



**THE MFRDMD/SEAFDEC FIRST REGIONAL WORKSHOP ON
REMOTE SENSING OF PHYTOPLANKTON**

Kuala Terengganu, Malaysia, 17-18 November, 1998

SEAFDEC/MFRDMD/WS/98/CR. 6

COUNTRY STATUS REPORT

VIETNAM

**STATUS OF MARINE
REMOTE SENSING APPLICATIONS IN VIETNAM**

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1.0 Applications of remote sensing in marine fisheries research.

Since 1980s, the remote sensing technique has been introduced in different fields. However, remote sensing application in marine research is still limited only in several studies such as:

- Sea surface temperature distribution mapping.
- Shallow sea bathymetric study.
- Coral reefs distribution mapping.
- Development of accumulative areas and changes of navigation channels mapping.
- Spatial structure of the storm and typhoon systems at the South China Sea analyses.

2.0 Status of phytoplankton research in seawaters of Vietnam.

As we know, plankton and zoo-benthos are the food sources of the fish in the sea. Knowledge in the rules of distribution and dynamic of biomass of those will give considerable contribution to the study of the distribution and dynamic of the marine fishery resources.

According to Nguyen Tien Canh (1994), there were 537 species of 4 phylum of algae in Vietnam waters, namely:

- Silicoflagellata with 2 species, constitutes 0.37%
- Cyanophyta with 3 species, constitutes 0.56%
- Pyrrophyta with 184 species, constitutes 34.26%
- Bacillariophyta with 348 species, constitutes 64.80%

In the Tonkin Gulf, 318 phytoplankton species were found, of which 1 species was of Silicoflagellata, 3 of Pyrrophyta and 230 of Bacillariophyta, taking 59.22% of the total species found in Vietnam seawaters.

In Central Vietnam, West and East of South Vietnam waters, there were 468 phytoplankton species of which 2 species was of Silicoflagellata, 3 of Cyanophyta, 159 of Pyrrophyta and 304 of Bacillariophyta, comprising of 87.15% of the total species found in Vietnam seawaters.

Vietnam waters is composed mainly of two seawater zones: The near shore water zones with low salinity, often less than 32.5‰, and the off shore water zones with high salinity, often higher than 33.5‰. Between them is a mixed water zone with the salinity of 32.5‰ - 33.5‰.

As few rivers come in near shore water of the Central Sea, water in this area has high salinity and many features of the offshore water to make it different from features of near shore waters in Tonkin Gulf, East of Southern Sea and West of Southern Sea.

Most of phytoplanktons in Vietnam seawaters are euryhaline and eurythermal, but some others distribute only in high or low salinity waters. Based on the distribution of

phytoplankton in different seawaters, they can be classified as follows (Nguyen Tien Canh, Truong Ngoc An and Nguyen Van Khoi, 1986):

- a. Species live in brackish water at the estuaries:
Chaetoceros abnormis, *Schmackeria speciosus*, *Acartia sinensis*, *A. bifilosa*
- b. Species prefer low salinity, represent those living in near shore waters:
Skeletonema costatum, *Ditylum sol*, *Thalassiothrix frauenfeldii*, *Hemidiscus hardmanianus*, *Hemiaulus indicus*
- c. Species prefer high salinity, represent those living in offshore waters with high salinity and high temperature:
Chaetoceros messanensis, *Ch. atlanticus*, *Coscinodiscus excentricus* (Bacillariophyta). Those species are also apparent in the Tonkin Gulf, where currents drive them in from offshore.
- d. Species distribute in the mixture of two above water masses, including both of euryhaline and eurythermic species such as:
Chaetoceros coartatus, *Ch. diverrus*, *Planktoniella sol*, *Coscinodiscus nobilis* (Bacillariophyta) and species only living in near shore waters such as:
Thalassionema nitzschioides, *Rhizosolenia imbricata*, *Hemidiscus hardmanianus*, *Stephanopyxis palmeriana* (Bacillariophyta).

The highest densities of phytoplankton observed in Vietnam seawater were:

- 125,892,000 cells/m³ observed in the Tonkin Gulf in September 1960
- 14,800,000 cells/m³ observed in Central Sea in September 1979
- 45,318,000 cells/m³ observed in East Southern Sea in May 1984
- 98,900,000 cells/m³ observed in West Southern Sea.

The phytoplankton density in Vietnam waters ranged between 437,000 - 5,549,000 cells/m³ (Table 1).

Area	Density (10 ³ cells/m ³)
Tonkin Gulf	1962
Central Sea	437
East of Southern Sea	872
West of Southern Sea	5549

Table 1: Average density of phytoplankton in Vietnam seawaters
(Source: MOFI, 1996. Fisheries Resources of Vietnam)

In comparison with the other seas, the density of the phytoplankton in seawater of Vietnam is rather higher. According to the surveys conducted by Zenrnova (1962) in north of Indian Ocean, the maximum average density was only 6,100 cells/m³ (in Andaman Sea); 3,600 cells/m³ (in Aden Gulf) and 1,200 cells/m³ (in Arabian Sea).

Kabanova's study on this ocean (1964) also gave the same results, i.e., 10,000 cells/m³ (in Andaman Sea), and 500 - 1,000 cells/m³ (in Bengal Gulf and in Arabian Sea).

According to Athan (1970) in his study in Singapore, the maximum average density was 1,600,000-1,700,000 cells/m³ observed respectively in April and May, almost less than 500,000 cells/m³ in other months. The average density for the whole year was only 575,000 cells/m³ (equal to that in Central Sea and East of Southern sea of Vietnam).

One of the special features of phytoplankton distribution in the Vietnam seawaters is that they often concentrate in near shore waters in the north or west of the Tonkin Gulf and Southern Sea. Those areas are near to the estuaries, with salinity of less than 32.4 ‰ and rich in nutrients, a good environment for phytoplankton to grow. Moreover, due to the influence of the upwelling water (in Central Sea, Tonkin Gulf), water from bottom layers is driven up to upper layers bringing also nutrients for phytoplankton.

Table 2 shows the average densities of phytoplankton in different seasons in four areas. The t-Student test has proven the difference in density of phytoplankton in different seasons and in different seas. The results of analyses showed that, in the Tonkin Gulf the density of phytoplankton in winter is higher than that in spring, much higher than that in summer and not much different in autumn. The density of phytoplankton in spring is not different from that in summer but lower than that in autumn. The highest density of phytoplankton is during summer in Central Sea and East of Southern Sea. In other seasons it is unclearly observed.

Sea area	Season	10 ³ cells/m ³
Tonkin Gulf	Winter	2,694
	Spring	1,149
	Summer	1,654
	Autumn	2,207
Central Vietnam	Winter	60
	Spring	22
	Summer	1,468
	Autumn	306
East of Southern Sea	Winter	800
	Spring	700
	Summer	1,468
	Autumn	340
West of Southern Sea	Winter	5,288
	Spring	5,809

Table 2: Average density of phytoplankton at the water layer of 0-100 m depth in Vietnam seawaters. (Source: MOFI, 1996. *Fisheries Resources of Vietnam*)

3.0 Needed research activities and Recommendation

- To obtain and analyse NOAA, SPOT and LANDSAT images to map the temperature distribution at the sea.
- To analyse images to study distribution and biomass of phytoplankton.
- To attend in training on methodology of satellite images processing to apply for fisheries.
- To participate in workshops, conferences both regional and international on the issues of applying remote sensing in marine fisheries.

4.0 Possibility of collaboration and research programs between Vietnam and other countries, and especially RIMP and SEAFDEC.

Research Institute of Marine Products (RIMP) has acquired equipment and software to analyse satellite images in marine fisheries research. The institute is still looking for sources of satellite images for research purposes. RIMP is willing to collaborate with organizations and nations in the region and in the world, and especially with SEAFDEC, in marine fisheries research in general and in application of remote sensing in marine fisheries in particular.

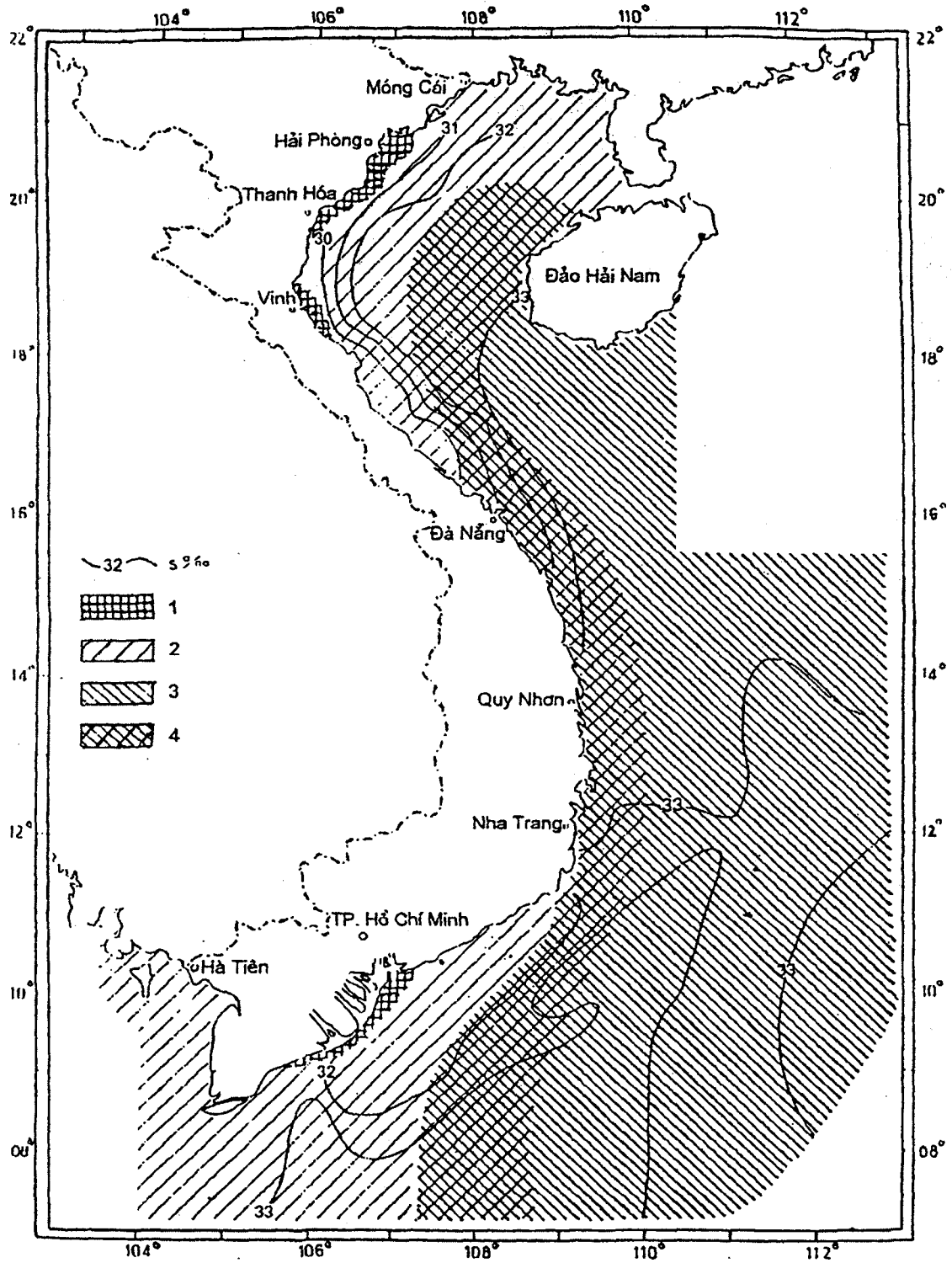






Figure 1. Distribution of phytoplankton species:
(Nguyen Tien Canh, 1989):

-  Near estuaries (1)
-  Low salinity, near shore seawater (2)
-  High salinity, off shore seawaters (3) and
-  Zone of mixture (4)

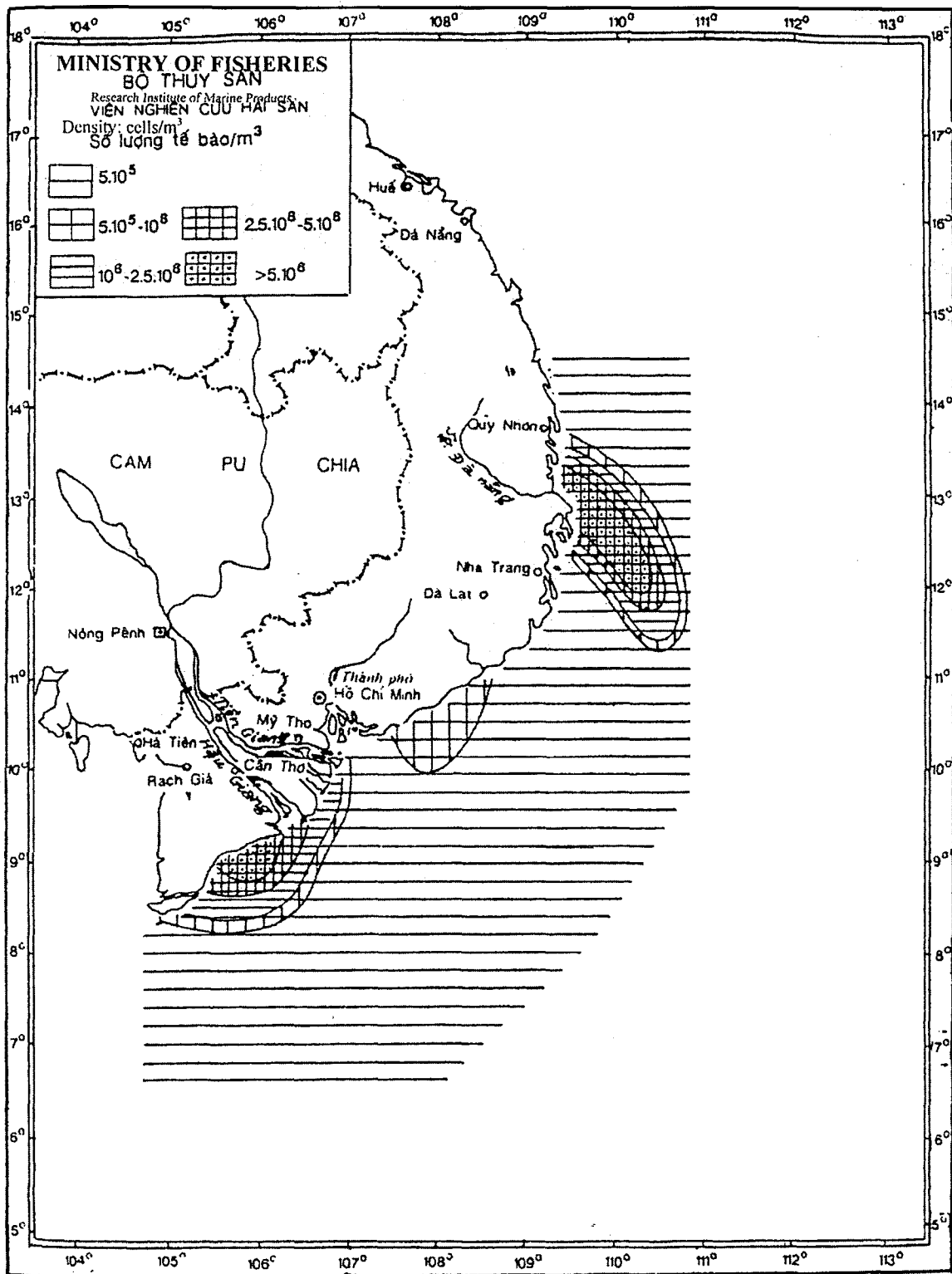


Figure 2. Distribution of phytoplankton in June 1979 in the Central Vietnam and East of Southern Sea (Nguyen Tien Canh, 1981)

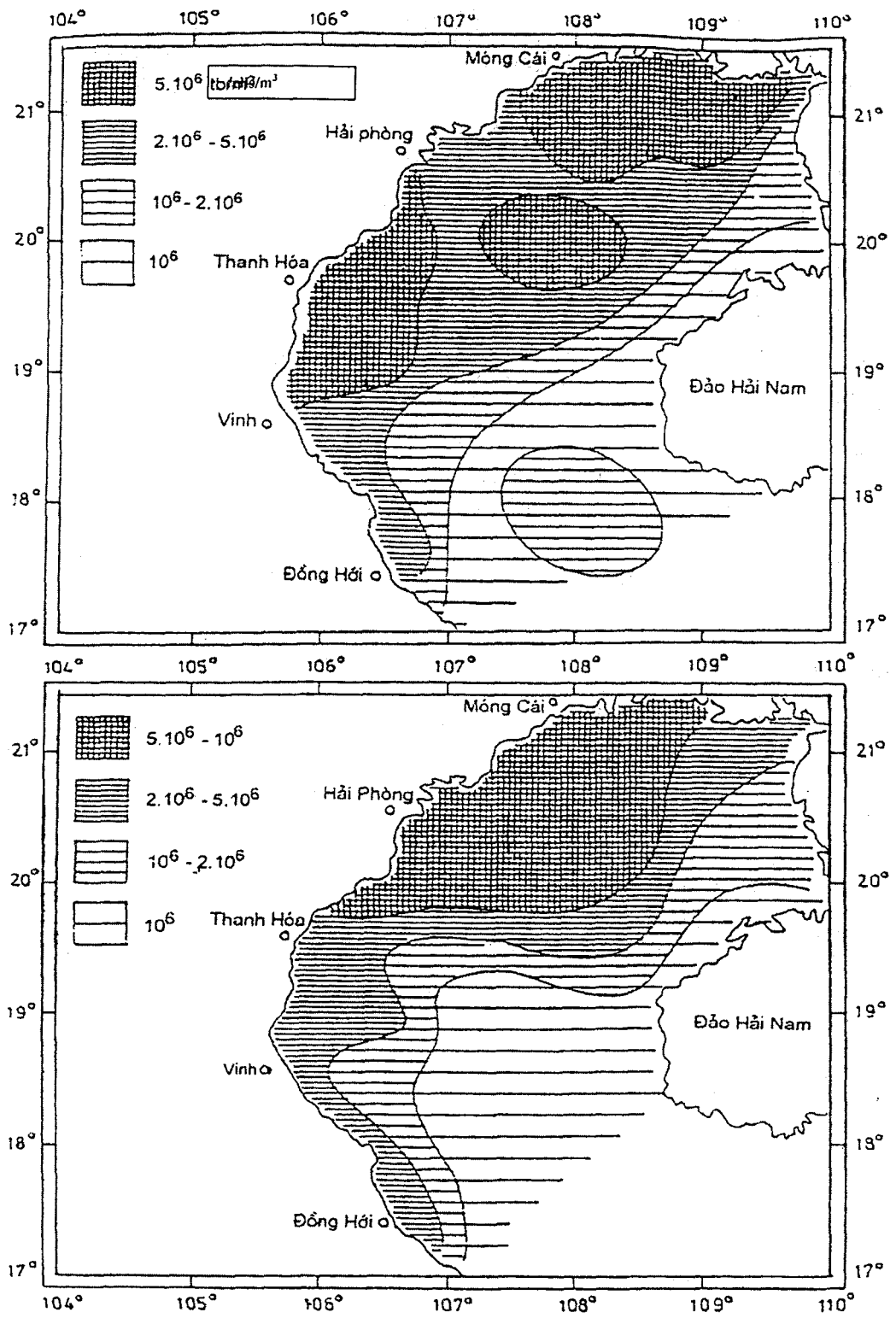


Figure 3: Distribution of phytoplankton cells in the Tonkin Gulf in the South West monsoon (1) and North East monsoon (2) (Nguyen Van Khoi, 1985)

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List of aronym

RIMP:	Research Institute of Marine Products.
MOFI:	Ministry of Fisheries.
SEAFDEC:	The South East Asian Fisheries Development Center
NOAA:	The National Oceanic and Atmospheric Agency