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**[Note]**

# Monitoring of Algal Bloom at Seomjin River Estuary, Southern Coast of Korea

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This study was conducted at Seomjin River estuary to identify the causative species of algal bloom and their blooming cycles. Field surveys were conducted at 4 stations in every week from April to December of 1999. Thirty species were observed as the causative species of alga bloom. *Skeletonema costatum, Thalassiosira* sp., and microflagellate spp. (mixed red tide: *Chroomonas* sp. and two species of Prasinophycea) made algal blooms during the present study period. In addition, toxic algal species of diatom *Pseudo-nitzschia multiseries* and dinoflagellate *Dinophysis acuminata* were observed. The algal blooms were caused by microflagellate spp. in June, *Thalassiosira* sp. in July and *Skeletonema costatum* in August. Generally, the algal blooms persisted for about 5 days in this area.

**Key Words:** algal bloom, red tide species, Seomjin River estuary

## INTRODUCTION

The causative species of algal blooms reported in the Korean Coast were totally 94 species; 57 species in Chrysophyta, 31 in Dinophyta, 3 in Cyanophyta and 1 in Euglenophyta, 1 in Cryptophyta, and 1 in Protozoa (Lee 1999). In Gwangynag Bay 10 algal species were reported; 7 in Chrysophyta *(Skeletonema costatum, Leptocylindrus danicus, Rhizosolenia delicatula, Eucampia zodiacus, Chaetoceros* sp., *Thalassiosira* sp., *Cylindrotheca closterium*), 1 in Dinophyta (*Cochlodinium* sp.), 1 in Cyanophyta (*Microcystis* sp.) and 1 in Protozoa (*Mesodinium rubrum*) (Park 1991; Kim *et al.* 1997). Several studies have been conducted on the ecology and vegetation/cyst distribution of phytoplankton community in Gwangyang Bay (Shim *et al.* 1984; Cho *et al.* 1994; Lee and Yoo 2000; Lee *et al.* 2001; Kim *et al.* 2003). Phytoplankton samples were not frequently collected in the previous studies. The previous field surveys were conducted only by each season or once. So the population dynamics in this area were not fully described in terms of the community structure and distribution. This study was, therefore, conducted to investigate the population dynamics of the causative species of algal bloom and to provide basic field data that could be applied for the management of algal bloom in the near future.

The aim of this study was to find out the current situation in the study area about the causative species of red tide and the toxic phytoplankton. In addition, the blooming cycle of them at Seomjin River estuary was considered.

## MATERIALS AND METHODS

This study was conducted to monitor the fluctuation of the phytoplankton communities of Seomjin River estuary. The field surveys were carried out weekly at 4 stations from April to December of 1999 (Fig. 1). The samples were collected in 2 L by van-Dorn sampler from the surface and bottom water of each station. After they were transferred to the laboratory, the species were identified by light microscope with DIC (Model Axioplan 2, Zeiss) and a scanning electron microscope (Model S-4000, Hitachi). The Sedgwich-Rafter counting chamber was used for the quantitative enumeration of standing crops (Clesceri *et al.* 1989).

## RESULTS AND DISCUSSION

The total of 30 causative species of algal bloom including toxic ones were identified at Seomjin River estuary during this study (Lee and Yoo 2000). They were

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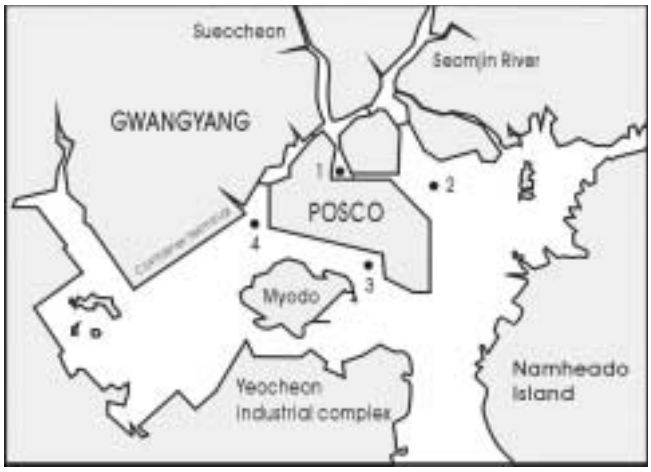


**Fig. 1.** A map showing sampling stations in the Seomjin River estuary.

composed of 13 species in Bacillariophyceae (*Asterionella glacialis, Chaetoceros pseudocurvisetus, Cylindrotheca closterium, Leptocylindrus danicus, Pseudo-nitzschia multiseries, P. pungens, P. seriata, Rhizosolenia fragilissima, R. setigera, Skeletonema costatum, Stephanopyxis palmeriana, Thalassionema nitzschioides,* and *Thalassiosira* sp.), 13 in Dinophyceae (*Ceratium furca, C. fusus, Dinophysis acuminata, Akashiwo sanguinea, Gyrodinium fissum, G. spirale, Heterocapsa triquetra, Katodinium glaucum, Noctiluca scintillans, Prorocentrum micans, P. minimum, P. triestinum,* and *Scrippsiella trochoidea*), 2 in Chrisophyceae (*Dictyocha fibula* and *D. speculum*), one in Cryptophyceae (*Chroomonas* sp.) and one in Ciliata (*Mesodinium rubrum*). The followings are the species that caused algal blooms during the present study period; 2 diatom species, *Skeletonema costatum* and *Thalassiosira* sp.; one *Chroomonas* sp. and two species in Prasinophyceae, which caused the mixed red tide. *S. costatum* showed high cell densities at station 1 in May and August, and at stations 2, 3, and 4 in August. The highest cell density was 32,700 cells · m$l^{-1}$ at station 1. The highest cell density at station was 6,100 cells · m$l^{-1}$ in July and August. This result indicated that cell density of *S. costatum* increased in spring (May) and summer (July and August) (Fig. 2A). *Thalassiosira* sp. showed high cell densities at station 3 in July and at station 4 in August with summer bloom (Fig. 2B). The mixed algal bloom composed of microflagellates inlcuding *Chroomonas* sp. and two species of Prasinophyceae occured at station 4 on June 21 with the cell density of 14,535 cells · m$l^{-1}$, which lasted for 5 days. Station 3 showed the cell density of 4,150 cells · m$l^{-1}$ on June 28 (Fig. 2A). The cell densities of the algal blooms during this study period were below the levels of the

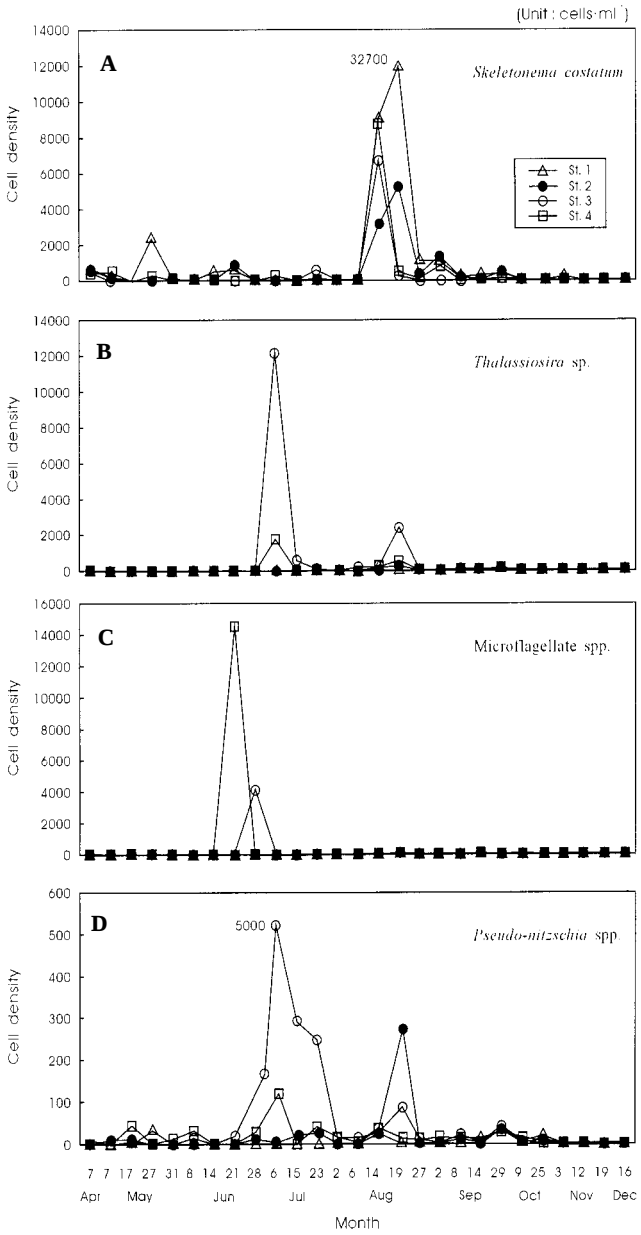


**Fig. 2.** Weekly variations of the causative species of red tide in the Seomjin River estuary.

HAB Warning and Alert densities defined by the National Fisheries Research and Development Institute (Kim *et al.* 2000).

The observed toxic phytoplankton species during the present study were listed as follows: one species of diatom, *Pseudo-nitzschia multiseries* causing amnesic shellfish poisoning and a species of dinoflagellate, *Dinophysis acuminata* causing diarrheic shellfish poisoning. As *P. multiseries* could not be identified at species level under a light microscope. I regarded *Pseudo-nitzschia* spp. as a species complex including *P. pungens, P. seriata* and *P. multiseries* and such species in the genus

*Pseudo-nitzschia* observed in Gwangyang Bay before (Lee 1994; Lee and Yoo 2000). In case of *Pseudo-nitzschia* spp., cell density of 130 cells · m$l^{-1}$ was observed at station 1 on June 21 and under 100 cells · m$l^{-1}$ in most cases. At station 3, the cell density increased between June 28 and July 23, showing the high cell concentration, 5,000 cells · m$l^{-1}$, on July 6; station 2 showed relatively high cell density on August 19, whereas station 4 showed relatively high cell density on July 6 (Fig. 2D); *Dinophysis acuminata* appeared at station 2 from spring through autumn with very low cell densities of below 100 cells · m$l^{-1}$ and more frequently in Spring.

This monitoring results indicated that *Skeletonema costatum* caused the bloom at station 1 in March and at all stations in August; *Thalassiosira* sp. bloom occurred at station 3 early in July and *Chroomonas* sp. bloom occurred at station 4 in June. Therefore, the bloom forming species at Seomjin River estuary were microflagellate of *Chroomonas* sp. and two Prasinophycese in June, *Thalassiosira* sp. in July and *S. costatum* in August.

*Chroomonas* sp. and two microflagellate bloom occurred locally, whereas *Skeletonema costatum* and *Thalassiosira* sp. blooms occurred widely at Seomjin River estuary. On the other hand, in the aspect of interspecific competition of red tide species, the *Chroomonas* sp. and two species of Prasinophyceae that was weak in competition appeared before diatom bloom, whereas dinoflagellate appeared widely at the whole estuary with low density.

Generally the scales of algal blooms at Seomjin River estuary have not reached to the level of the red tide warning and alert. Several toxic phytoplankton appeared in relatively lower densities in this area than in the other areas. Therefore, this area should be constantly monitored because this area has been experiencing frequent algal blooms caused by some diatoms and in addition there have been increasing microflagellates blooms in Gwangyang Bay.

## REFERENCE


Cho K.-A., Wui I.-S. and Choi C.-I. 1994. Ecological study of phytoplankton in the Kwang-Yang Bay. *Korean J. Environ. Biol.* **12:** 137-150.

Clesceri L.S., Greenberg A.E. and Trussell R.R. 1989. *Standard methods for the examination of water and wastewater*, 17th ed. APHA, Washington D.C. 10-54-10-66 pp.

Kim H.G., Lee S.G., An K.H., Youn S.H., Lee P.Y., Cho E.S., Kim J.B., Choi H.G. and Kim P.J. 1997. *Recent Red Tides in Korean Coastal Waters.* NFRDI, Busan. 280 pp.

Kim H.G., Lee Y.P., Lee S.G., Cho Y.C. and Choi H.G. 2000. *Handbook on Oceanography, Marine Environment and Harmful Algal blooms.* NFRDI, Busan. 346 pp.

Kim S.-Y., Moon C.-H. and Cho H.-J. 2003. Relationship between dinoflagellate cyst distribution in surface sediments and phytoplankton assemblages from Gwangyang Bay, a southern coastal area of Korea. *The Sea* **8:** 111-120.

Lee C.I. and Yoo J.S. 2000. *Monitoring of Marine Ecosystem of the Kwangyang Bay Nearby Kwangyang Iron and Steel Works.* Research Institute of Science and Technology, Kwangyang.

Lee J.H. 1994. Neurotoxin-producing diatom, *Pseudo-nitzsechia pungens* Grunow f. *multiseries* Hasle, off the coastal waters of southern Korea. I. Morphological features. *Korean J. Phycol.* **9:** 125-134.

Lee J.H. 1999. A review on red-tides and phytoplankton toxins in the coastal waters of Korea. *Korean J. Environ. Biol.* **17:** 217-232.

Park J.S. 1991. Red tide occurrence and countermeasure in Korea. In: Recent approches on red tides. Proceedings of "1990 Korean-French Semina on Red Tices" held Nov. 9-10, 1990 at NFRDA, Korea.

Shim J.H., Shin Y.K. and Lee W.H. 1984. On the phytoplankton distribution in the Kwangyang Bay. *J. Oceanol. Soc. Korea* **19:** 172-186.


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