STUDY OF NITRATE AND NITRITE IN THALE SAP SONGKLA:
WATER QUALITY OF THALE SAP SONGKLA I

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ABSTRACT

A study of nitrate and nitrite in Thale Sap Songkla was
carried out during 1985-1988. Water samples were collected
every month and analysed by spectrophotometry using 1) Brucine
method and 2) cadmium reduction methods.

The results from these studies show that the nitrate
concentrations were in the range of 0.001-0.069 mg/L during
1985-1986, 0.020-0.705 mg/L during 1986-1987, and 0.216-0.791
mg/L during 1987-1988. In the dry season the concentrations of

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/ nitrate and nitrite were higher than those in the wet season on
every stations.

The concentration of nitrate and nitrite were high at the
stations near the outlet of small canal that passes through the
community areas (townn/city).

The overall results indicated that the nitrate and nitrite
increased significantly between 1985 to 1988. ⁿ

INTRODUCTION

The Songkla Lake Basin (SLB), is a sub-region on the eastern side of Southern Thai Peninsula, consists of Thale Luang, Thale Sap, and Thale Sap Songkla (Figure 1).

Thale Sap Songkla is the most seaward of the SLB and is essentially a marine system which is flushed regularly by tidal exchange and also by the fresh water. It also receives urban liquid wastes from the local community area through thd klong (small canal).

The water quality of the Thale Sap Songkla was determined by certain parameters studied by the author and coworkers. The nitrate and nitrite was one of the parameters.

Nitrogen as nitrate, nitrite, and ammonia are the most important nutrients besides phosphorus-phosphate. Increasing the concentration of nitrates in water produces the overall effect of an increasing in the rate of plant growth which can produce algae bloom condition, particularly in slow-moving waters in the summer and spring. The bloom reduces light penetration and restricts atmospheric reoxygenation of water.

EXPERIMENTAL PROCEDURES

Sampling and Analysis

Water samples were collected, (a) at the surface and (b) at one meter depth, from eight stations in Thale Sap Songkla (Figure
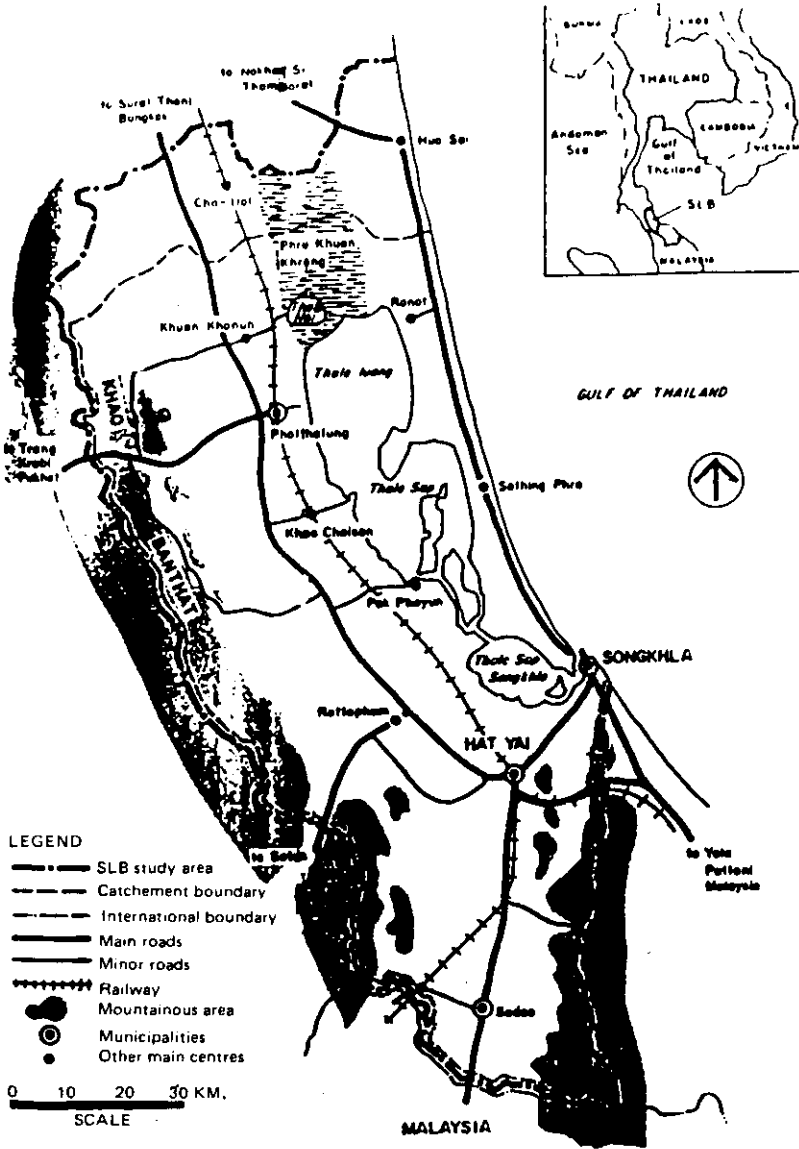
Figure 1   The Eastern Side of Southern Thai Peninsula
              (showing Thale Luang, Thale Sap, and Thale
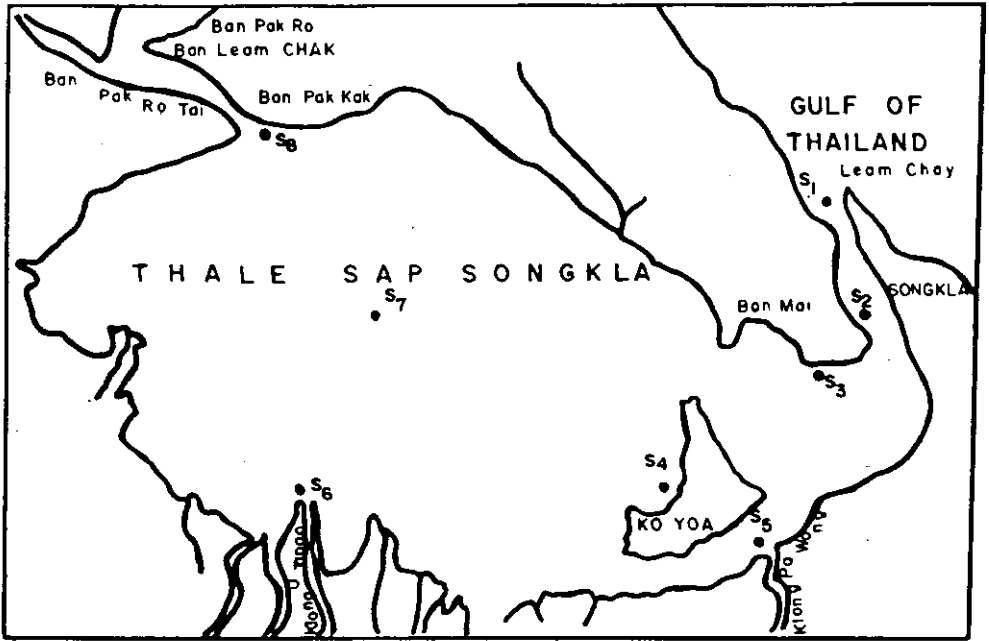   Sap Songkla, the Songkla Lake Basin)

Figure 2   Water Sampling Stations In Thale Sap Songkla, S1-S8

2) every month from July 1985 - March 1988 using polyethylene
bottles.   The samples were preserved by adjusting the pH <2 with
sulfuric acid   and then keeping at $4^{\circ}C$.

The nitrate concentrations were analysed by Brucine's method
(1,2) at the optimum conditions (3) i.e. pH 6-7, temperature $90^{\circ}C$
time 25 minutes, and the optimum absorption wavelength of 410
nanometer.   The total nitrate and nitrite were determined by
cadmium reduction's method (1,2) with the optimum conditions (3)
i.e. time for cadmium coated with copper sulfate 5 minutes and
washed with water at least 10 times (each time about 1 minute),
cadmium column length 10 centimeters, and the optimum absorption
wavelength of 543 nanometer.

Table 1   The Concentration of Nitrate in Thale Sap Songkla

(July 1985 to March 1988)

Station	Average Nitrate concentration, mg/L		
	1985-1986	1986-1987	1987-1988
S_{1s}	0.021	0.204	0.527
S_{1D}	0.011	0.192	0.612
S_{2s}	0.033	0.169	0.513
S_{2D}	0.014	0.161	0.581
S_{3s}	0.047	0.222	0.456
S_{3D}	0.038	0.215	0.467
S_{4s}	0.049	0.238	0.453
S_{4D}	0.032	0.223	0.459
S_{5s}	0.021	0.571	0.472
S_{5D}	0.020	0.541	0.524
S_{6s}	0.028	0.511	0.558
S_{6D}	0.025	0.534	0.482
S_{7s}	0.028	0.029	0.492
S_{7D}	0.015	0.024	0.466
S_{8s}	0.058	0.029	0.447
S_{8D}	0.012	0.025	0.464

S_{s} , $_{s}D$ = surface and 1 meter depth water sample , ND = nondetectable

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Table 2   The Concentration of Nitrite in Thale Sap Songkla

(July 1985 to March 1988)

Station	Average Nitrite concentration, mg/L		
	1985-1986	1986-1987	1987-1988
S_{1s}	ND	0.001	0.008
S_{1D}	ND	0.002	0.010
S_{2s}	ND	0.001	0.009
S_{2D}	ND	0.002	0.009
S_{3s}	ND	0.002	0.010
S_{3D}	ND	0.002	0.010
S_{4s}	ND	0.002	0.008
S_{4D}	ND	0.002	0.011
S_{5s}	ND	0.004	0.007
S_{5D}	ND	0.004	0.007
S_{6s}	ND	0.003	0.013
S_{6D}	ND	0.004	0.014
S_{7s}	ND	ND	0.009
S_{7D}	ND	ND	0.008
S_{8s}	ND	ND	0.008
S_{8D}	ND	ND	0.008

S_s, S_D = surface and 1 meter depth water sample, ND = nondetectable
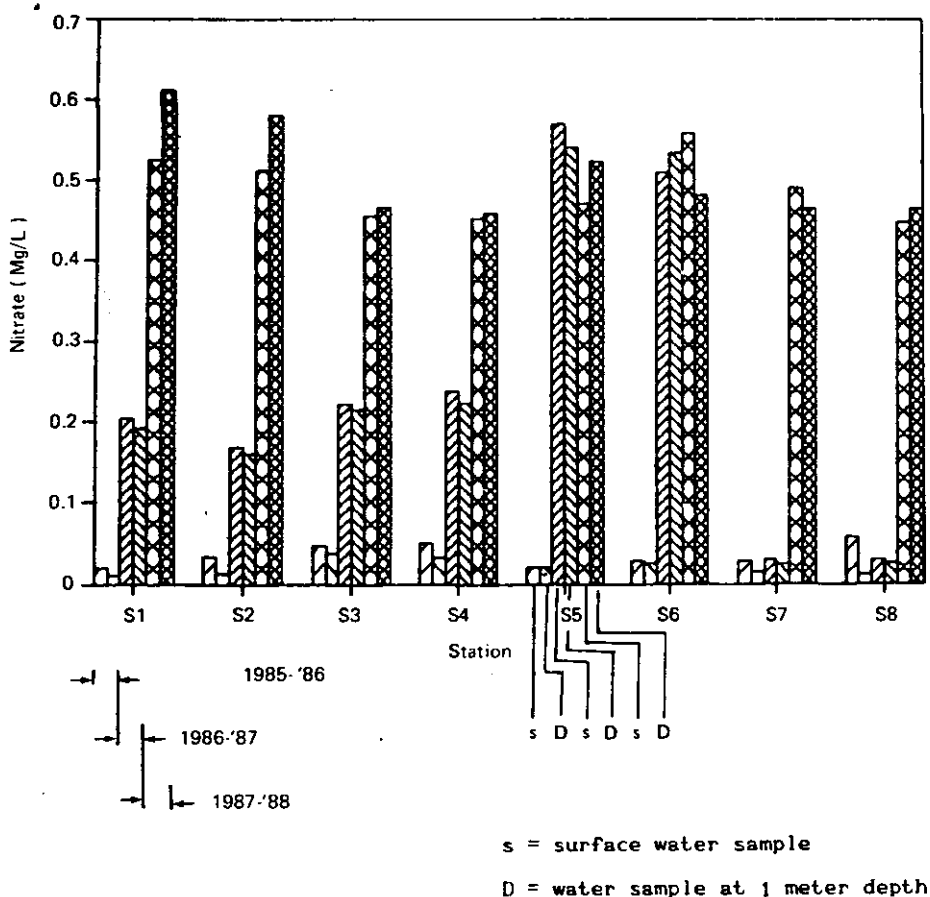
Figure 3   The Nitrate Concentrations in Thale Sap Songkla between
              July 1985 – March 1988

All the water samples collected from Thale Sap Songkla were
analysed for nitrate and total nitrate plus nitrite.   The dif-
ference between these two give the concentration of nitrite in the
samples.

RESULTS AND DISCUSSION

Since the optimum conditions were use in these analyses of
nitrate and nitrite the recovery were 99.6% and 100.5 respectively
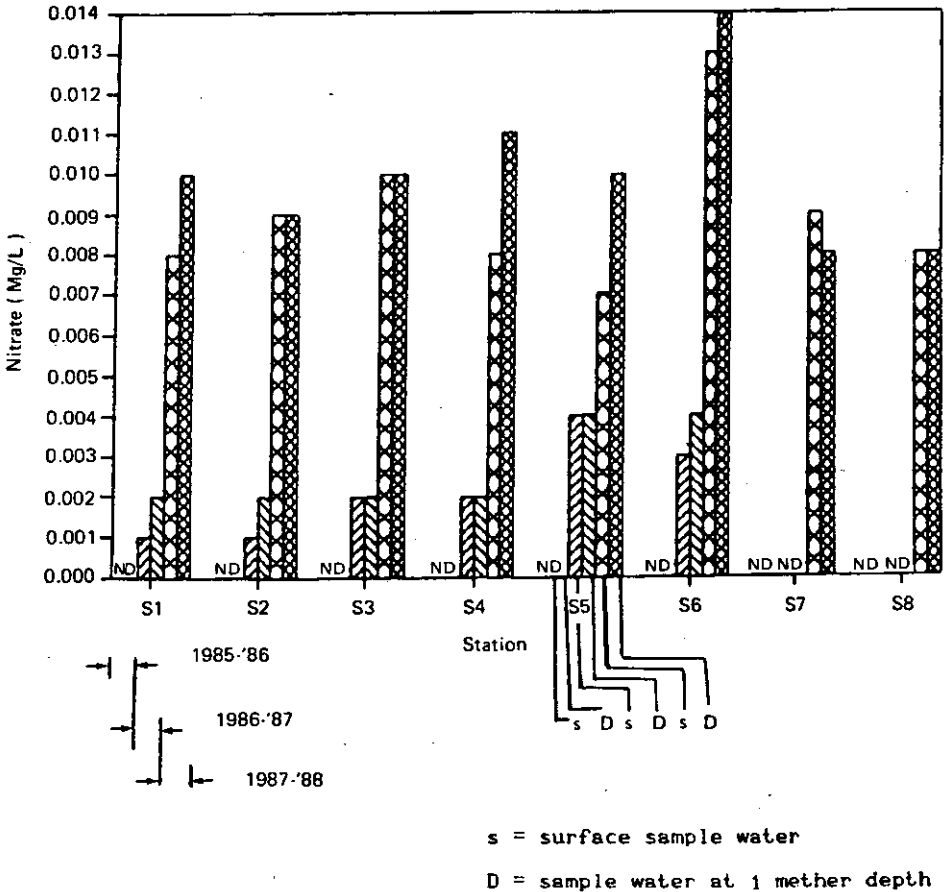
Figure 4   The Nitrite Concentration in Thale Sap Songkla between
              July 1985 - March 1988

(3).   The detection limit of nitrate determination was in the range
of 0.1-2.0 mg/L and nitrite was in the range of 0.0-1.0 mg/L.

      The water samples were analysed and the concentrations of
NO_a-nitrogen were determined directly from the standard calibra-
tion curve and then calculated from the equation

$$mg/l\ NO_3\text{-nitrogen}\ =\ \frac{ug\ NO_3\text{-nitrogen}}{mg\ sample}$$

The total nitrate and nitrite ($NO_3^- + NO_2^-$) from the absorbance
(substracting the background absorbance from the measured absorbance
of the sample). The nitrite concentration were calculated by
substracting NO_3^- from $NO_3^- + NO_2^-$.

The sample from Thale Sap Songkla were analysed during July
1985 – March 1988. The average concentrations of nitrate and
nitrite in Thale Sap Songkla within these three year (July 1985 –
March 1988) are shown in Table 1 and 2. The graphs of nitrate and
nitrite concentration in each station during three years are shown
in Figure 3 and Figure 4.

From this study it can be seen that the concentrations of
nitrate and nitrite in each station increased significantly from
July 1985 to March 1988. The nitrate concentration of the surface
water and the one mether depth (or as deep as it can be eg. 0.7
meter in some station) did not show any significance different and
therefore it can be concluded that the water is homogeneous. The
nitrite concentrations of the surface water samples were less than
those from the one mether depth probably due to the oxidation of
oxidation of nitrite to nitrate. The nitrite concentrations in
all stations were less than nitrate concentrations which indicated
that in natural water nitrates are more stable.

From the results of this study we suggested that the nitrate
and nitrite parameters should be monitored frequently since they
had increased approximately ten times within these three years.
These increases can be serious source of pollution in the future.

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