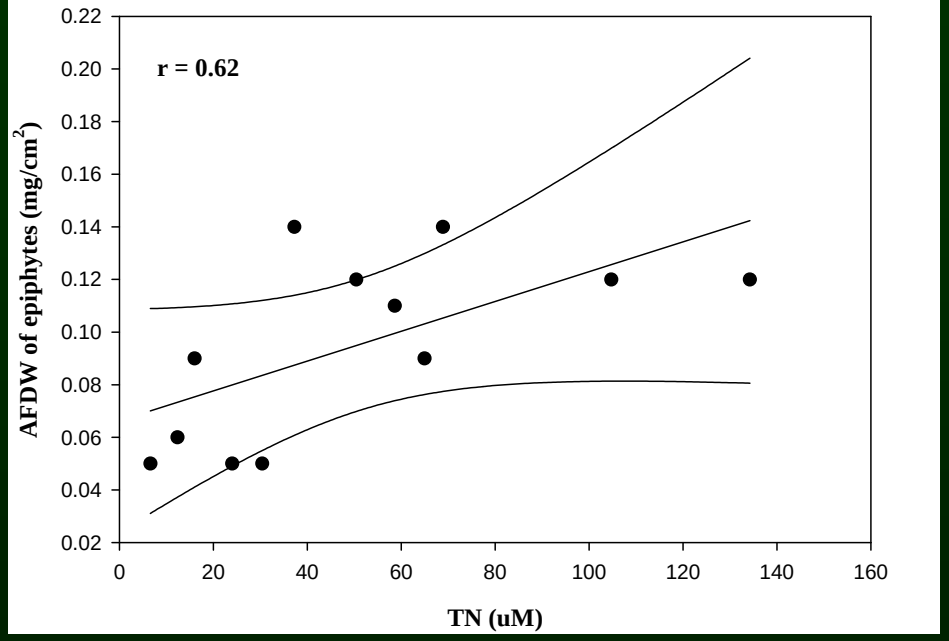
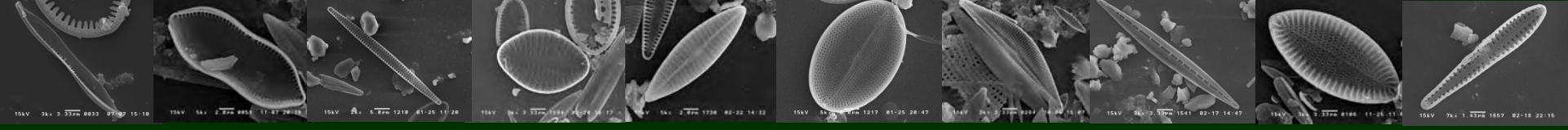


Fig. 9. Relationships between standing crop of epiphytes and epiphytic algae and TN of water column.



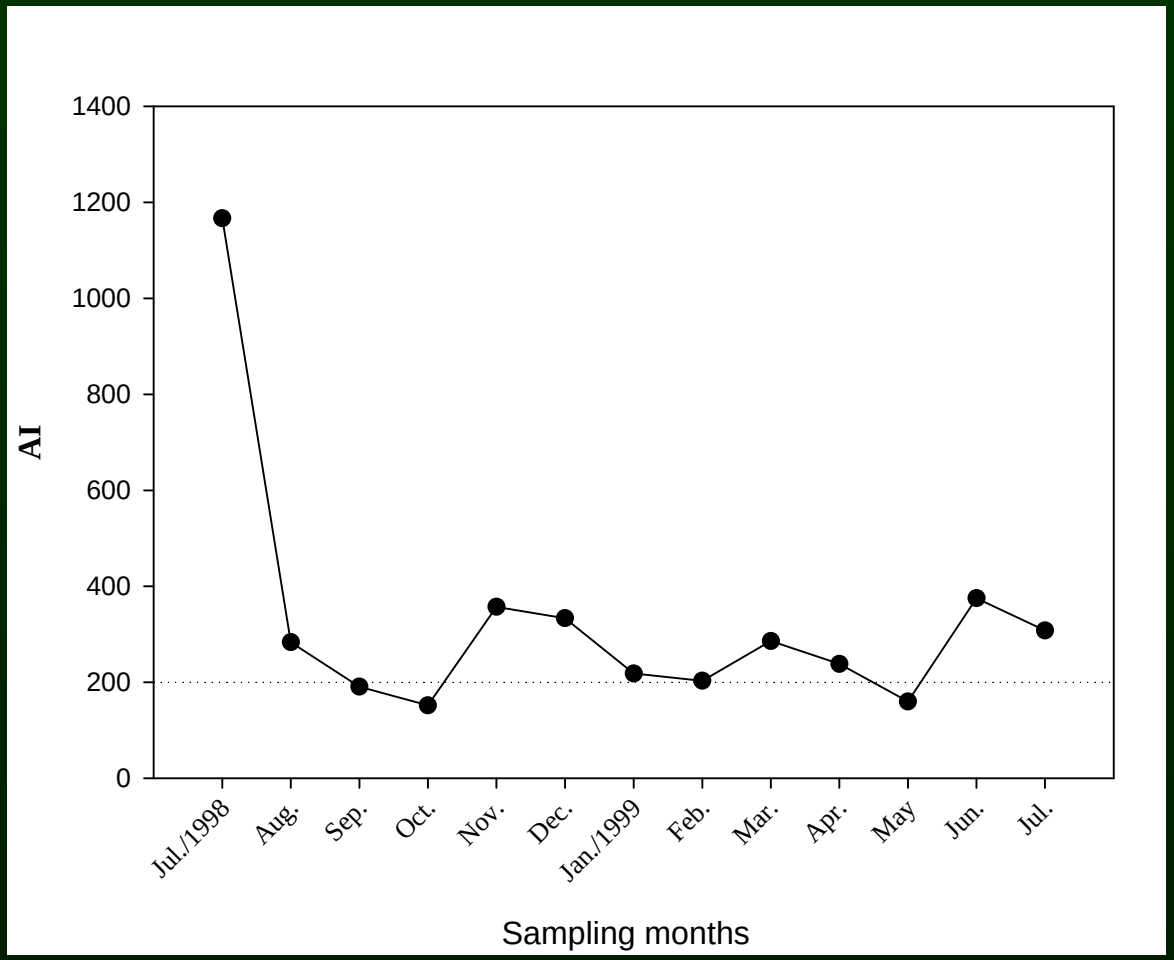
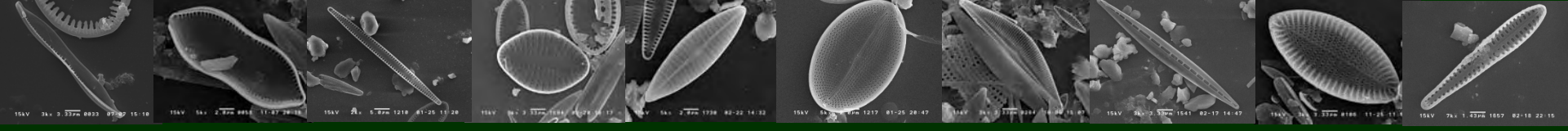
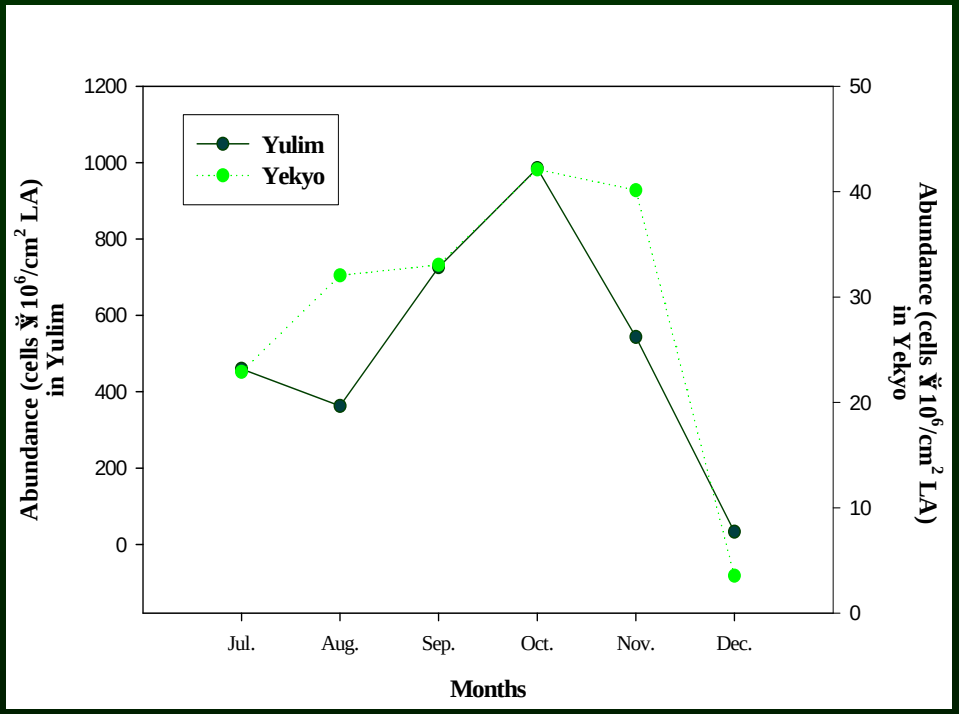


Fig. 10. Seasonal variation of AI of epiphytes in Yulim from July, 1998 to July, 1999.





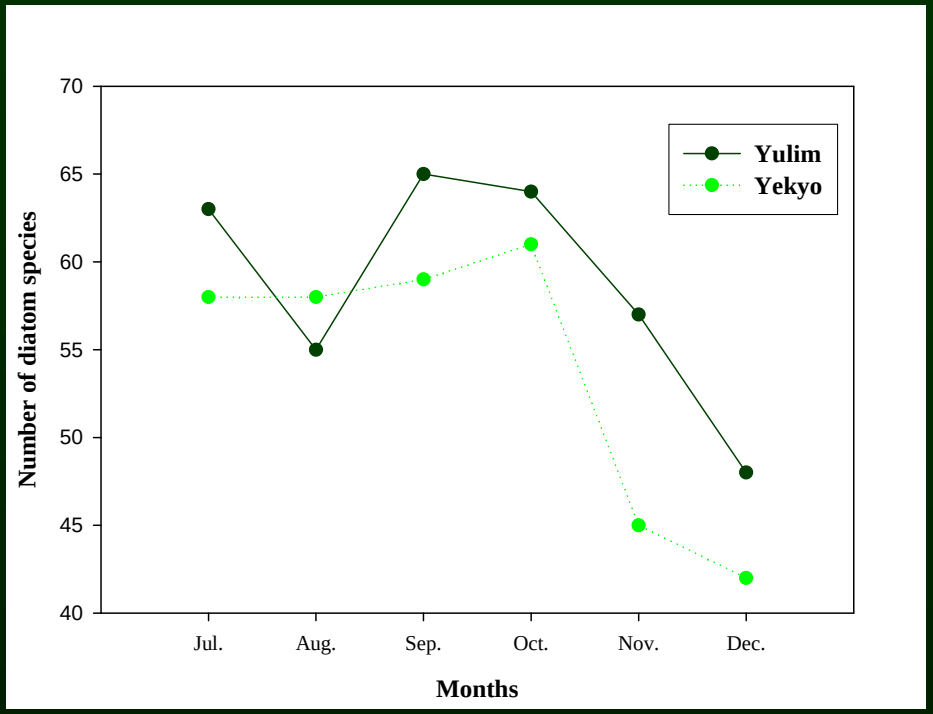


Fig. 11. Monthly variation of abundance and number of species of epiphytic diatom in Yulim from July to Dce., 1998.

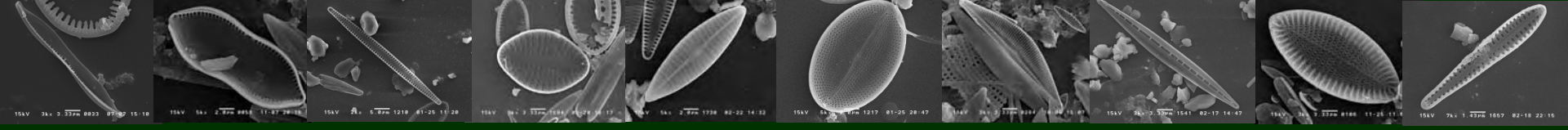
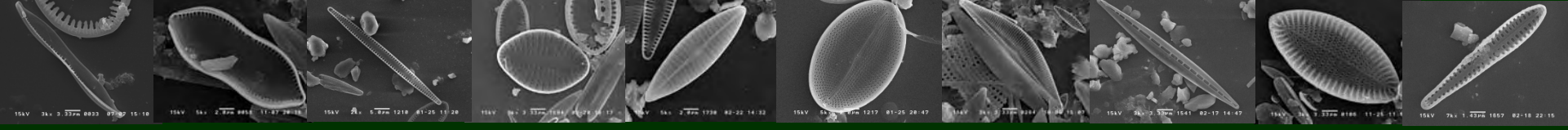


Table 1. Dominant epiphytic diatom species on eelgrass (*Z. marina*) leaf surface from Yulim and Yekyo, Dolsan Is., in Korea.

1998	Sites	Dominant species (%)		
Jul.	Yulim	*Tabularia fasciculata* (22.5)	*Gomponemopsis exigua* (15.3)	*Cocconeis placentula* (11.2)
	Yekyo	*Cocconeis placentula* (15.4)	*Cocconeis scutellum* (12.3)	*Cocconeis heteroidea* (10.5)
Aug.	Yulim	*Tabularia fasciculata* (14.5)	*Cocconeis placentula* (12.7)	*Gomponemopsis exigua* (8.1)
	Yekyo	*Cocconeis placentula* (21.1)	*Cocconeis scutellum* (17.5)	*Berkaleya rutilans* (10.5)
Sep.	Yulim	*Berkaleya rutilans* (35.3)	*Tabularia fascicula* (9.3)	*Gomponemopsis exigua* (9.3)
	Yekyo	*Cocconeis placentula* (22.3)	*Cocconeis scutellum* (21.6)	*Gomponemopsis exigua* (9.0)
Oct.	Yulim	*Gomponemopsis exigua* (18.7)	*Berkaleya rutilans* (12.3)	*Cocconeis placentula* (10.1)
	Yekyo	*Cocconeis placentula* (13.5)	*Cocconeis scutellum* (11.4)	*Gomponemopsis exigua* (9.12)
Nov.	Yulim	*Gomponemopsis exigua* (14.9)	*Nitzschia sigmoidea* (12.1)	*Berkaleya rutilans* (11.0)
	Yekyo	*Cocconeis placentula* (29.0)	*Cocconeis scutellum* (18.6)	*Cocconeis maxima* (12.3)
Dec.	Yulim	*Navicula perminuta* (16.6)	*Berkeleya rutilans* (11.5)	*Gomponemopsis exigua* (8.6)
	Yekyo	*Cocconeis placentula* (25.2)	*Gomponemopsis exigua* (12.7)	*Cocconeis scutellum* (8.8)



Summary

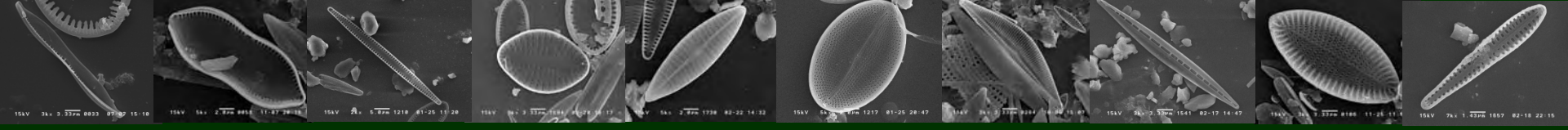
- Biomass of epiphyes (DW and AFDW) : NO_3^-, TN, leaf area and length of *Z. marina* – positive correlation

- % of epiphytic algae : inorganic contents > organic contents,

  Chl. *a*,*c*, and carotinoid ↑

  diatom + calcareous algae > green algae + etc.

- Heterotrophic community and autotrophic community of epiphytes

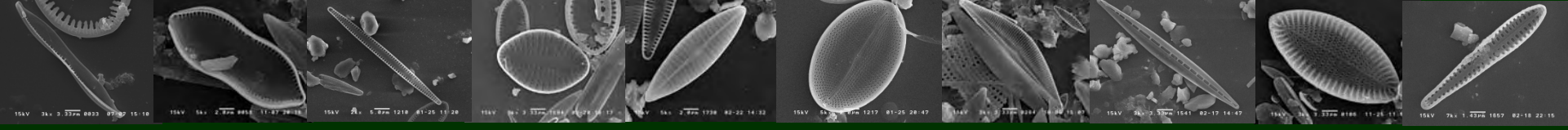


➢ The research objects of the future

1) Relationships between epiphytes and seagrass and the water column (long term observations)

2) Relationships between epiphytic bacteria, epiphytic fauna etc. and epiphytic algae

⇒ To understand ecological structure of epiphytes community on seagrass ecosystem



Thank you!