

Case study of identifying major threats to marine biodiversity in Korean coastal water

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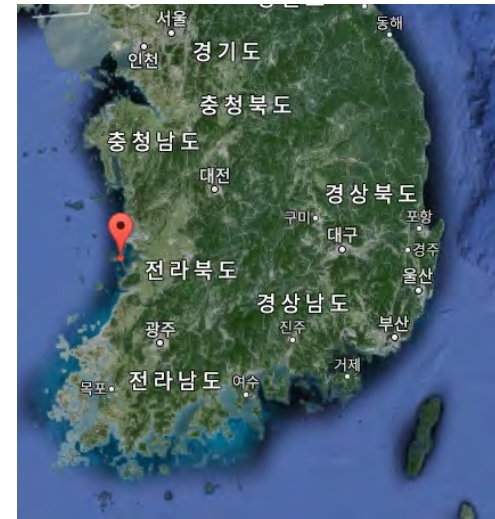
Study area



1989



2006

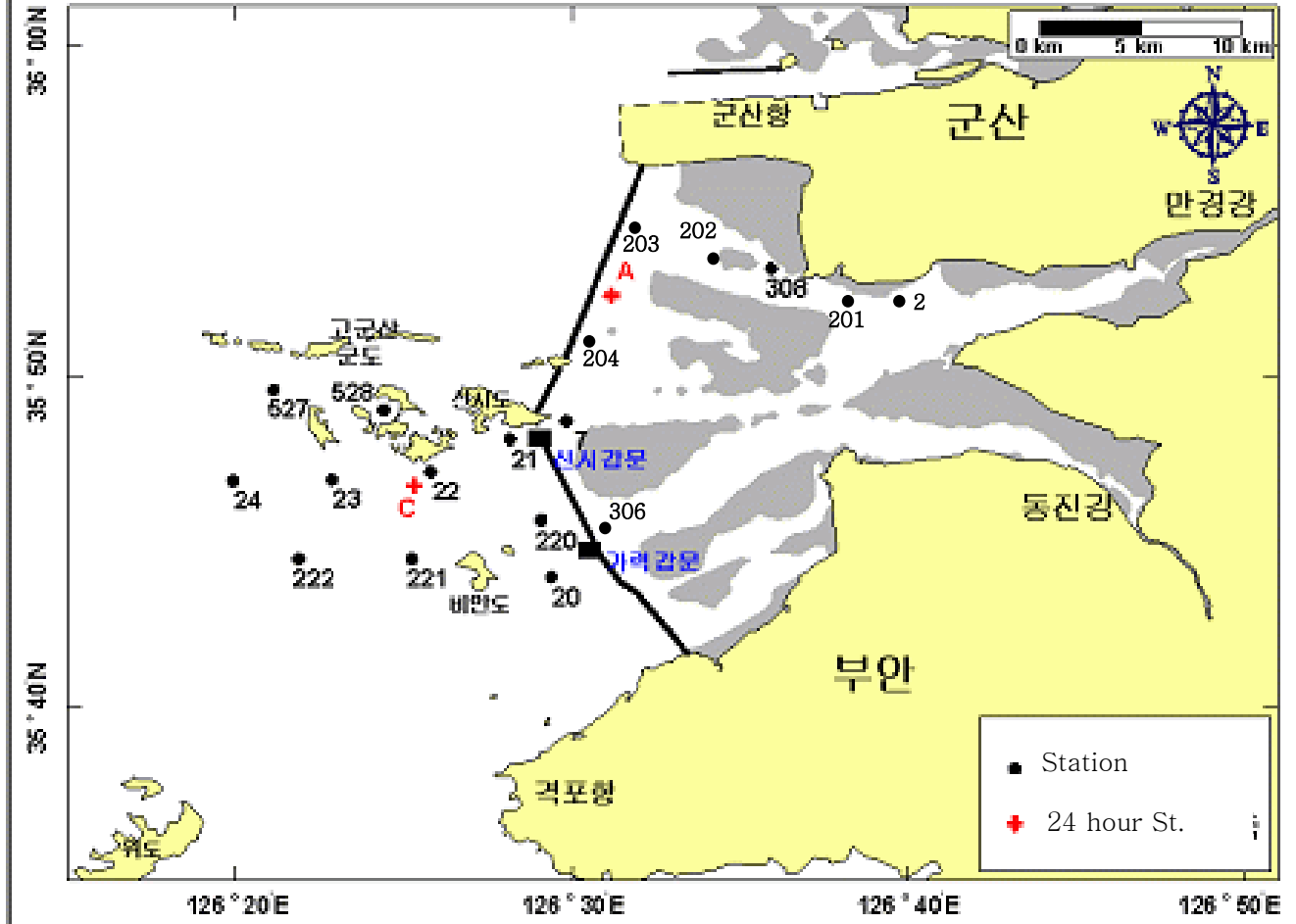


Seamanguem dike construction('91~'06)

- 34km dike (longest dike in the world)
- Aim to 20,000ha reclamation

Study area

Saemanguem study area



Study area

Data collection : 2002~2009(8 yr.)

Factors of biodiversity threat


Habitat alternation : dike construction

Eutrophication : strong eutrophication

Non-Indigenous species : NA

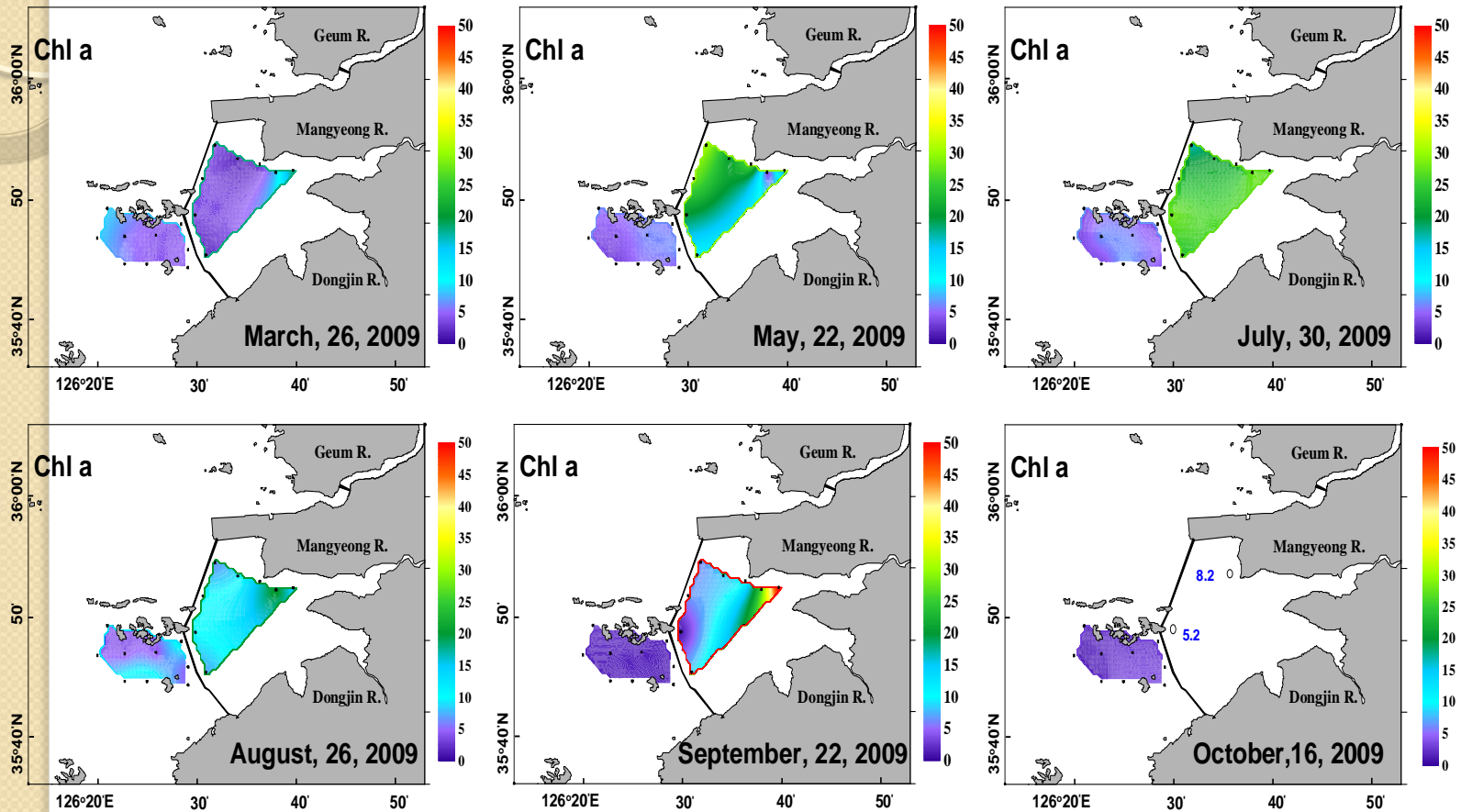
Research parameters

Seasonal study	inside: 2 station	sampling: (March, May, July, Sep.)
: plankton ecology	outside : 10station	parameters: Chl.a, phyoplankton, red tide primary production, zooplankton
monthly study	inside: 2 station	sampling: (April~Oct.)
: phytoplankton	outside : 10station	parameters: Chl.a, phyoplankton, red tide
intense study	inside: 1 station	sampling: (July)
: tidal variability	outside : 1station	parameters: Chl.a, phyoplankton, red tide primary production, zooplankton
discharge water	inside: 1 station	sampling: (two times per week)
study		parameters: Chl.a, phyoplankton



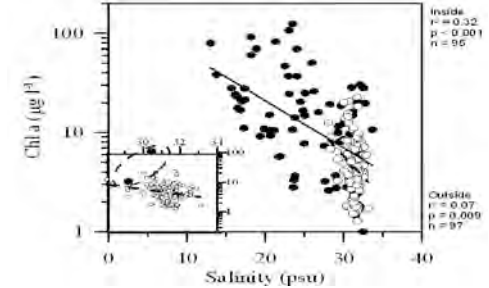
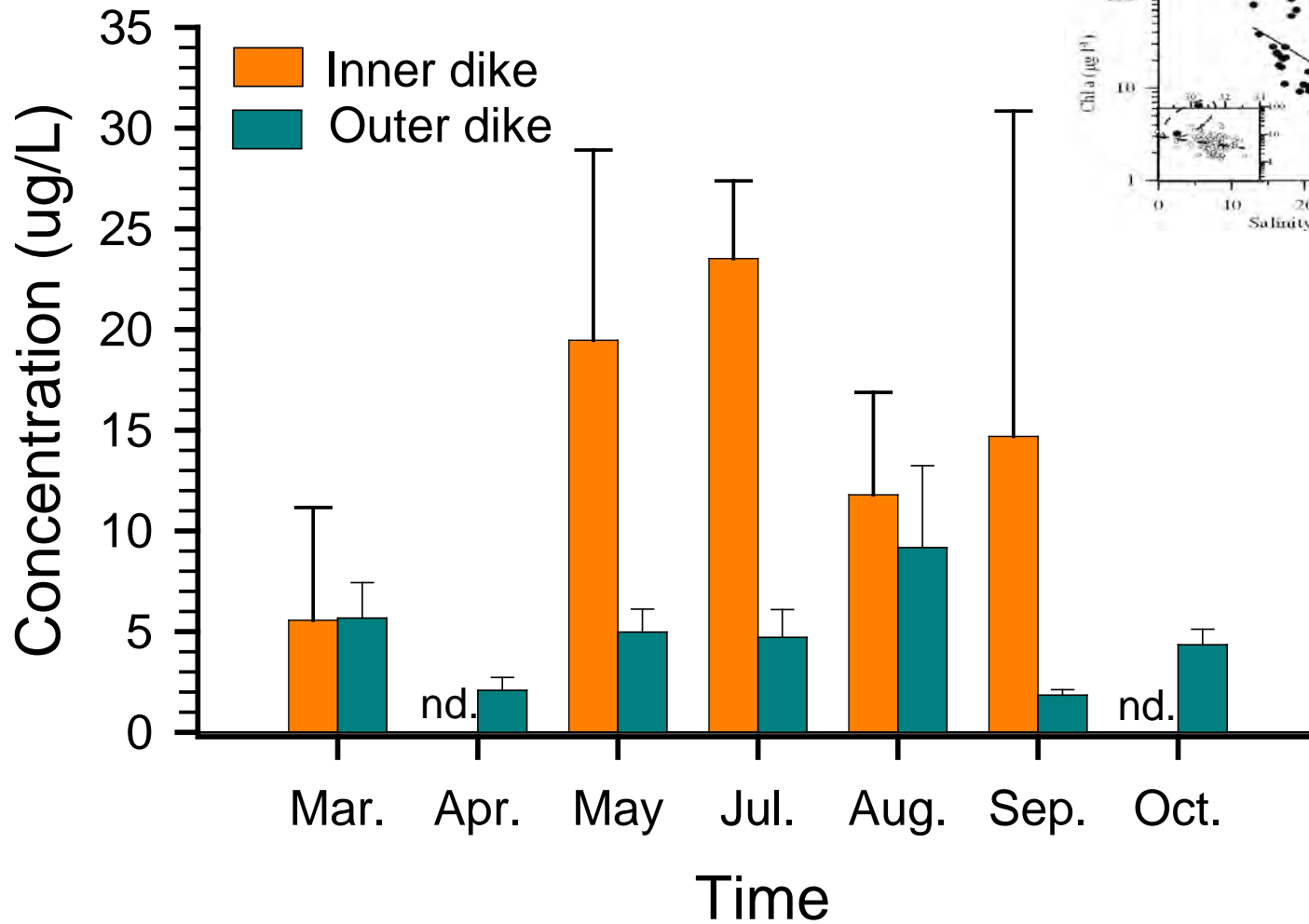
2009 results
(Ecosystem status)

Seasonal Chl.a distribution

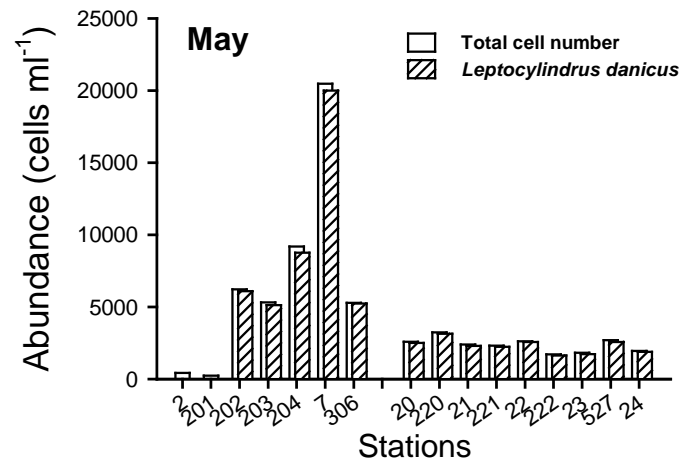
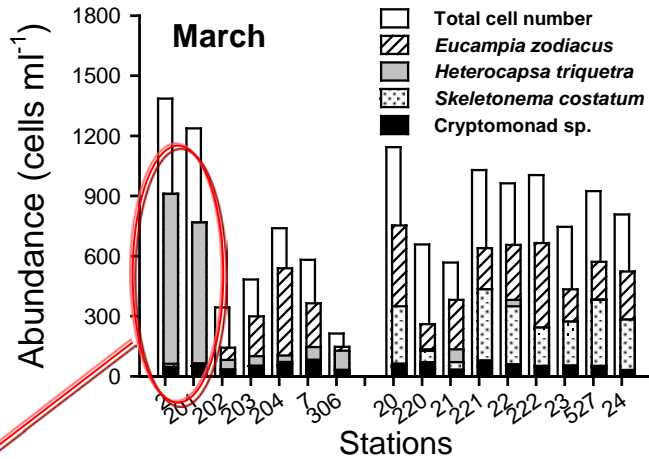


Inner dike shows high chl.a in May, July and September

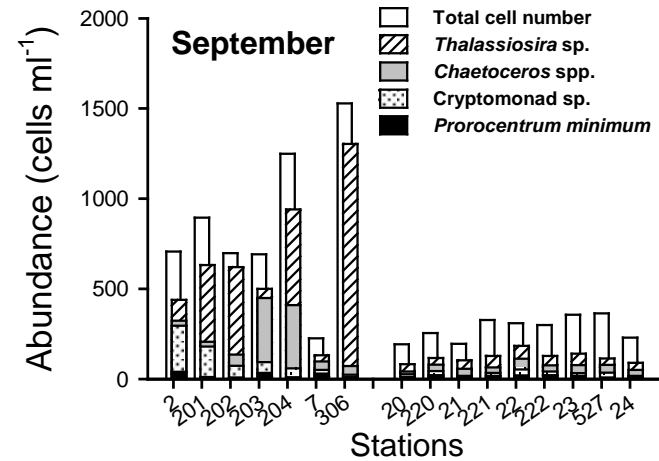
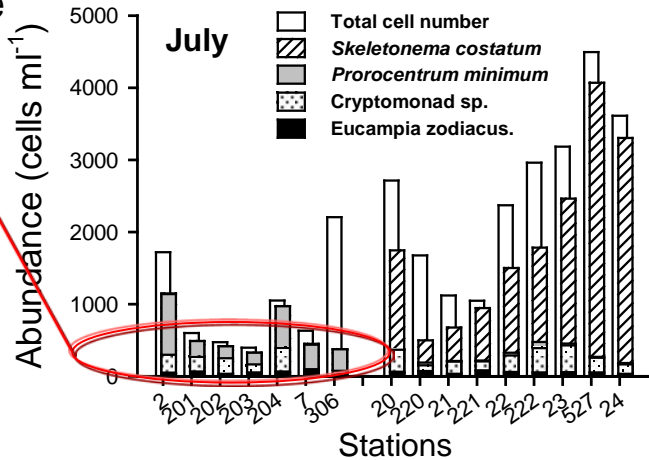
Inner dike vs Outer dike chl.a



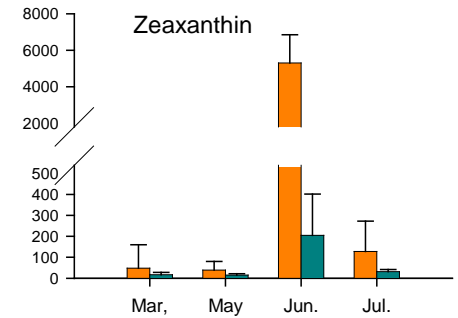
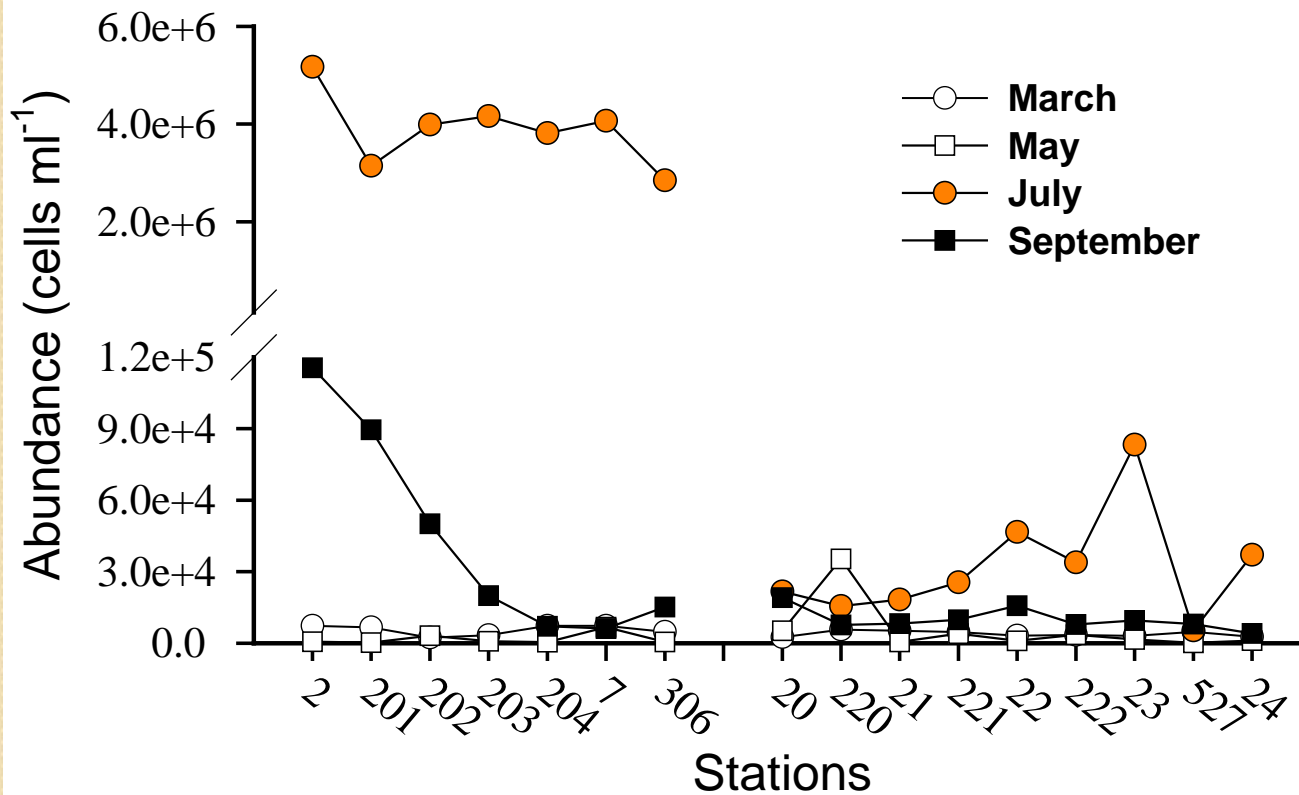
Phytoplankton population



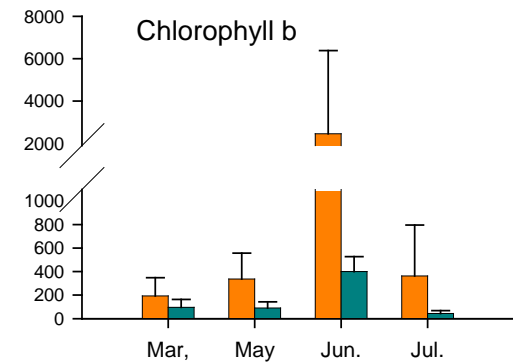
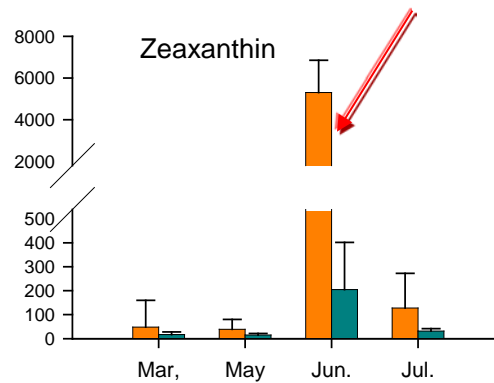
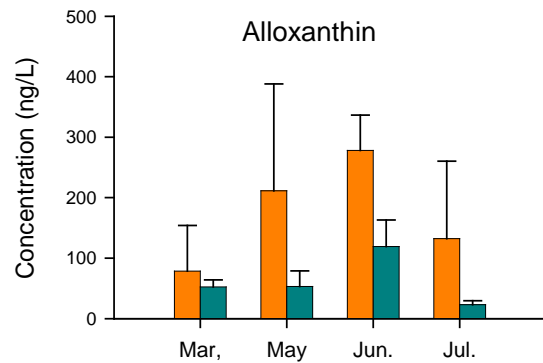
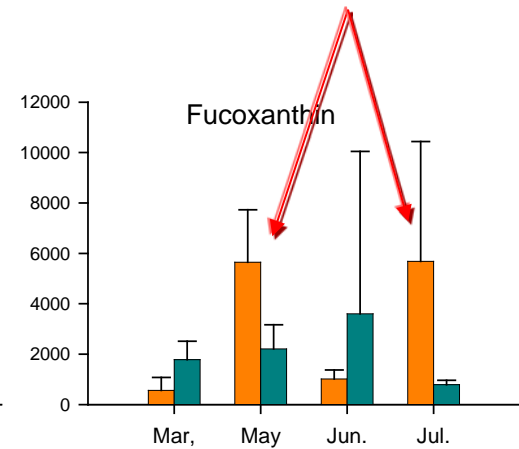
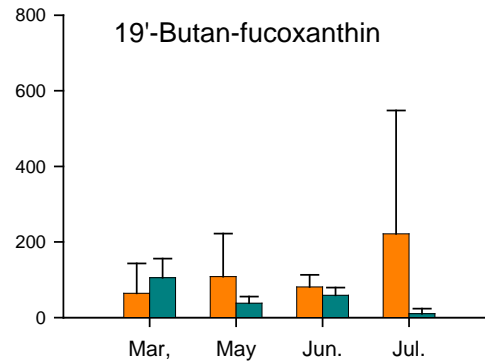
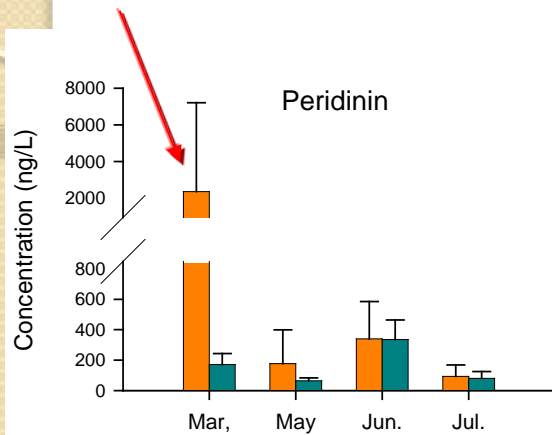
Red tide



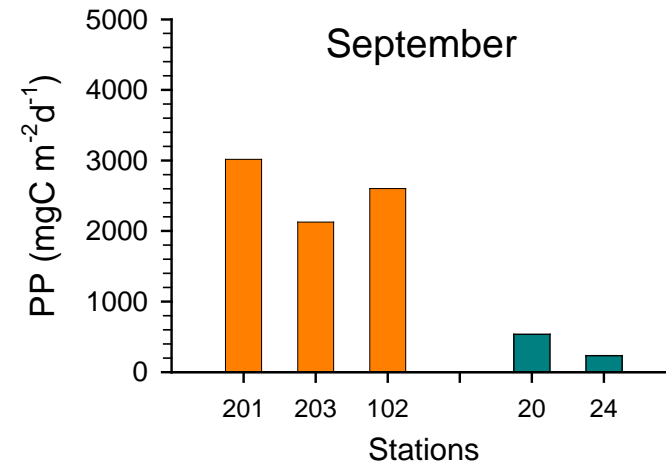
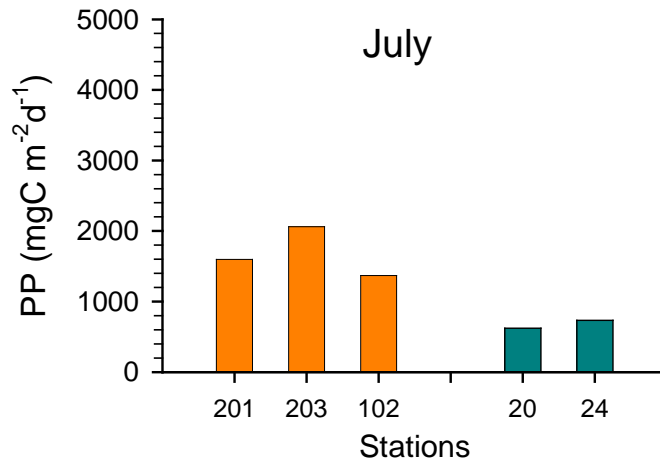
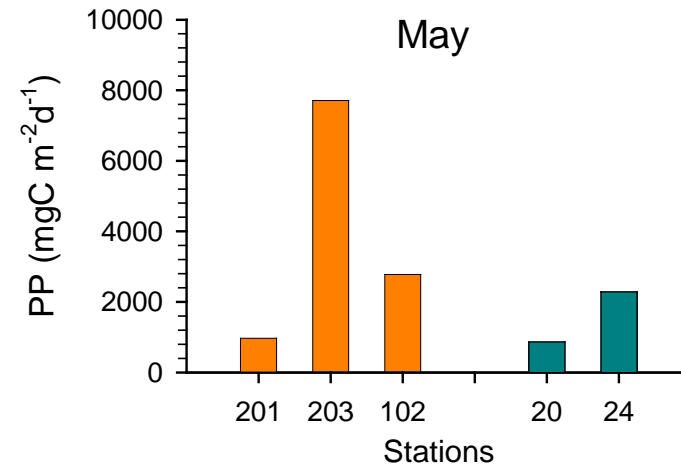
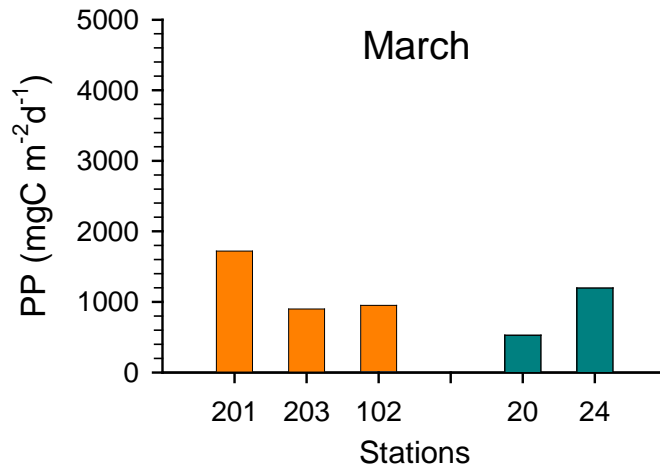
Cyanobacteria population



Phtoplankton pigment

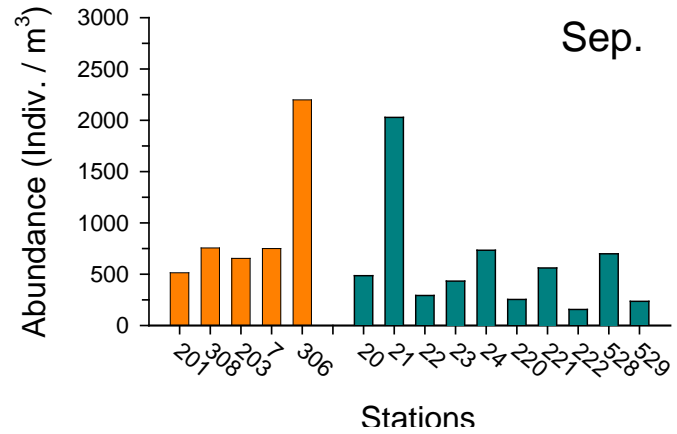
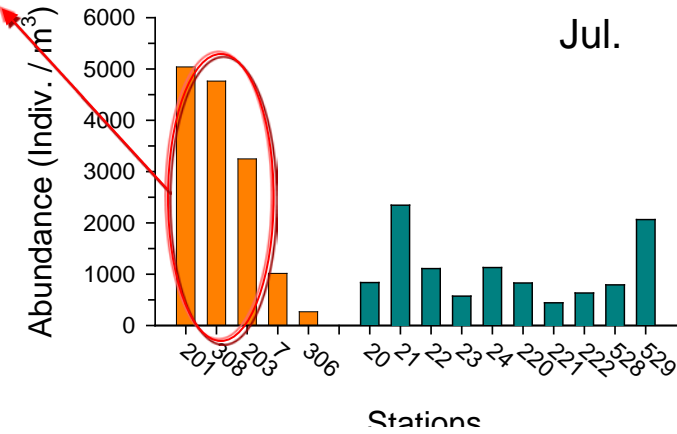
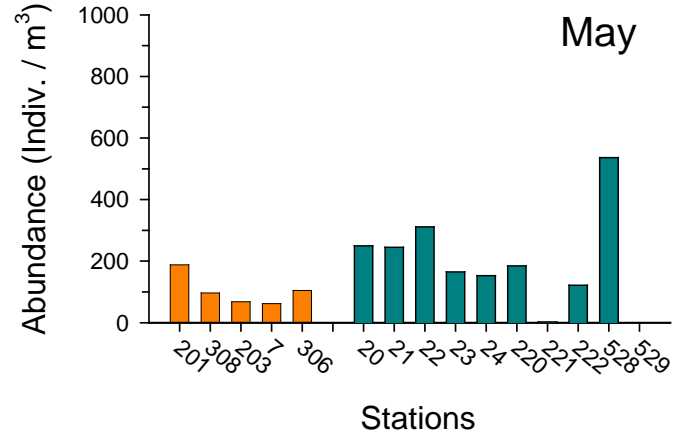
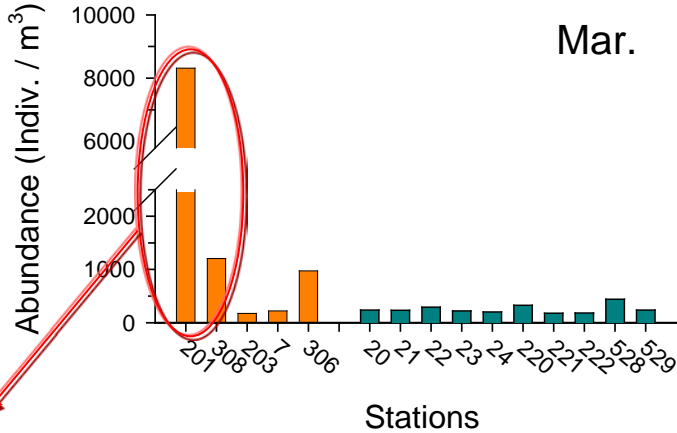


Seasonal primary production

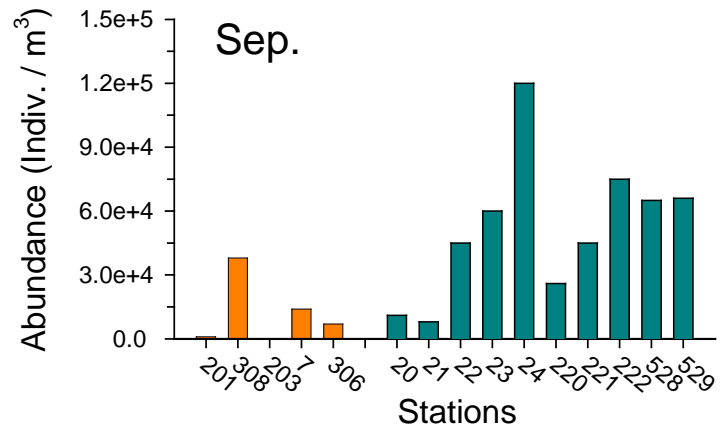
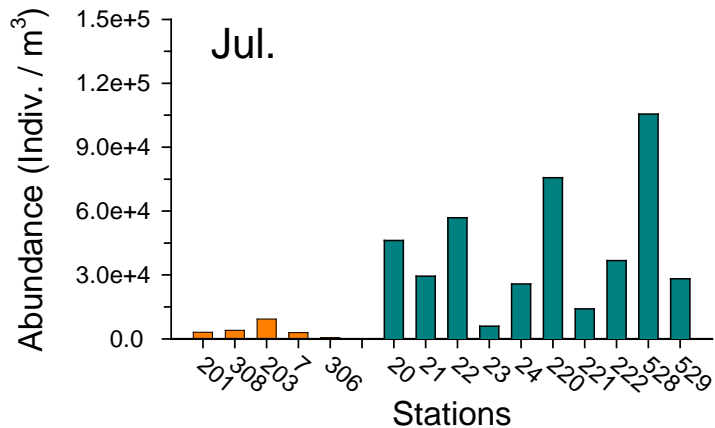
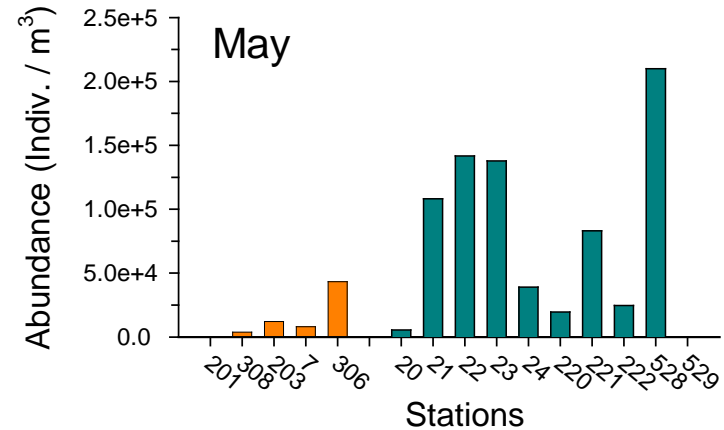
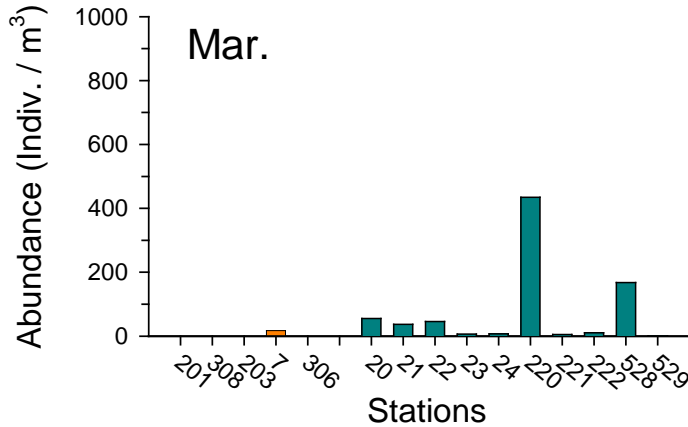


Zooplankton population


Brackish species



Noctiluca population

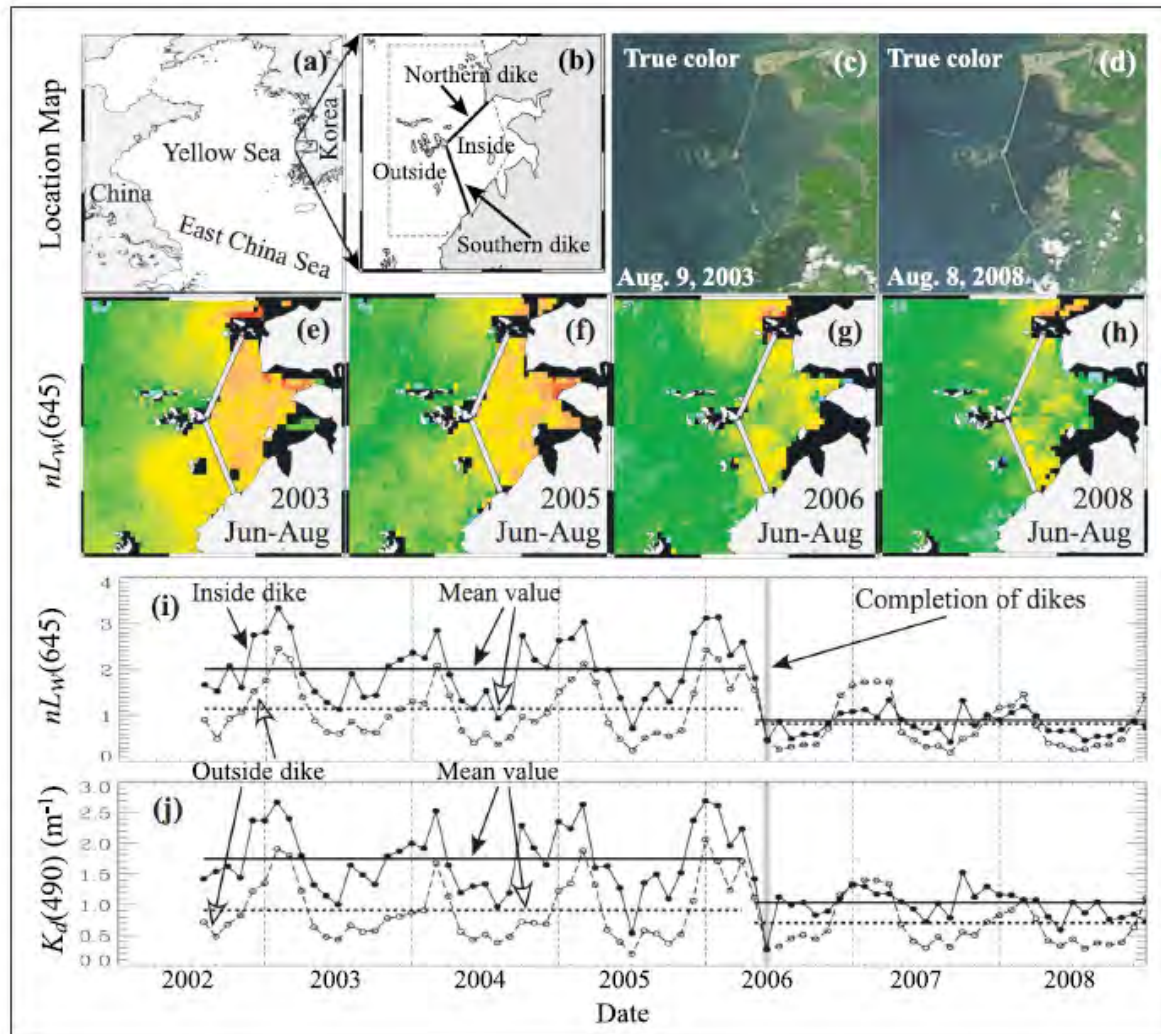


Bloom occurred outer dike in May,
July and September

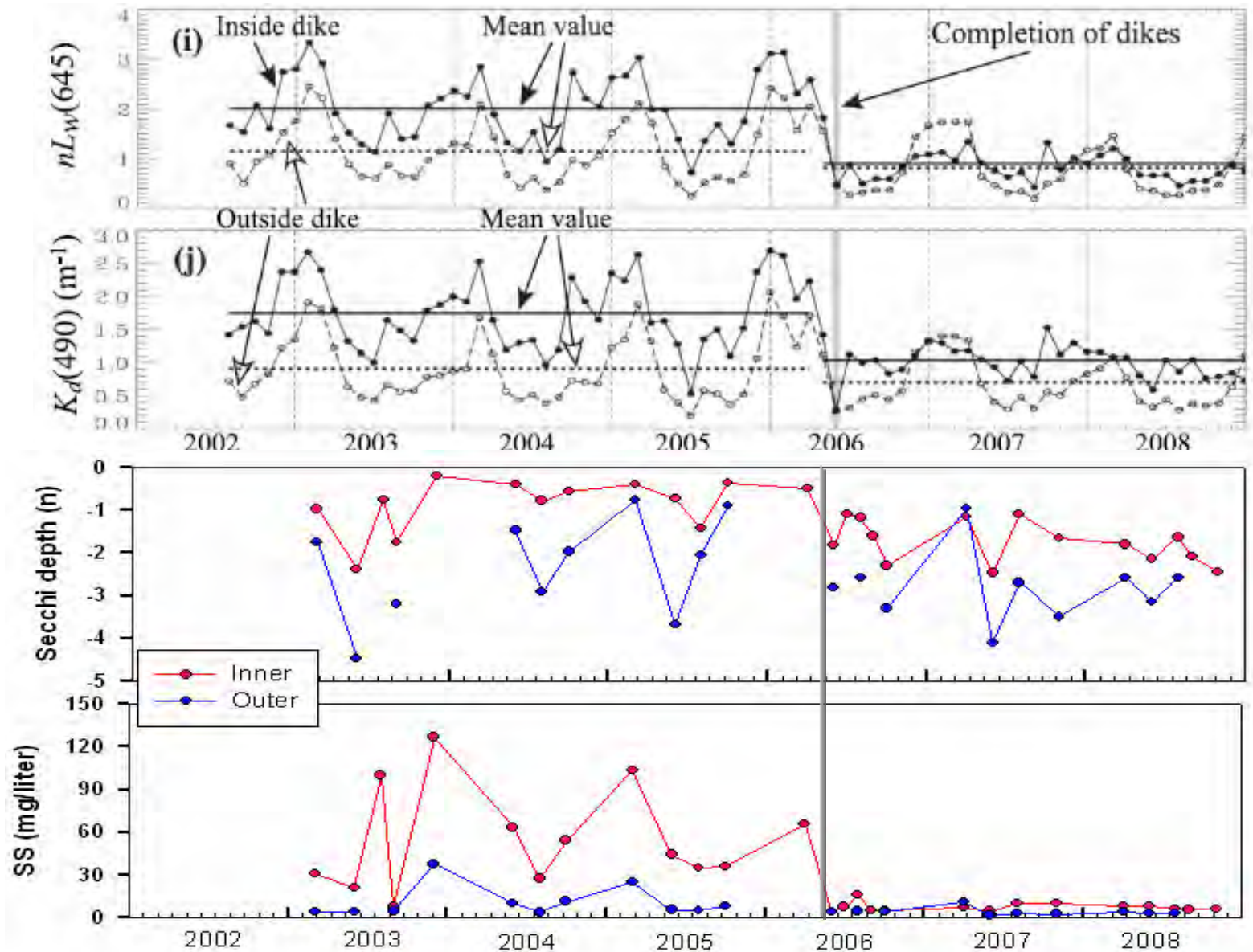


Ecosystem change on dike construction

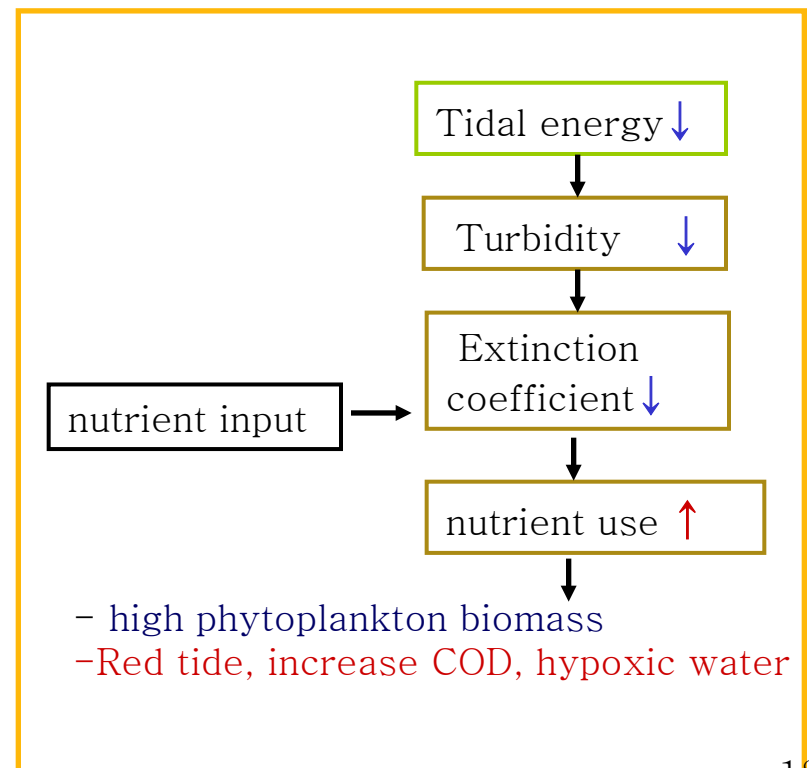
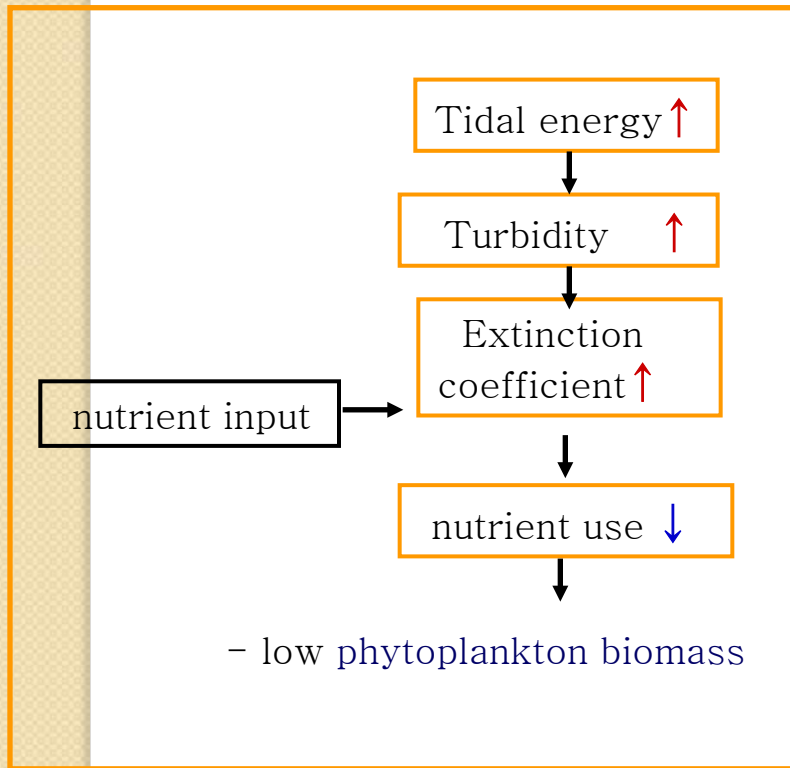
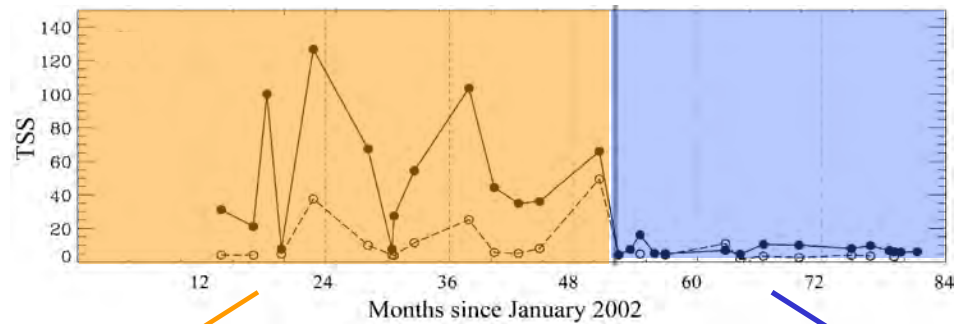
Turbidity changes on completion of dikes



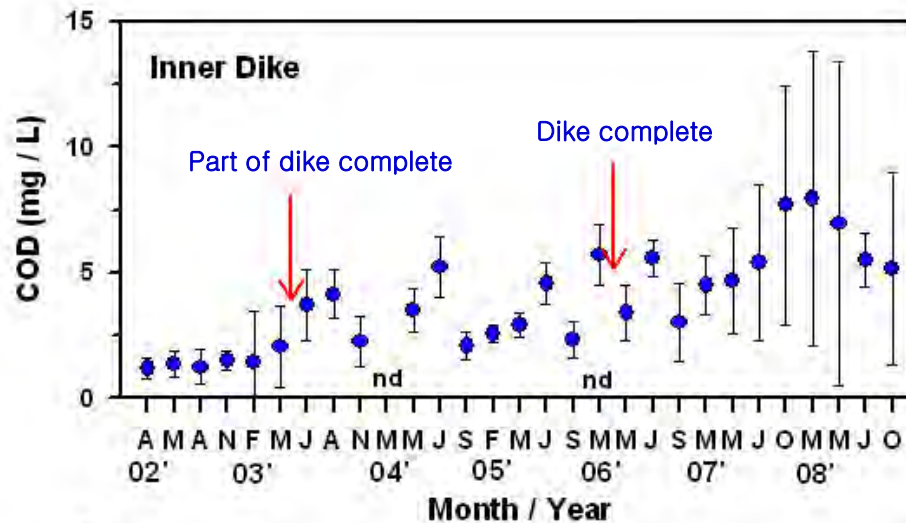
Turbidity changes on completion of dikes



Ecosystem changes on completion of dikes

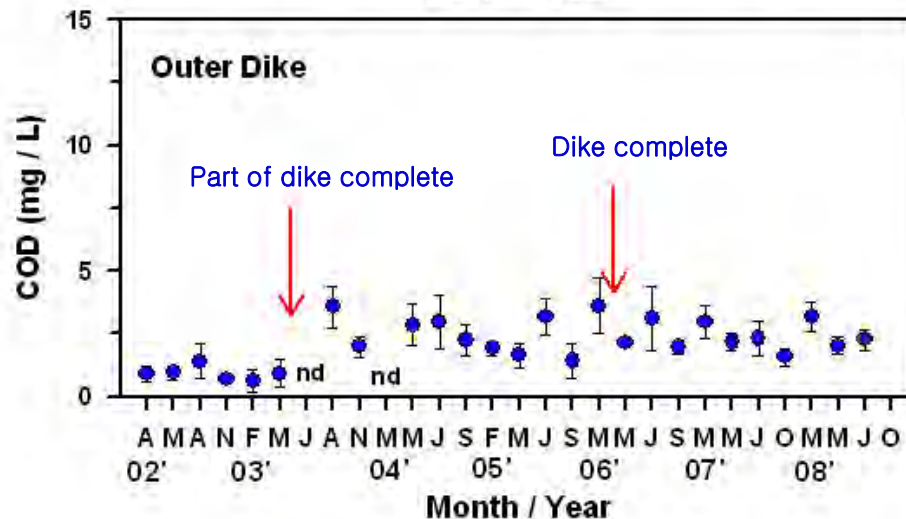


COD changes [2002~2008)



● Inner dike

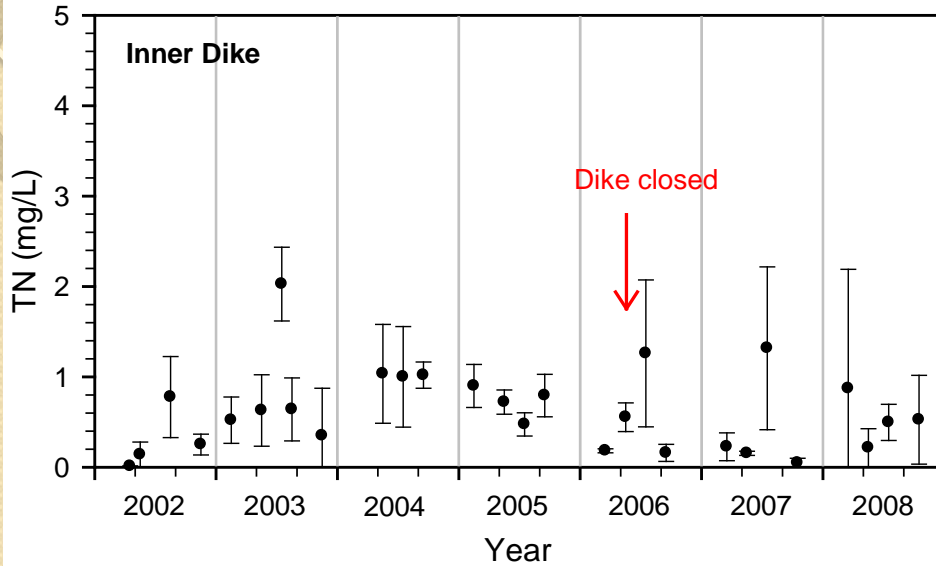
– COD increase after dike complete



● Outer dike

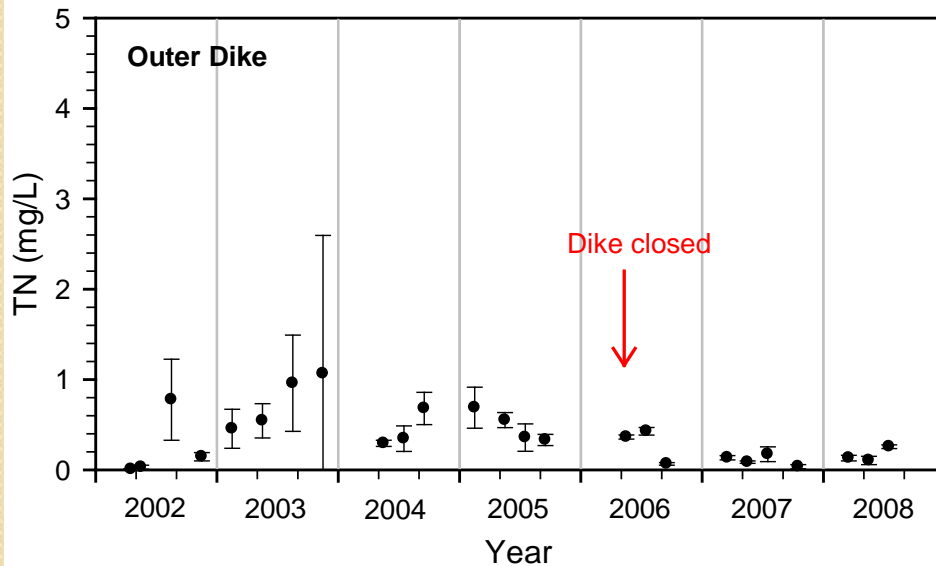
– COD increased with dike construction

TN changes [2002~2008)



● Inner dike

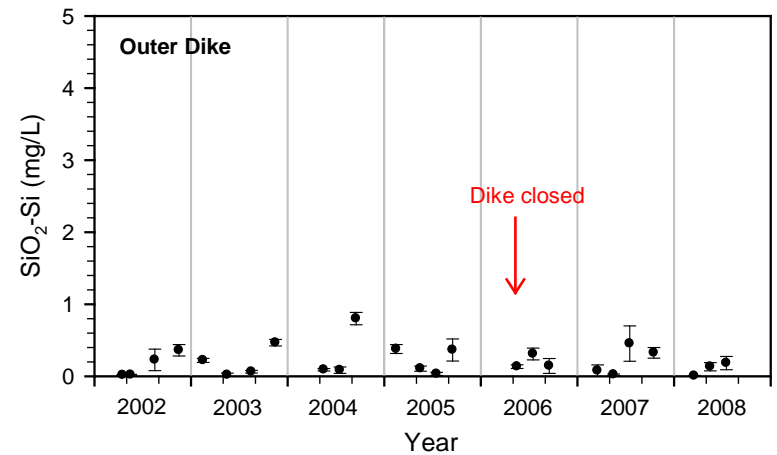
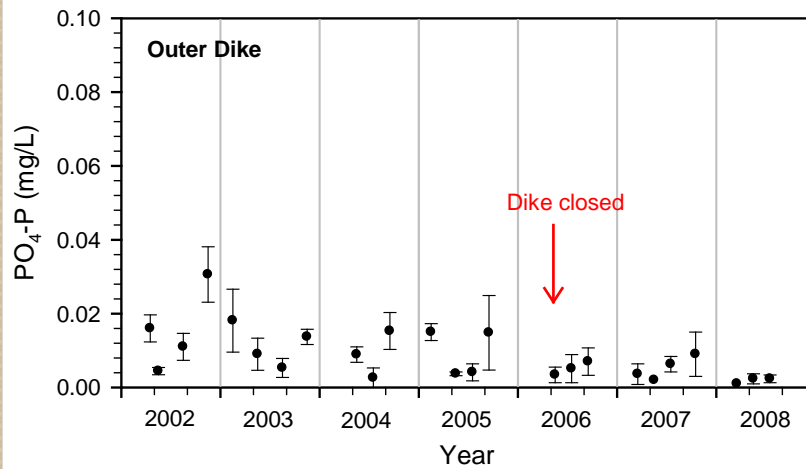
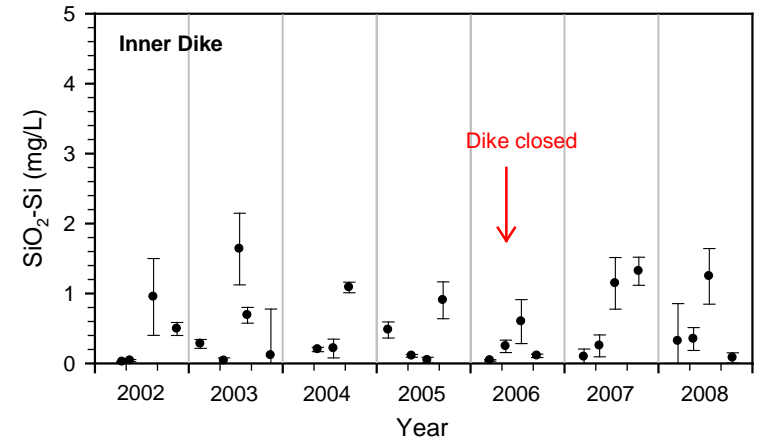
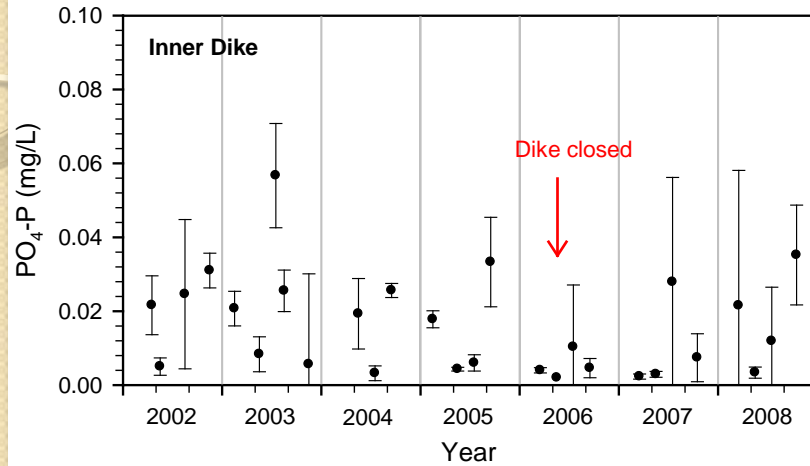
– After dike closed, higher TN occurred in summer season



● Outer dike

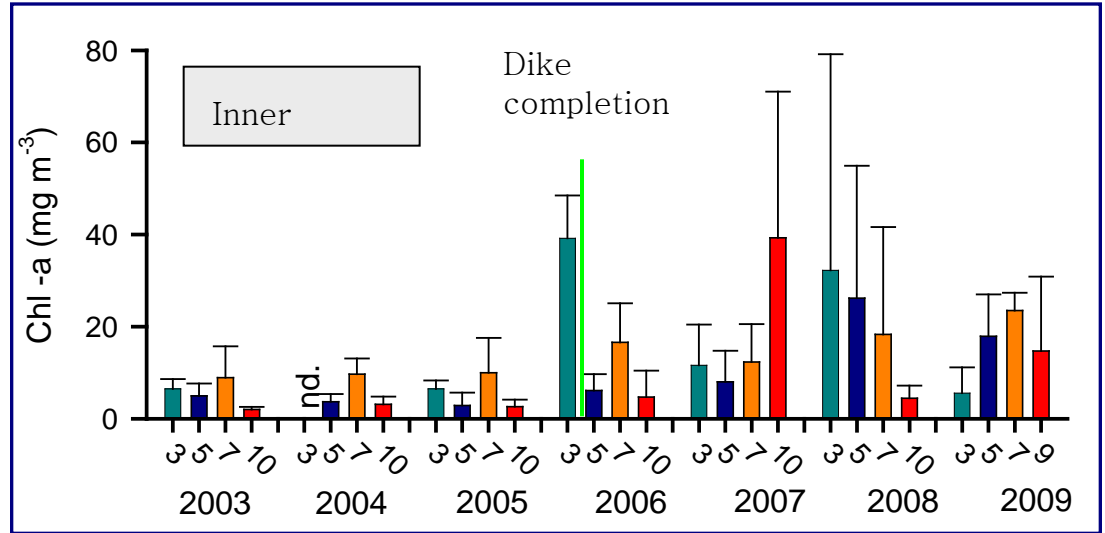
– TN decreased after dike closed

PO₄ & SiO₂ changes [2002~2008]

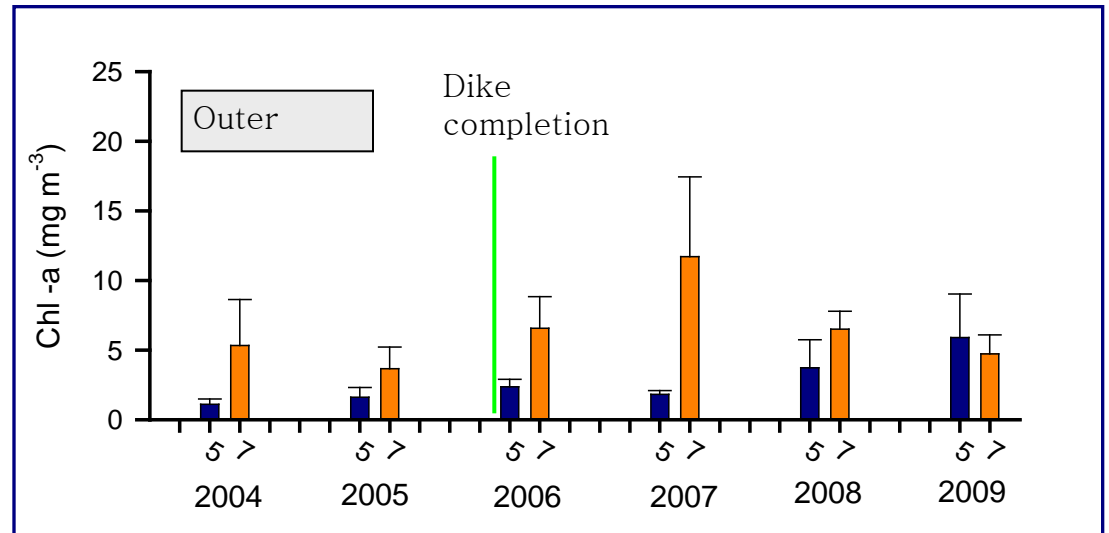


Chl.a changes on completion of dikes

Inner: Chl.a concentration increase after dike completion.



Outer: Chl. a concentration increase in May



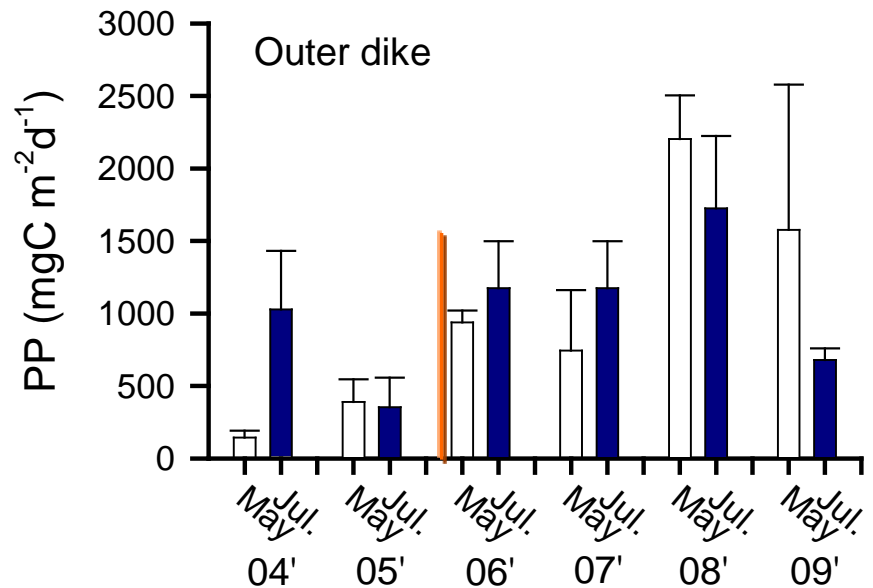
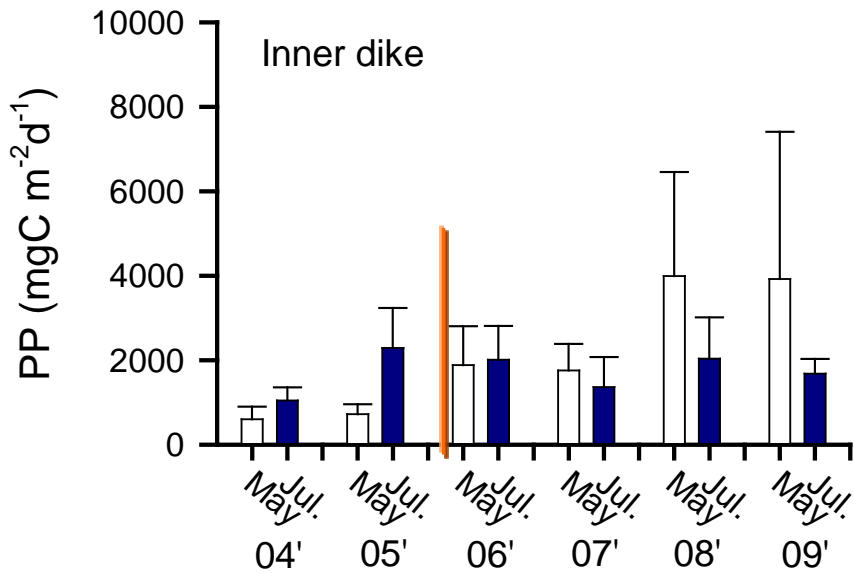
Phytoplankton species

Time		Dominant species
Year	Month	
2002	Apr.	<i>Eucampia zodiacus</i>
	May	<i>Leptocylindrus danicus</i>
	Aug.	<i>Skeletonema costatum</i>
2003	Feb.	<i>Skeletonema costatum</i>
	May	<i>Eucampia zodiacus</i>
	Aug.	<i>Chaetoceros spp.</i> , <i>Eucampia zodiacus</i>
2004	May	<i>Pseudo-nitzschia pungens</i> , <i>Eucampia zodiacus</i>
	Jul.	<i>Eucampia zodiacus</i>
	Sep.	<i>Chaetoceros debilis</i> , <i>Skeletonema costatum</i>
2005	Feb.	<i>Asterionellopsis kariana</i> , <i>Skeletonema costatum</i>
	May	<i>Thalassiosira sp.</i>
	Jul.	<i>Eucampia zodiacus</i> , <i>Skeletonema costatum</i>
2006	Sep.	<i>Skeletonema costatum</i> , <i>Chaetoceros socialis</i>
	Mar.	<i>Skeletonema costatum</i> , <i>Asterionellopsis kariana</i>
	May	<i>Cylindrotheca closterium</i> , <i>Paralia sulcata</i>
	Jul.	<i>Chaetoceros sp.</i> , <i>Pseudo-nitzschia sp.</i>
2007	Sep.	<i>Chaetoceros debilis</i> , <i>Eucampia zodiacus</i>
	Mar.	<i>Eucampia zodiacus</i>
	May	<i>Prorocentrum minimum</i>
	Jul.	<i>Dictyocha speculum</i> , <i>Small dinoflagellate group</i>
2008	Oct.	<i>Prorocentrum minimum</i>
	Mar.	<i>Euglena sp.</i> , <i>Dictyocha speculum</i>
	May	<i>Euglena sp.</i> , <i>Dictyocha speculum</i> , <i>Cryptomonas sp.</i>
	Jul.	<i>Skeletonema costatum</i> , <i>Cryptomonas sp.</i>
2009	Oct.	<i>Cyclotella sp.</i> , <i>Chaetoceros sp.</i> , <i>Cylindrotheca closterium</i> .
	Mar.	<i>Eucampia zodiacus</i> , <i>Heterocapsa triquetra</i> , <i>S. costatum</i> ,
	May	<i>Leptocylindrus danicus</i>
	Jul.	<i>Skeletonema costatum</i> , <i>P. minimum</i> , <i>Cryptomonas sp.</i>
Sep.	<i>Thalassiosira sp.</i> , <i>Chaetoceros sp.</i> , <i>P. minimum</i>	

-  Diatom
-  Dinoflagellate
-  Silicoflagellate
-  Euglena
-  Cryptomonas

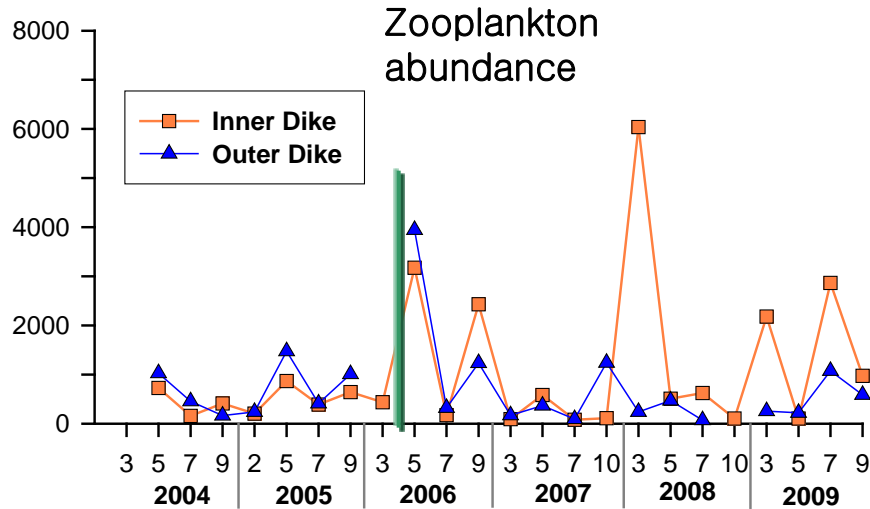
❖ Various bloom occurred after 2007

PP change

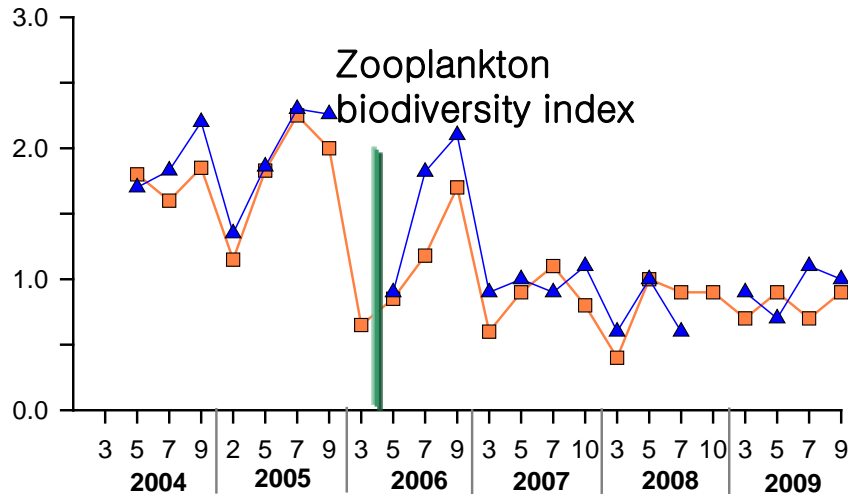


Increased after dike construction completed

Zooplankton change (2004–2009)

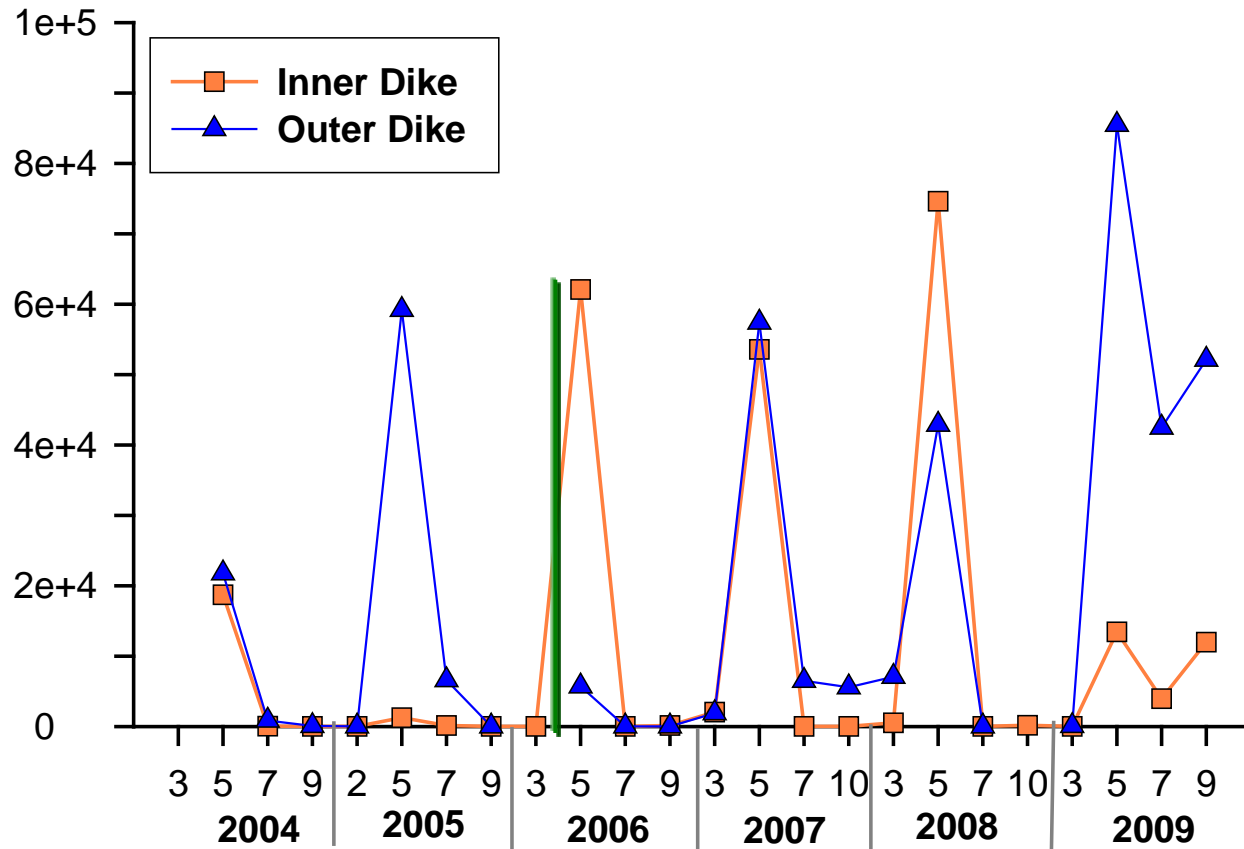


–Zooplankton in inner dike increased after dike construction completed



–Biodiversity index decreased after dike construction completed

Noctiluca population (2004–2009)



–Bloom occurred after dike construction completed

Conclusion

- Phytoplankton biomass is increased and red tide occurred frequently after dike construction completed .
- Dominant phytoplankton species are various after dike construction completed.
- Primary production is increased.
- Zooplankton and *Noctiulca* bloom occurred.
- Dike construction(habitat alternation) occurred major threats of marine biodiversity and ecosystem in study area.

A bright blue sky with scattered white clouds and a faint rainbow arc. The text "Thank you" is centered in a dark brown font.

Thank you