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APPENDIX

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Appendix A

The Upper Gulf of Thailand database

The database of the Upper Gulf of Thailand was separated two different groups. First, the oceanography database includes hydrology, chemistry, other observations in the Upper Gulf and loads from terrestrial that drain into the Upper Gulf. Second, the weather database includes the information about meteorological observations around the Upper Gulf of Thailand. Their structure is the following table:

- The master table of oceanography contains information on where, when, and by whom the samples were taken.

Stations:

Field Name	Field Type
ID	N*
LAT	N
LON	N
SQDEG	N
WDEPTH	N
DAY	N
MONTH	N
YEAR	N
TIME	N
STNNO	A30
GROUP	A30

- The different detail tables of oceanography include all information of the Upper Gulf of Thailand (for example hydrological, chemical, state of sea, etc.).

Hydro:

Field Name	Field Type
ID	N*
OBSDEP	N*
DEPCODE	N
QOBSDEP	N
TEMP	N
QTEMP	N
SALIN	N
QSALIN	N
SALIN_MET	N
OXYGEN	N
QOXYGEN	N
DENSITY	N
QDENSITY	N

This table contains the hydrological information of the Upper Gulf of Thailand.

Chem:

Field Name	Field Type
ID	N*
OBSDEP	N*
QOBSDEP	N
PO4P	N
QPO4P	N

Appendix A (continued)

Chem: (continued)

TOTP	N
QTOTP	N
NO2N	N
QNO2N	N
NO3N	N
QNO3N	N

This table contains the chemical information of the Upper Gulf of Thailand.

Chlor:

Field Name	Field Type
ID	N*
OBSDEP	N*
QOBSDEP	N
CHL	N
QCHL	N

This table contains the Chlorophyll information of the Upper Gulf of Thailand.

pH:

Field Name	Field Type
ID	N*
OBSDEP	N*
QOBSDEP	N
PH	N
QPH	N

This table contains pH data of the Upper Gulf of Thailand.

Statesea:

Field Name	Field Type
ID	N*
Air Pressure	N
Air Temp	N
Wind Speed	N
Wind Dir	N
Current Speed	N
Current Dir.	N
SignWavHgt	N
Waveper	N
Color	N

This table contains the state of sea and color information of the Upper Gulf of Thailand.

Oxylight:

Field Name	Field Type
ID	N*
OXYSAT	N
Att. coeff. blue	N
Att. coeff. green	N
Att. coeff. red	N
Gamma rd. 1st region	N
Gamma rd. 2nd region	N
Gamma rd. 3rd region	N

Appendix A (continued)

Oxylight: (continued)

Field Name	Field Type
Gamma rd. 4th region	N

This table contains the light and oxygen saturation information of the Upper Gulf of Thailand.

Units:

Field Name	Field Type
GROUP	A20
COMPLETE NAME	A70
TEXTCODE	A20
VARIABLE	A38
UNITS	A22
METHOD	A90

This table includes abbreviated and completed group name that provided data, text code (TEMP, PO4, OXYGENSAT, etc.), variable code (temperature, phosphate, % oxygen saturation, etc.), units (°c, µg-at/l) and methods that were used.

River:

Field Name	Field Type
RIVER	A20
YEAR	N
MONTH	N
FLOW (MCM.)	N
NO2 (mg/l)	N
NO2ld (Kg.)	N
NO3 (mg/l)	N
NO3ld (Kg.)	N
NH3 (mg/l)	N
NH3ld (Kg.)	N
TKN (mg/l)	N
TKNld (Kg.)	N
ORGN (mg/l)	N
ORGNld (Kg.)	N
PO4 (mg/l)	N
PO4ld (Kg.)	N
TOTP (mg/l)	N
TOTPld (Kg.)	N

This table contains the riverborne nutrient loads of the major rivers that drain into the Upper Gulf of Thailand.

Runoff:

Field Name	Field Type
Year	N
Month	N
RUNOFF MAE KLONG (MCM.)	N
RUNOFF CHOA PRAYA (MCM.)	N
RUNOFF NAKHON NAYOK (MCM.)	N
RUNOFF PACHIN (MCM.)	N
RUNOFF THA CHIN (MCM.)	N
RUNOFF BANGPAKONG (MCM.)	N

This table contains the freshwater runoff information of the major rivers that drain into the Upper Gulf of Thailand.

Appendix A (continued)

- The master table of the weather contains information on where, when, and by whom the observations were made.

Station:

Field Name	Field Type
ID	N*
Station	A22
Province	A21
Year	N

- The different detail tables of the weather include cloud, dry and wet bulb temperature, evaporation, rainfall, sunshine duration and wind direction observations around the Upper Gulf of Thailand.

Mcloud:

Field Name	Field Type
ID	N*
Jan	N
Feb	N
Mar	N
Apr	N
May	N
Jun	N
Jul	N
Aug	N
Sep	N
Oct	N
Nov	N
Dec	N
Annual	N

This table contains the cloud information.

Mdry-x-n:

Field Name	Field Type
ID	N*
Month	N*
Mean	N
Daymax	A9
Maximum	N
Daymin	A9
Minimum	N
AnnualMean	N
AnnualMax	N
Yeardaymax	A9
AnnualMin	N
Yeardaymin	A9

This table contains the dry bulb temperature information.

Mevap:

Field Name	Field Type
ID	N*
Jan	N
Feb	N

Appendix A (continued)

Mevap: (continued)

Mar	N
Apr	N
May	N
Jun	N
Jul	N
Aug	N
Sep	N
Oct	N
Nov	N
Dec	N
Annual	N

This table contains the evaporation information.

Mrain:

Field Name	Field Type
ID	N*
Type	A7*
Jan	N
Feb	N
Mar	N
Apr	N
May	N
Jun	N
Jul	N
Aug	N
Sep	N
Oct	N
Nov	N
Dec	N
Annual	N

This table contains the rainfall information.

Msund:

Field Name	Field Type
ID	N*
Jan	N
Feb	N
Mar	N
Apr	N
May	N
Jun	N
Jul	N
Aug	N
Sep	N
Oct	N
Nov	N
Dec	N
Annual	N

This table contains the sunshine duration formation.

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Appendix A (continued)

Mwet:

Field Name	Field Type
ID	N*
Jan	N
Feb	N
Mar	N
Apr	N
May	N
Jun	N
Jul	N
Aug	N
Sep	N
Oct	N
Nov	N
Dec	N
Annual	N

This table contains the wet bulb temperature information.

Mwind:

Field Name	Field Type
ID	N*
Jan	N
Prev_Jan	A10
Feb	N
Prev_Feb	A10
Mar	N
Prev_Mar	A10
Apr	N
Prev_Apr	A10
May	N
Prev_May	A10
Jun	N
Prev_Jun	A10
Jul	N
Prev_Jul	A10
Aug	N
Prev_Aug	A10
Sep	N
Prev_Sep	A10
Oct	N
Prev_Oct	A10
Nov	N
Prev_Nov	A10
Dec	N
Prev_Dec	A10

This table contains the wind direction information.

- The special tables include the missing information which impossible to create ID and link to other tables.

Hydro:

Field Name	Field Type
ID	N

Appendix B

Script for helping to access the Upper Gulf of Thailand database:

Script Check_id

This script will update the table Last_id to run the script New_id.

```
password "see"
@1,1 ?? "Script checks min and max ID for each year from 59 to 94."

Query

 Stations |           ID           |
          | calc min,calc max ,59.. |
          | calc min,calc max ,60.. |
          | calc min,calc max ,61.. |
          | calc min,calc max ,62.. |
          | calc min,calc max ,63.. |
          | calc min,calc max ,64.. |
          | calc min,calc max ,65.. |
          | calc min,calc max ,66.. |
          | calc min,calc max ,67.. |
          | calc min,calc max ,68.. |
          | calc min,calc max ,69.. |
          | calc min,calc max ,70.. |
          | calc min,calc max ,71.. |
          | calc min,calc max ,72.. |
          | calc min,calc max ,73.. |
          | calc min,calc max ,74.. |
          | calc min,calc max ,75.. |
          | calc min,calc max ,76.. |
          | calc min,calc max ,77.. |
          | calc min,calc max ,78.. |
          | calc min,calc max ,79.. |
          | calc min,calc max ,80.. |
          | calc min,calc max ,81.. |
          | calc min,calc max ,82.. |
          | calc min,calc max ,83.. |
          | calc min,calc max ,84.. |
          | calc min,calc max ,85.. |
          | calc min,calc max ,86.. |
          | calc min,calc max ,87.. |
          | calc min,calc max ,88.. |
          | calc min,calc max ,89.. |
          | calc min,calc max ,90.. |
          | calc min,calc max ,91.. |
          | calc min,calc max ,92.. |
          | calc min,calc max ,93.. |
          | calc min,calc max ,94.. |

Endquery

Do_It!
rename "ANSWER" "Last_id"
□
```

Appendix B (continued)

Script New_id

This script is adapted to create ID for observations dating from 1968 up to 1994.

```
{Modify} {Restructure} {Station} Down Ins Right  "NYID" Right
 "n" Down Ins Left  "MaxID" Right  "n" Down Ins Left  "Y" Right
 "n" Do_It!

ARRAY Año[27]
FOR i FROM 1 TO 27
  Año[i]=0
ENDFOR
EDIT "Station"
SCAN
[Y]=[Year]
  i=[Y]-1967
  Año[i]=Año[i]+1
  SWITCH
    CASE [Y]=1968:  [MaxID]=680000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1969:  [MaxID]=690000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1970:  [MaxID]=700000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1971:  [MaxID]=710000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1972:  [MaxID]=720000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1973:  [MaxID]=730000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1974:  [MaxID]=740000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1975:  [MaxID]=750000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1976:  [MaxID]=760000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1977:  [MaxID]=770000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1978:  [MaxID]=780000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1979:  [MaxID]=790000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1980:  [MaxID]=800000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1981:  [MaxID]=810000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1982:  [MaxID]=820000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1983:  [MaxID]=830000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1984:  [MaxID]=840000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1985:  [MaxID]=850000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1986:  [MaxID]=860000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1987:  [MaxID]=870000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1988:  [MaxID]=880000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1989:  [MaxID]=890000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1990:  [MaxID]=900000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1991:  [MaxID]=910000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1992:  [MaxID]=920000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1993:  [MaxID]=930000   [NYID]=[MaxID]+Año[i]
    CASE [Y]=1994:  [MaxID]=940000   [NYID]=[MaxID]+Año[i]

  ENDSWITCH
ENDSCAN
DO_IT!

ECHO NORMAL
ECHO OFF
RETURN
```

Appendix B (continued)

Script Timeseries

There is a script called Timeser that you can use to extract time series for a specific station or co-ordinate interval, and use with the TS&CS program. When you run it, first you have to choose the parameter that you want to include (temp, salinity or any other).

You get the following menu:

Choose one number: 1=sal, 2=temp, 3=OXYGEN, 4=PO4P,
5=TOTP, 6=SIO4(not avail.), 7=NO3N, 8=NO2N, 9=NH4N (not avail.),
10=TOTN (not avail) or 11=EXIT

The script extracts the information from the database (Date, Time, Obsdep and a specific parameter), then it creates the Day, Month and Year columns and adapts the Time column. If time is missing, then it is replaced by zero. The user can sort the answer table by date, time and depth and then to export and use the time series options from the TS&CS program, directly.

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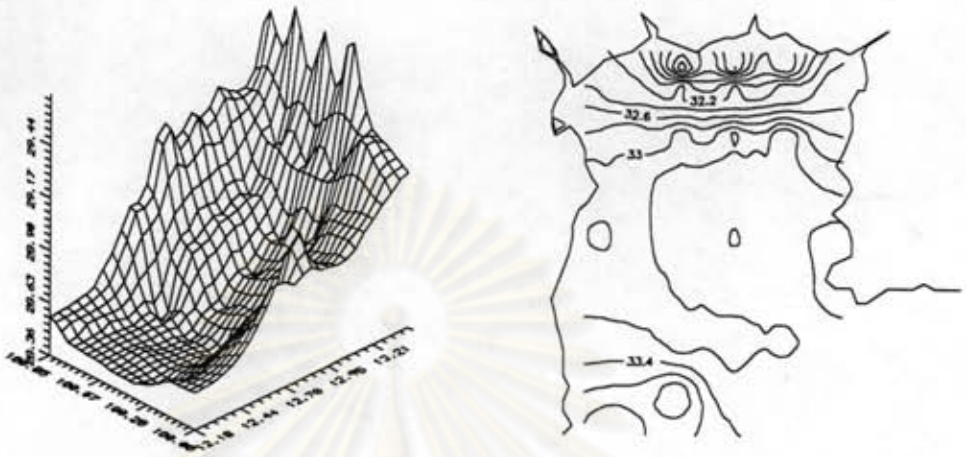
Appendix B (continued)

Script Surfer

Maybe you would like to run the Surfer program to create 3d surface diagrams or contour plots like:



In this case, you have to run a query like the next one (you get this if you run the script surfer1):

Stations	ID	LAT	LON	MONTH	YEAR	
	_id	Check not blank	Check not blank	3	1993	

Hydro	ID	OBSDEP	SALIN	QSALIN
	_id	0	Check	not 0

What you are doing is to get LAT, LON, and a parameter like Salinity for a date and depth that you chose. The answer table will include LAT, LON and Salinity.

Next step is to run surfer2 to adapt the co-ordinates to the Surfer program in the next way:

Restructure the answer table to create the new fields QLAT and QLON and make the following calculations:

```
QLAT=INT(LAT/100)+(LAT-INT(LAT/100)*100)60
QLON=INT(LON/100)+(LON-INT(LON/100)*100)60
```

Now you can export the answer table as a WK1 file with the fields QLAT, QLON and Salinity and runs The Surfer program to draw 3d surface diagrams or contour plot.

Appendix B (continued)

Script Askthai

If you would like to extract some information from the database to do something. You can run askthai script to extract the information that you want. When you run this script, you get the following menu:

GULF OF THAILAND DATABASE

MENU

1. Hydrology and chemistry
2. Oxygen sat. and light
3. River loads
4. Runoff
5. State of the Sea
6. EXIT

Type the number that corresponds to the subject you want to check. There will be several linked tables. Use DOWN or UP IMAGE to select any table and type your queries. If you want to remove any of them select it first and then press F8.

First, you have to choose the item that you want from the menu. Next step, the script will link that item with the station table. The last, when you get the queries, you can ask specified information that you want by checked marked at those fields.

Maybe you would like to run the TS&CS program to draw transect plot, you must have the table that contains LAT, LON, OBSDEP and specific parameter (use askthai script to extract this table). Then, you export the table to WK1 file and change to text file. When you have the text file already, you can run the TS&CS program to draw transect plot.

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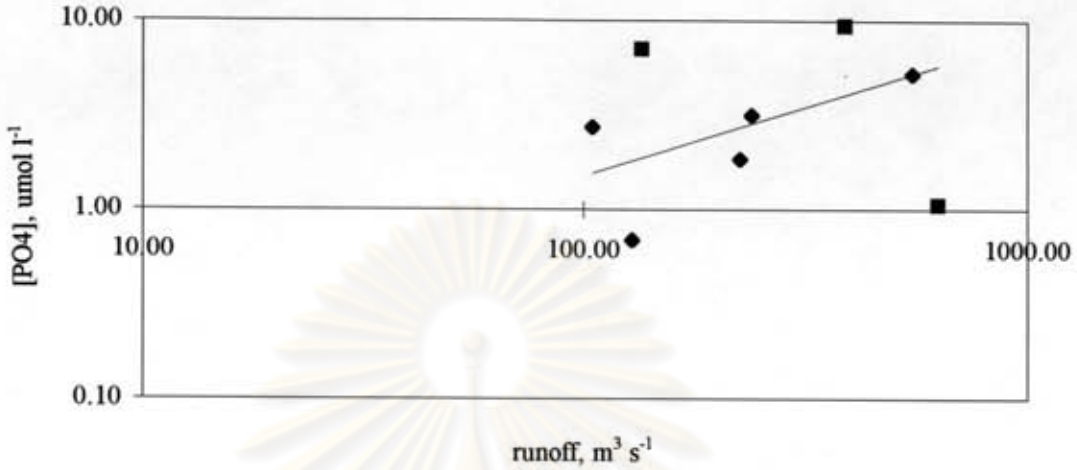
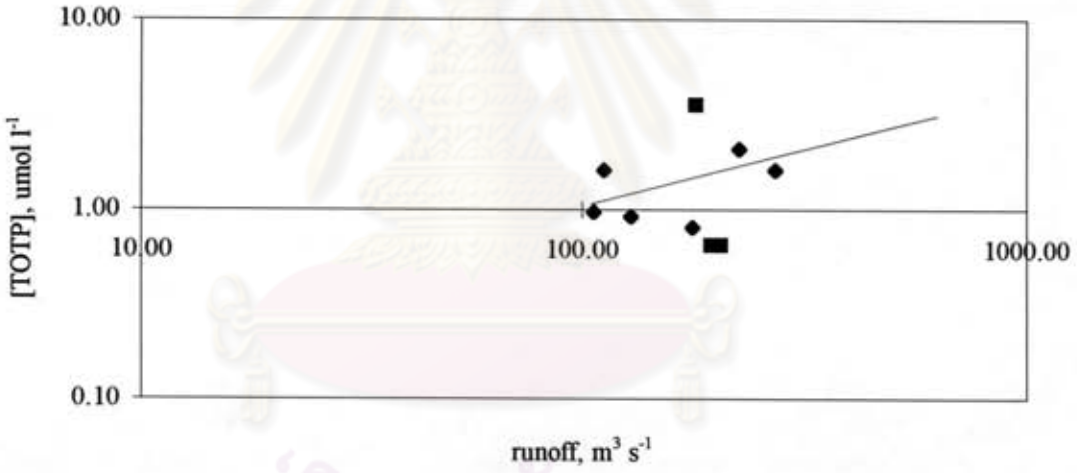
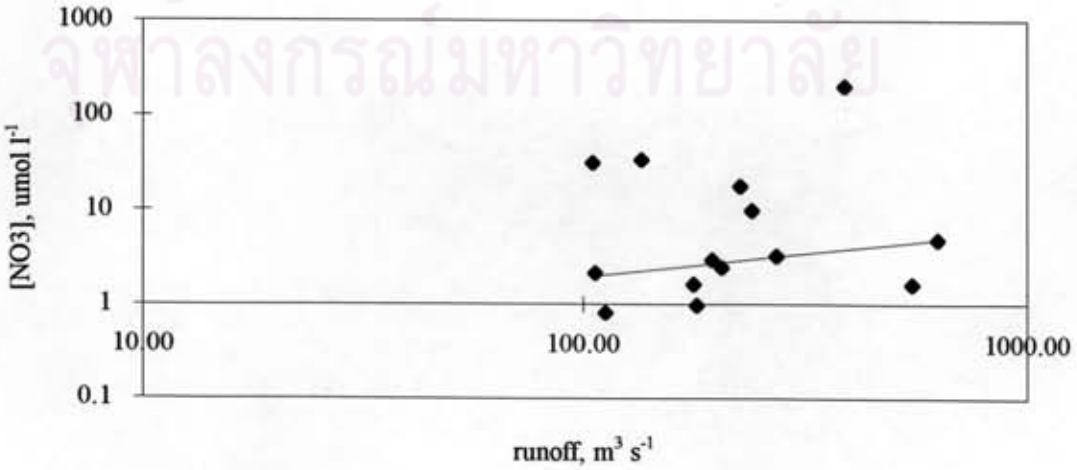
Appendix C

The interpolation of monthly riverborne nutrient concentrations for four major rivers

Log-log relationships for nitrate, phosphate, total phosphorus and river runoff for Chao Phraya River







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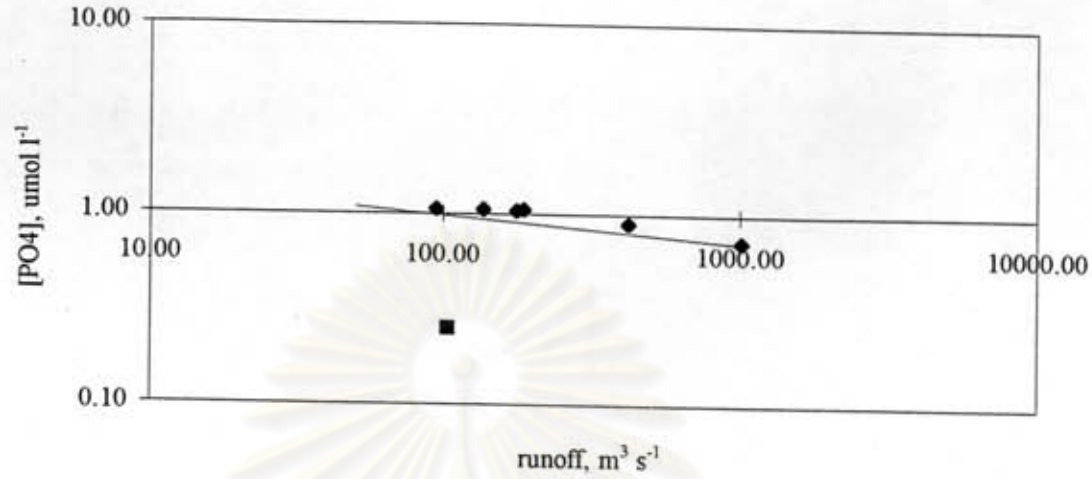
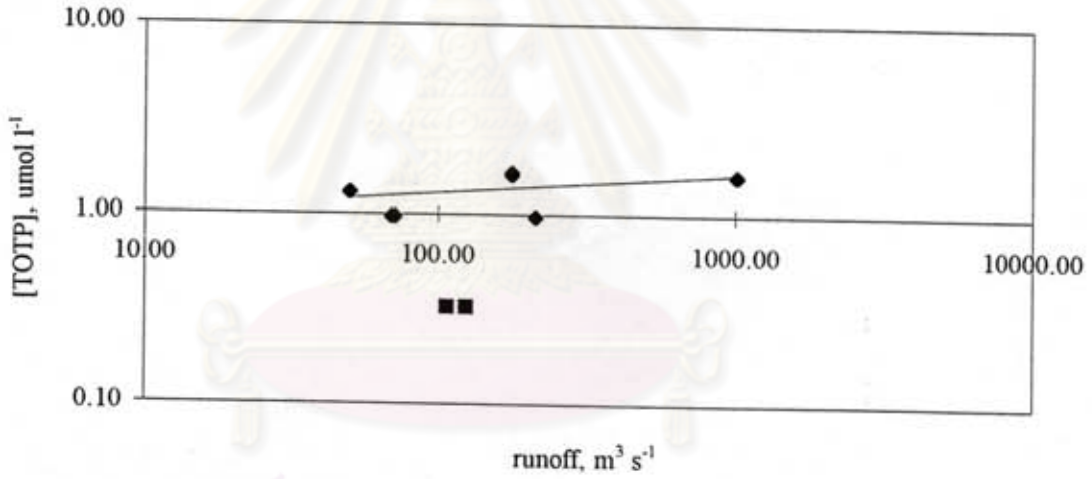
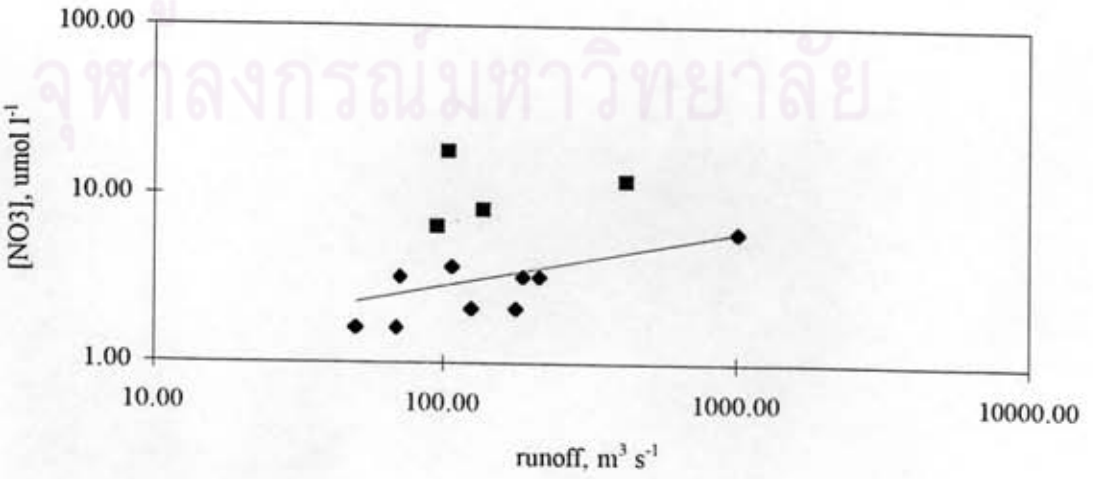
Appendix C (continued)

Log-log relationships for nitrate, phosphate, total phosphorus and river runoff for Mae Klong River







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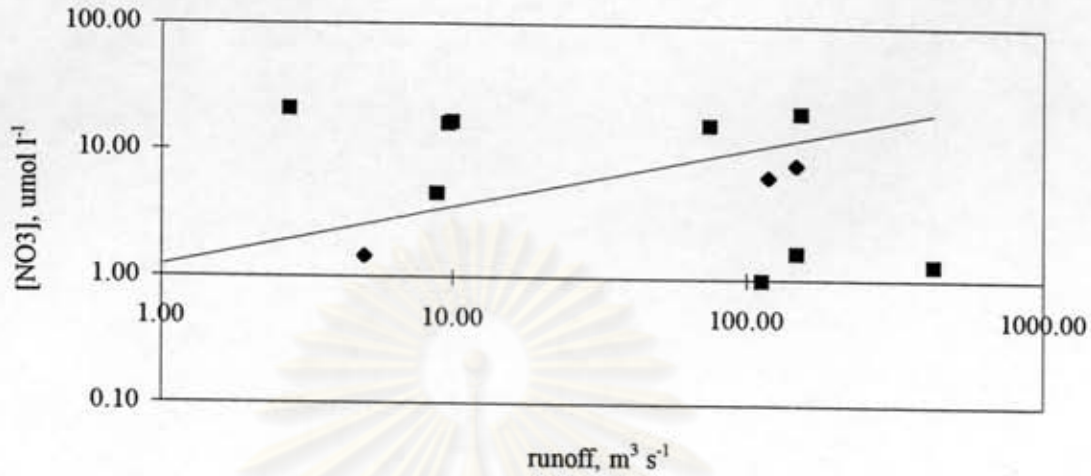
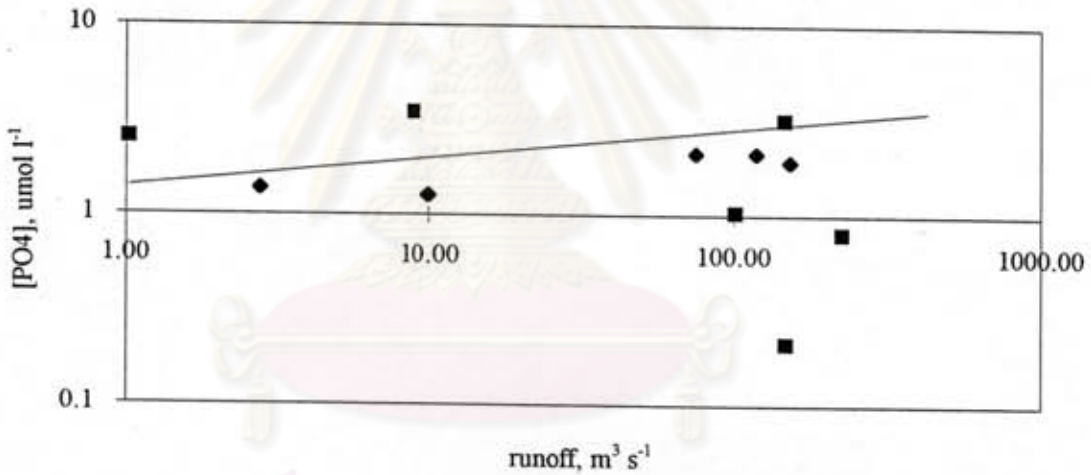
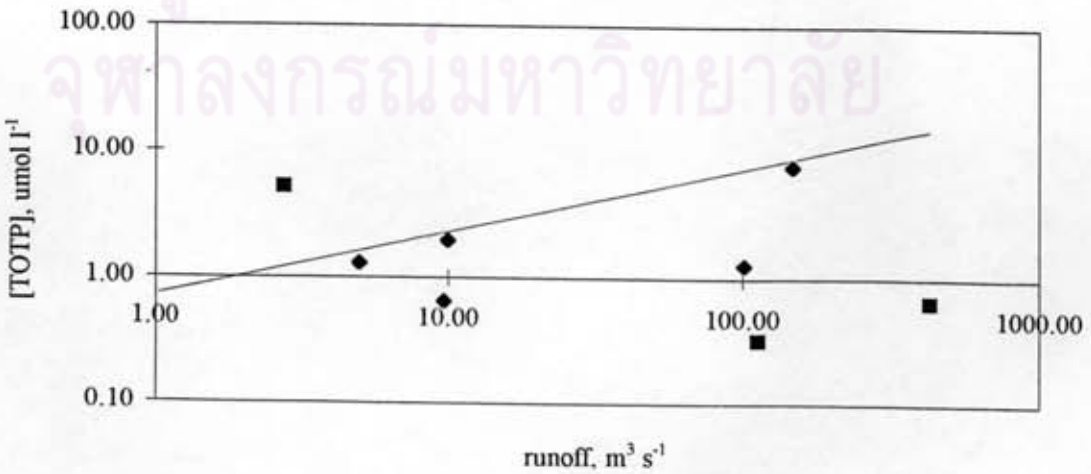
จุฬาลงกรณ์มหาวิทยาลัย

Appendix C (continued)

Log-log relationships for nitrate, phosphate, total phosphorus and river runoff for Bangpakong River



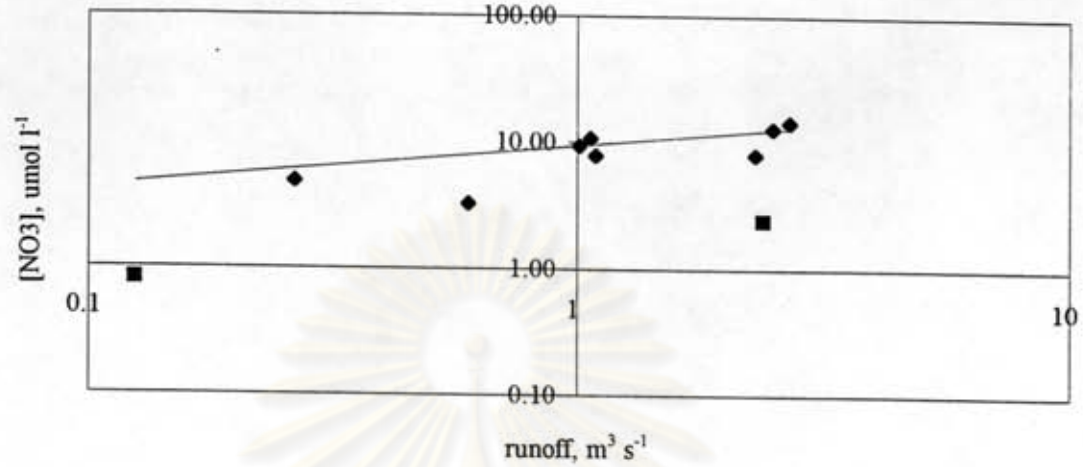


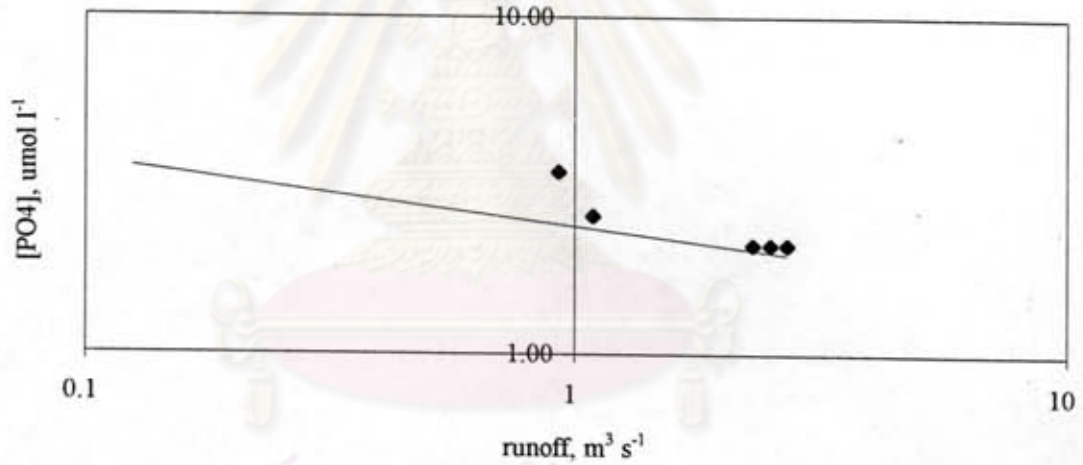


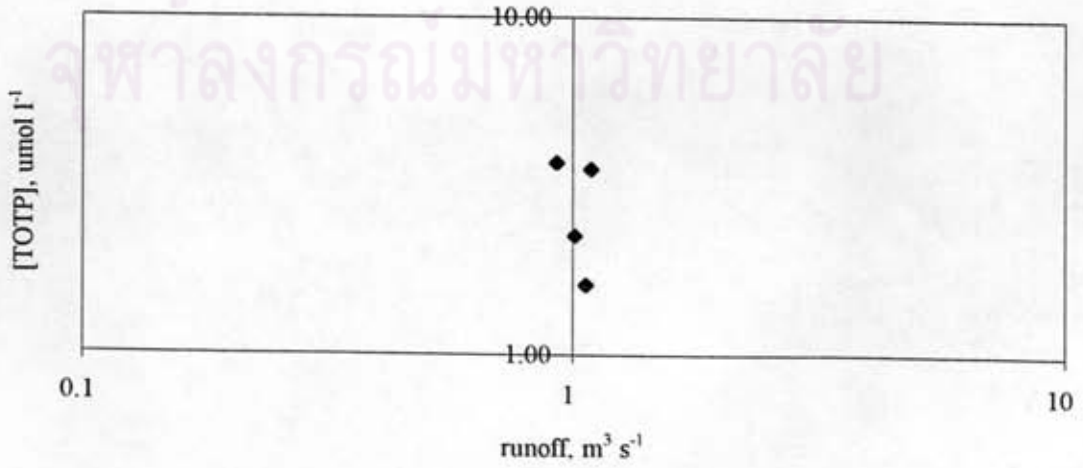
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix C (continued)

Log-log relationships for nitrate, phosphate, total phosphorus and river runoff for Ta Chin River





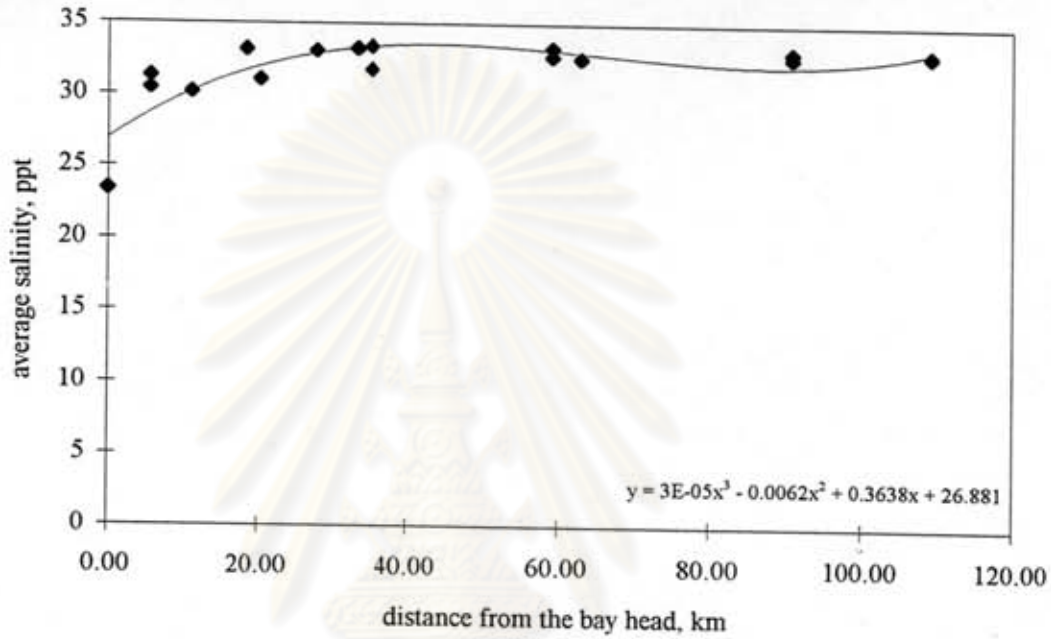


ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

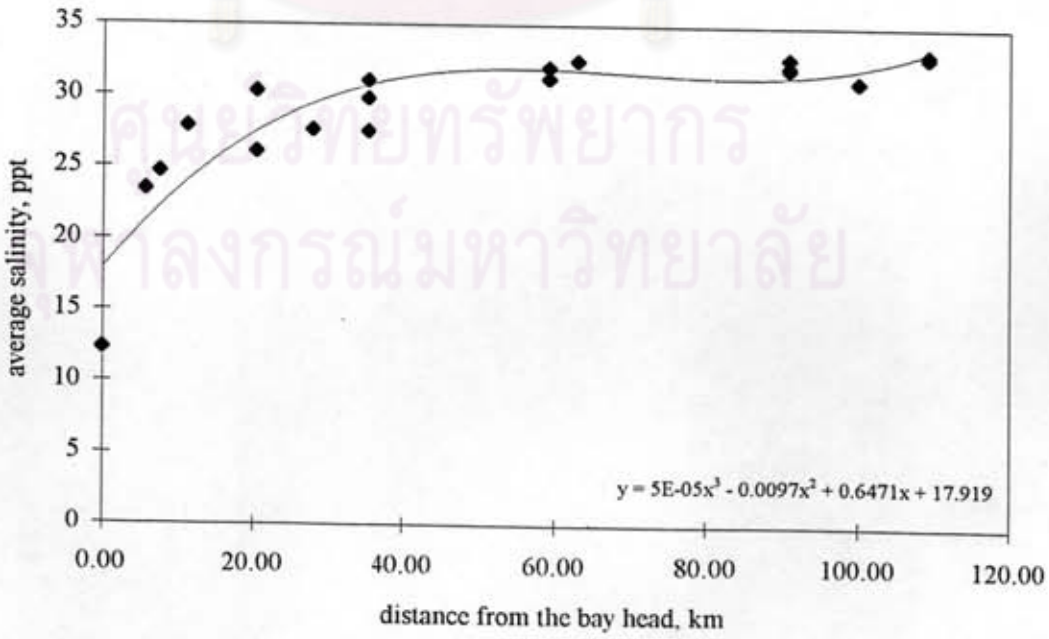
Appendix D

The relationship between salinity and distance from the bay head (estimating for the salinity gradient substitution term)

March 1979



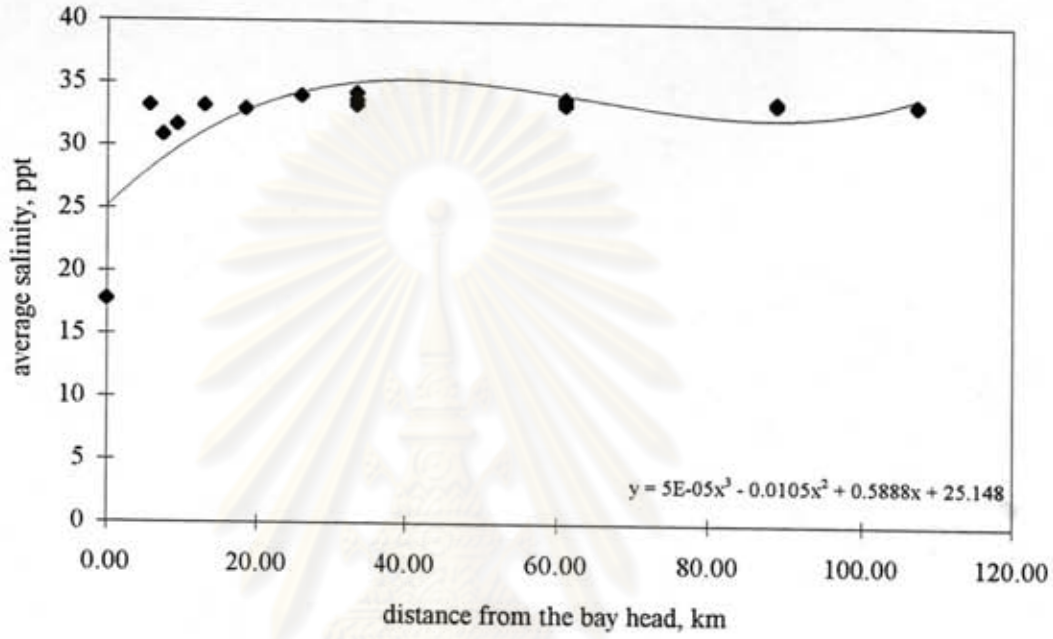
September 1979



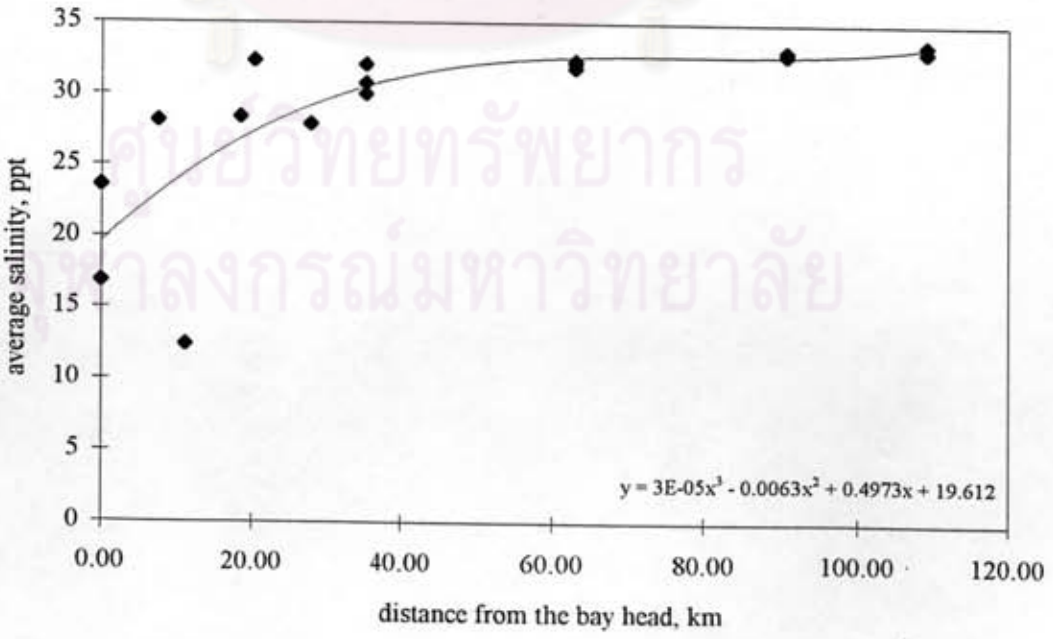
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

June 1980



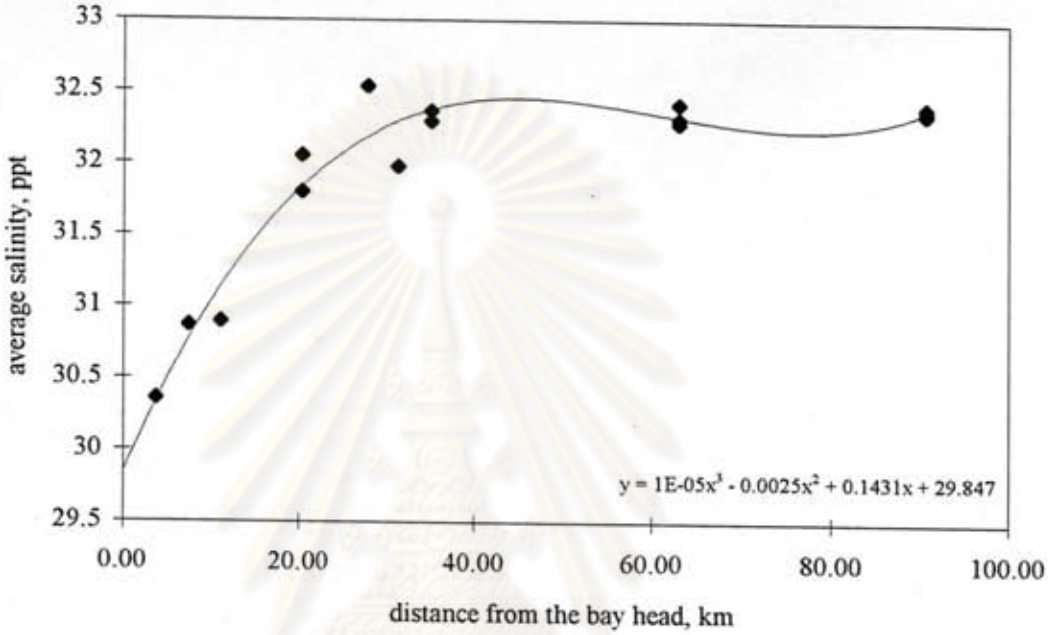
September 1980



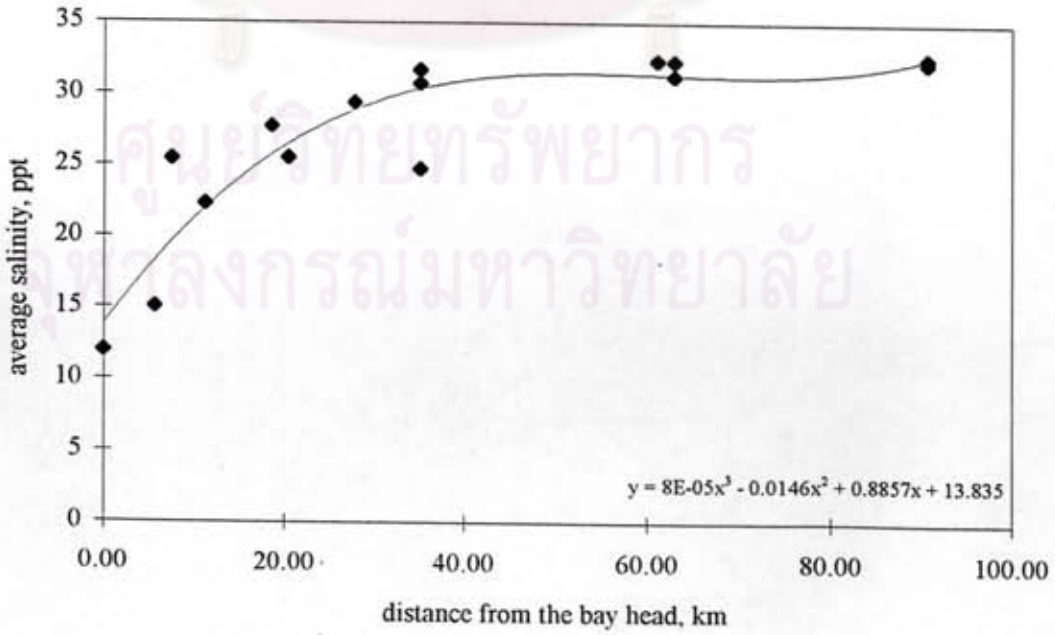
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

March 1981



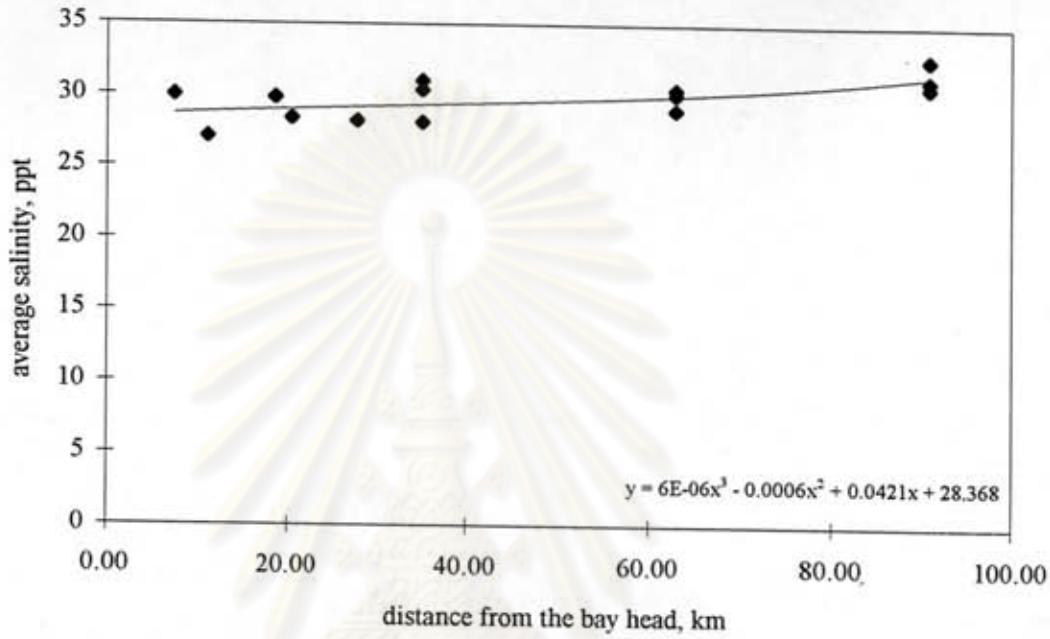
July 1981



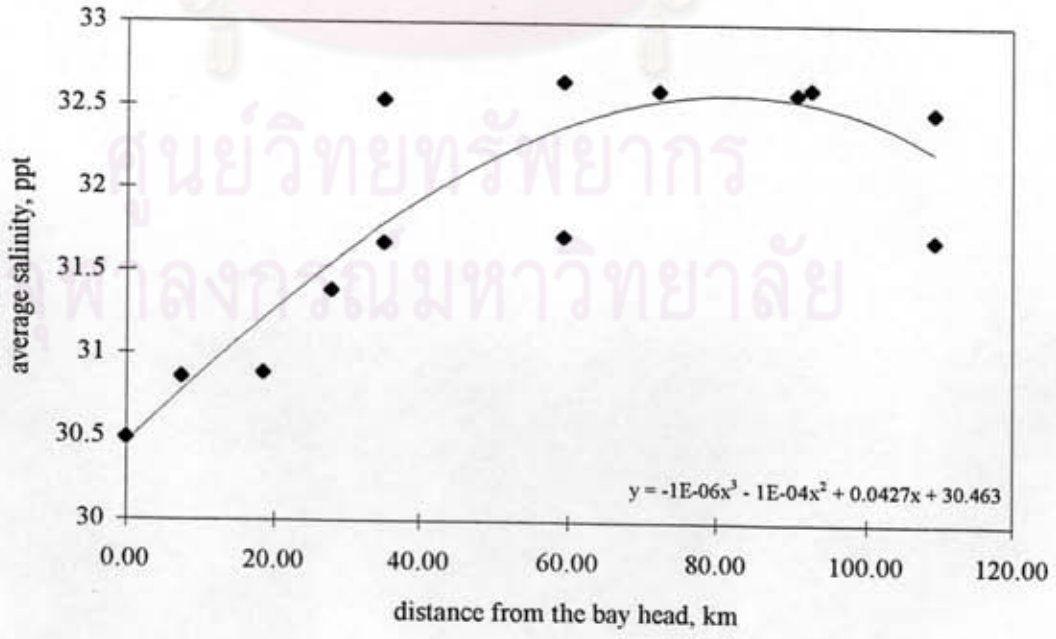
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

September 1981



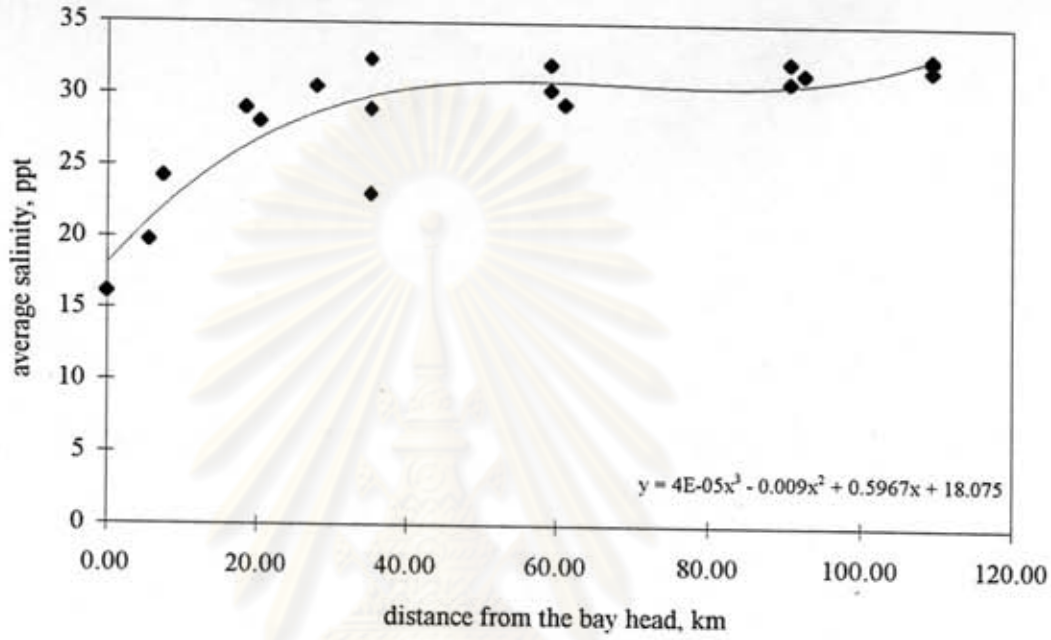
February 1982



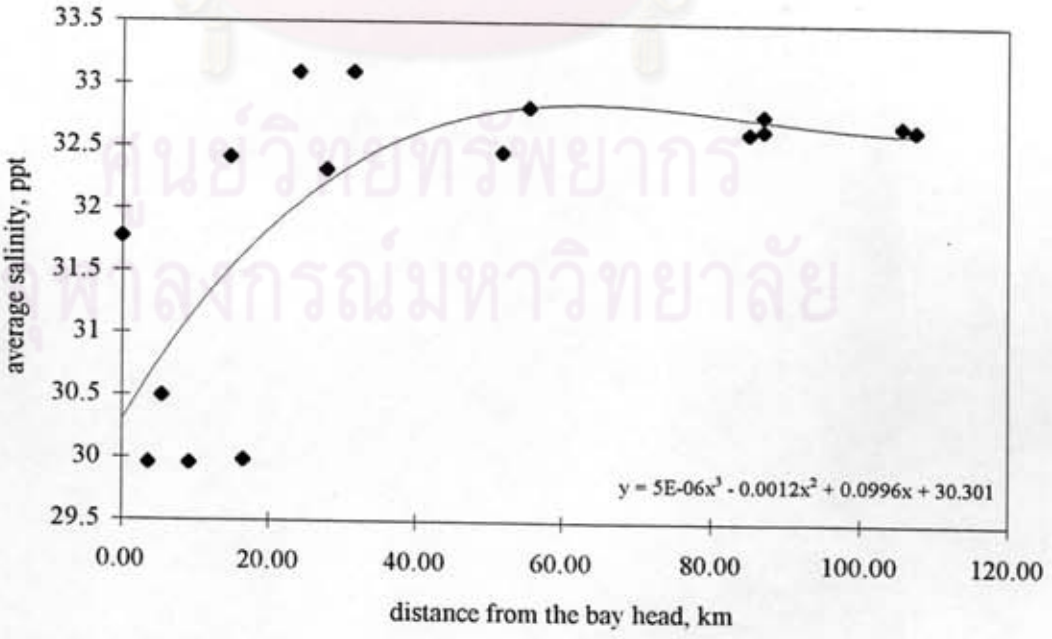
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

September 1982



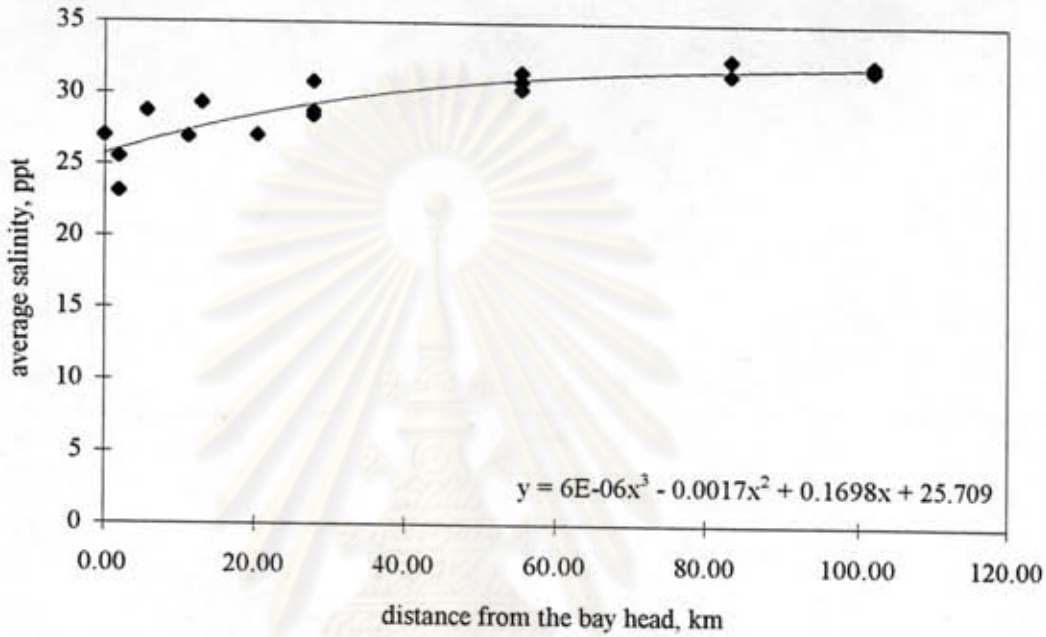
April 1983



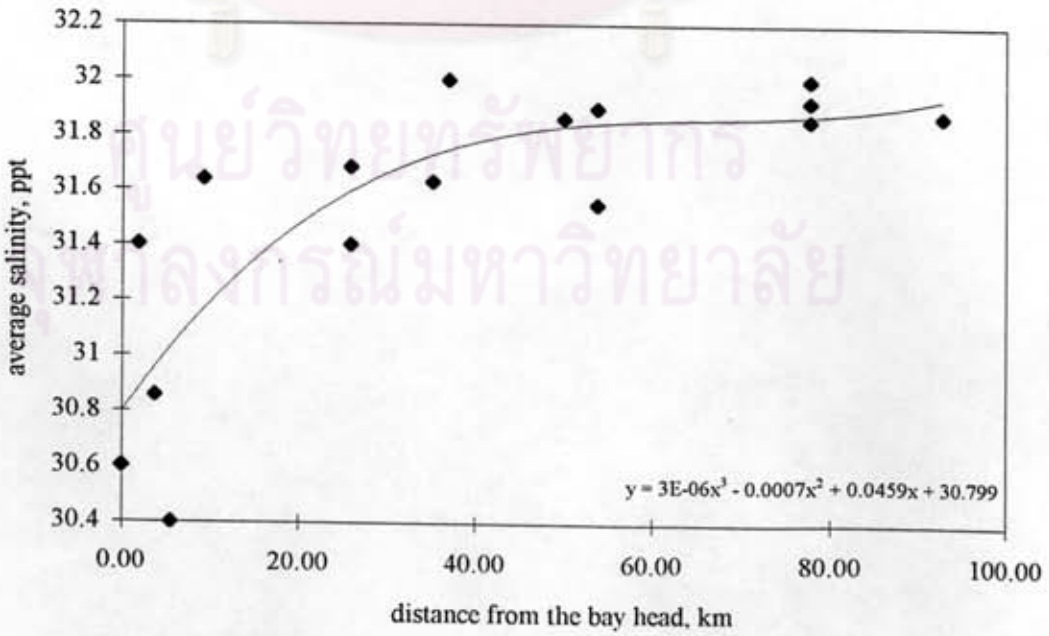
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

September 1983

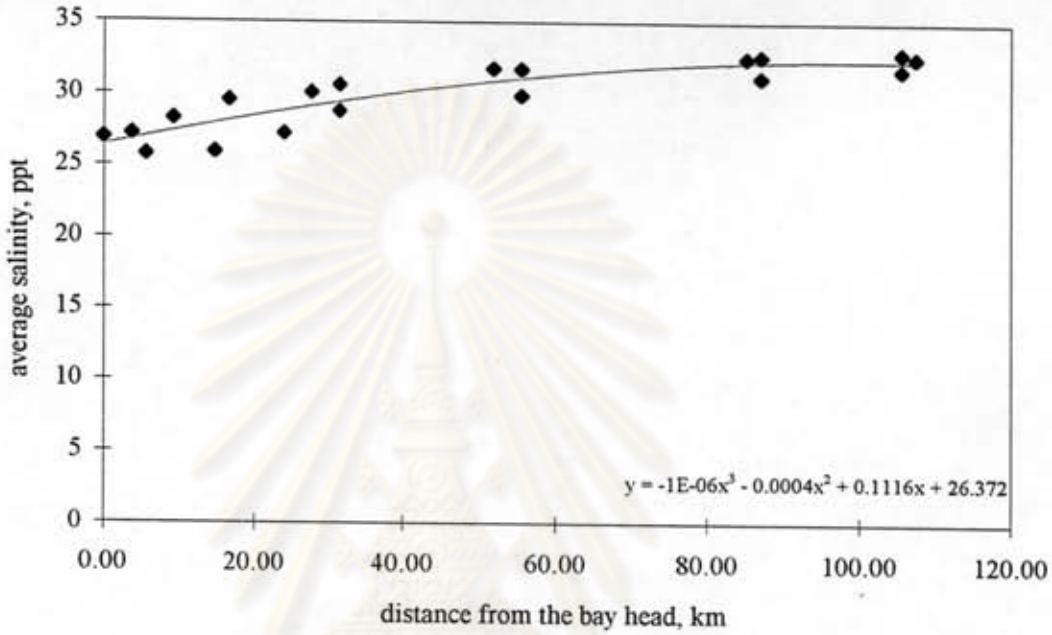


March 1984

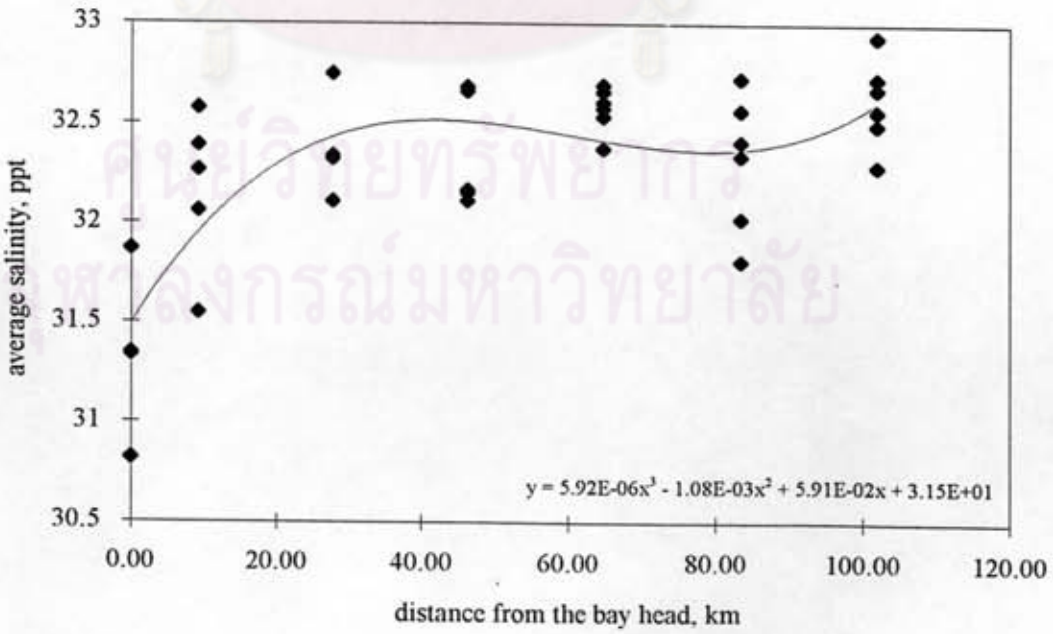


Appendix D (continued)

August 1984



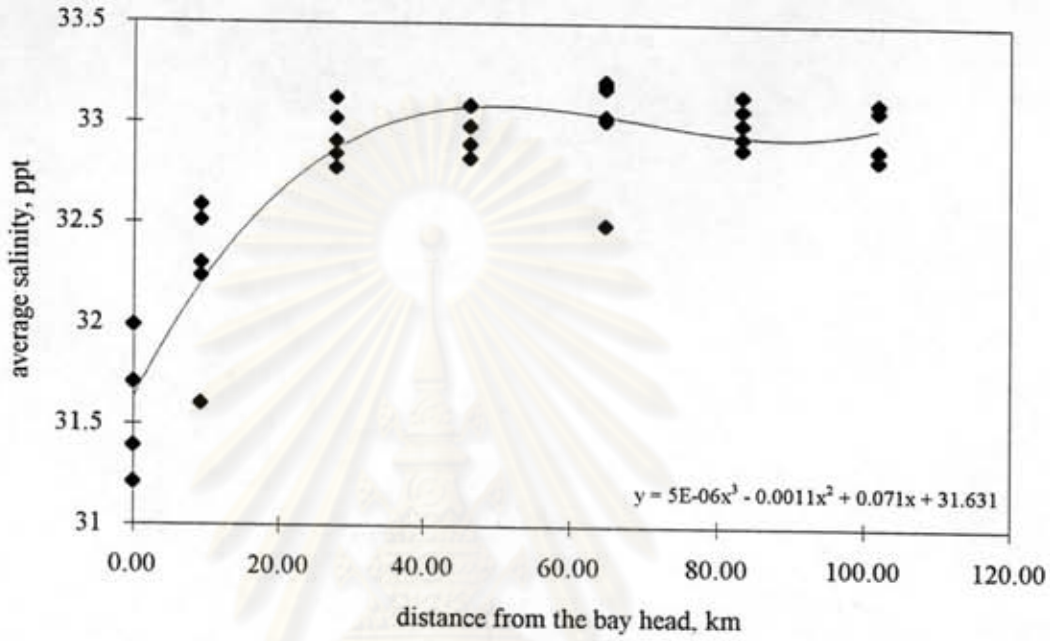
January 1989



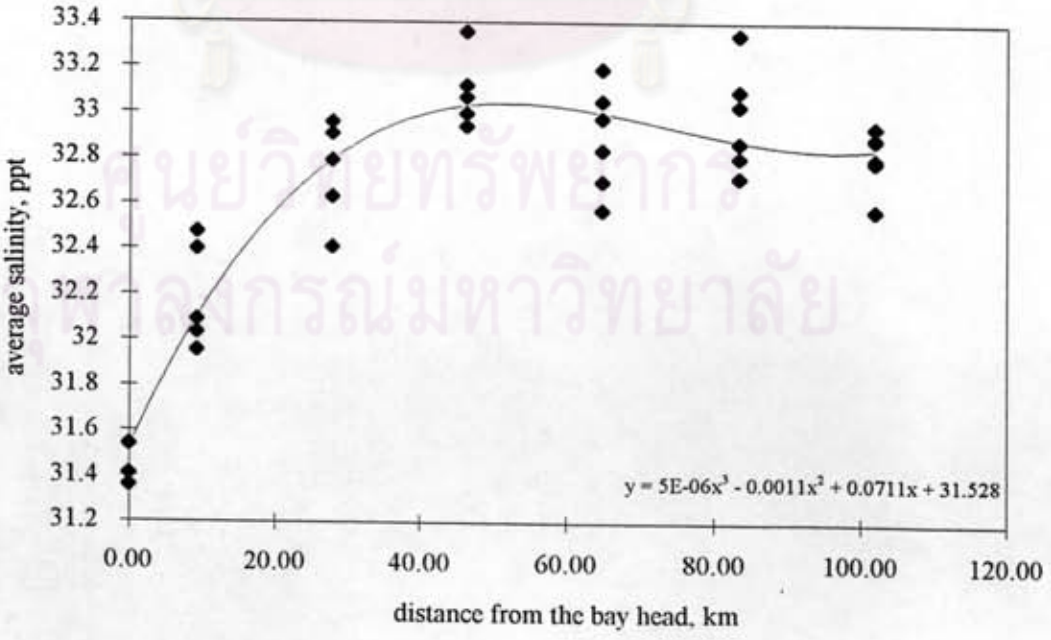
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

February 1989

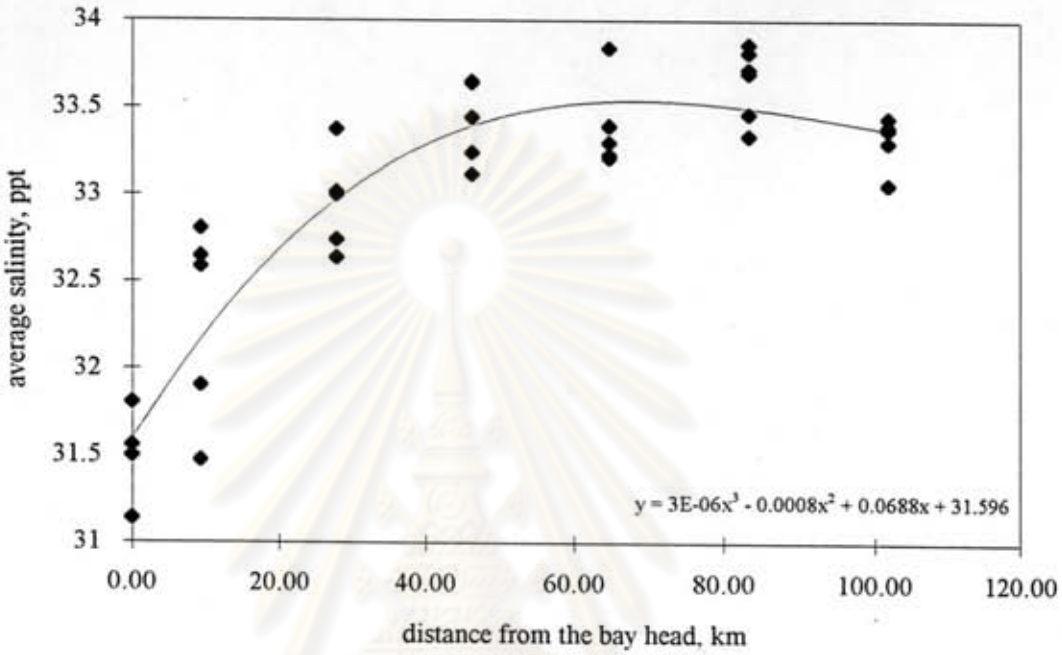


April 1989

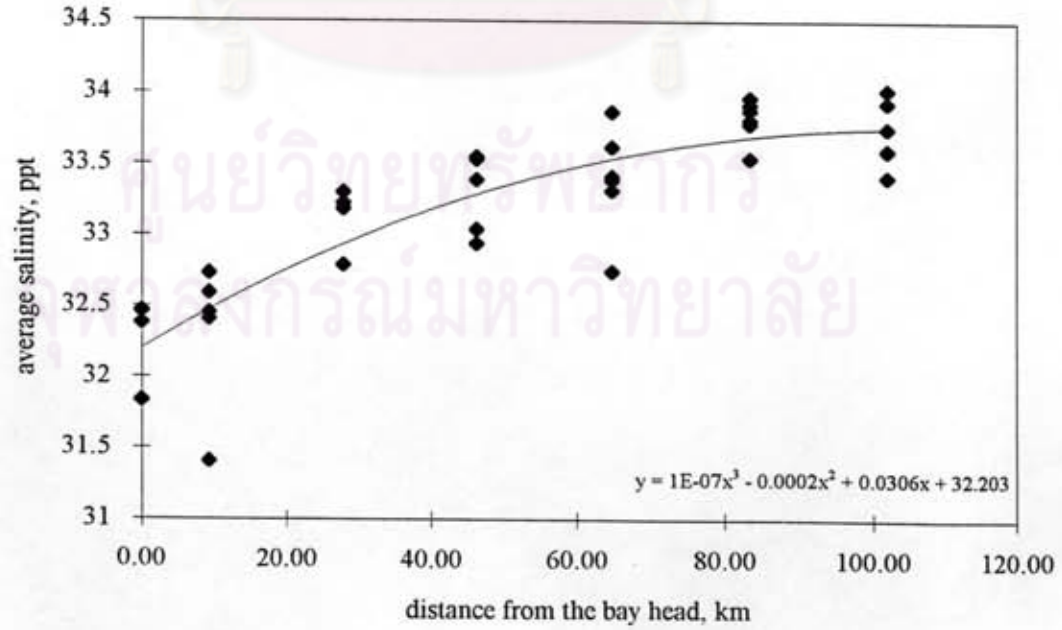


Appendix D (continued)

May 1989

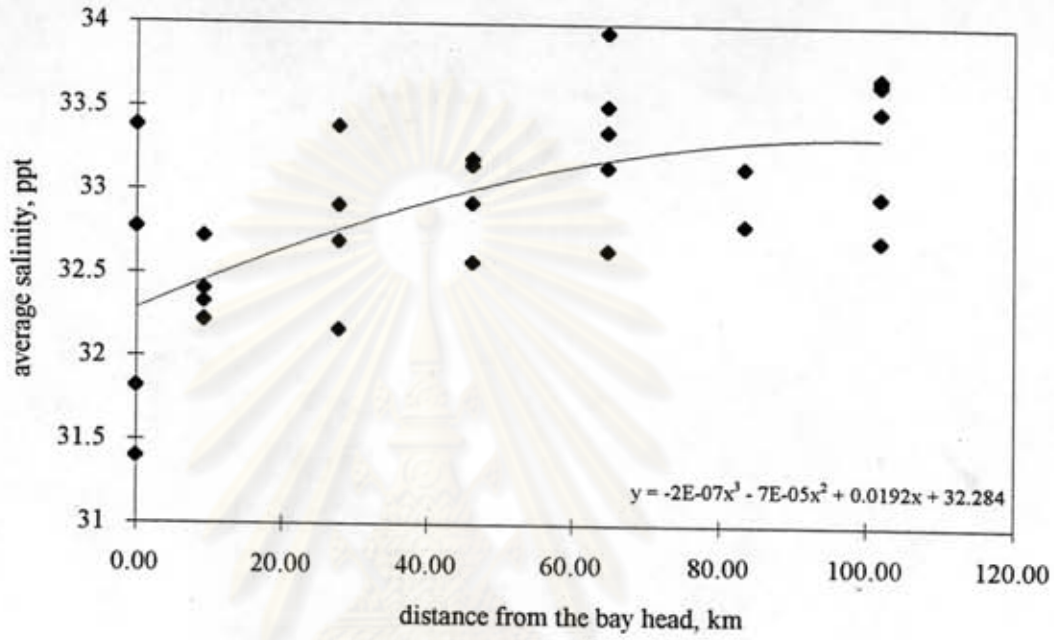


June 1989

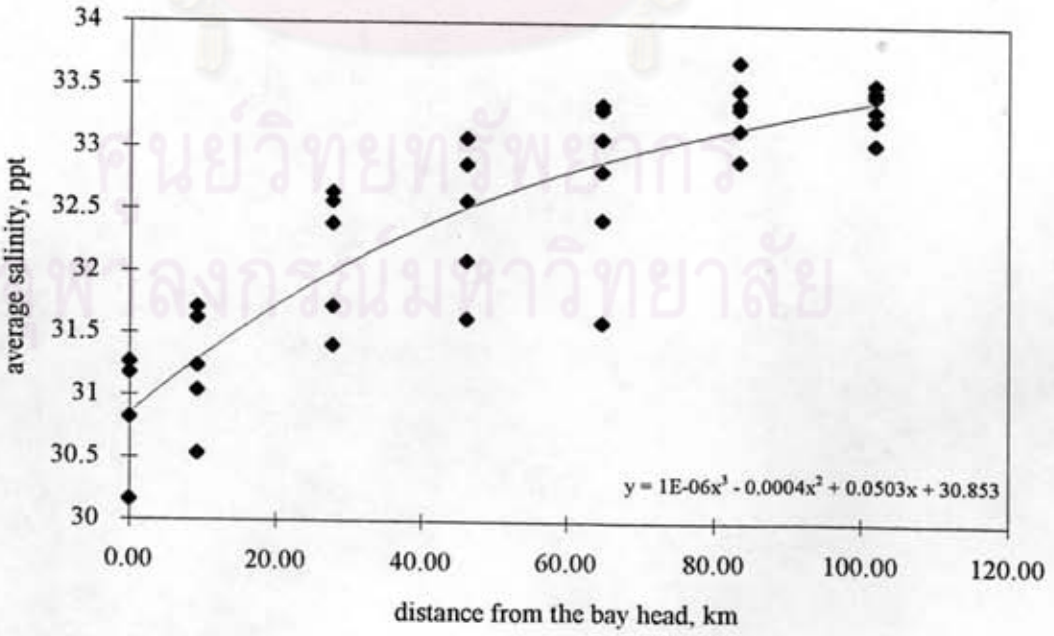


Appendix D (continued)

July 1989

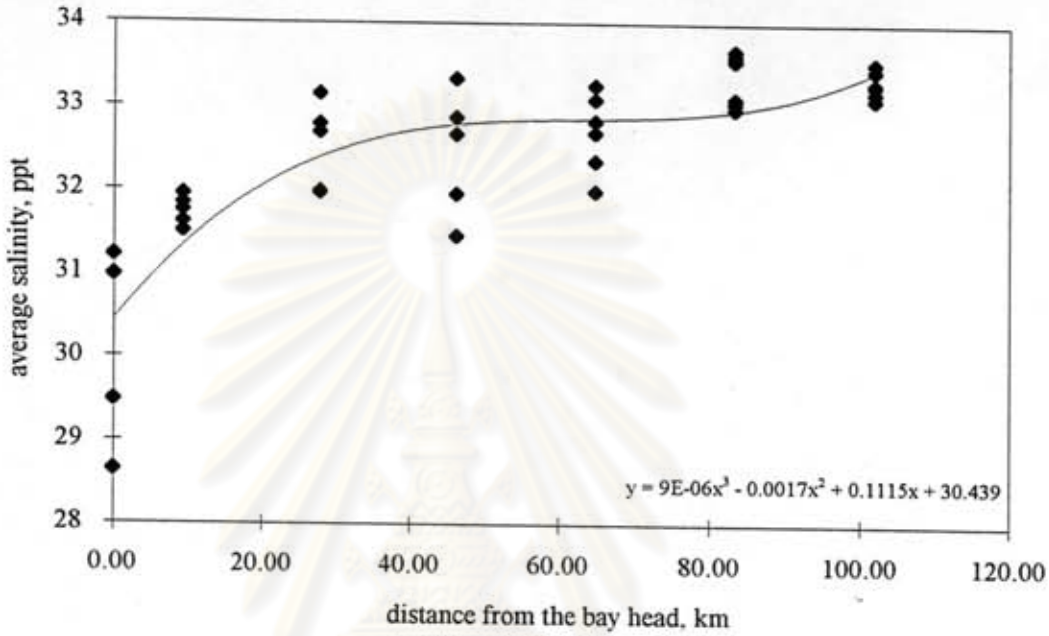


August 1989

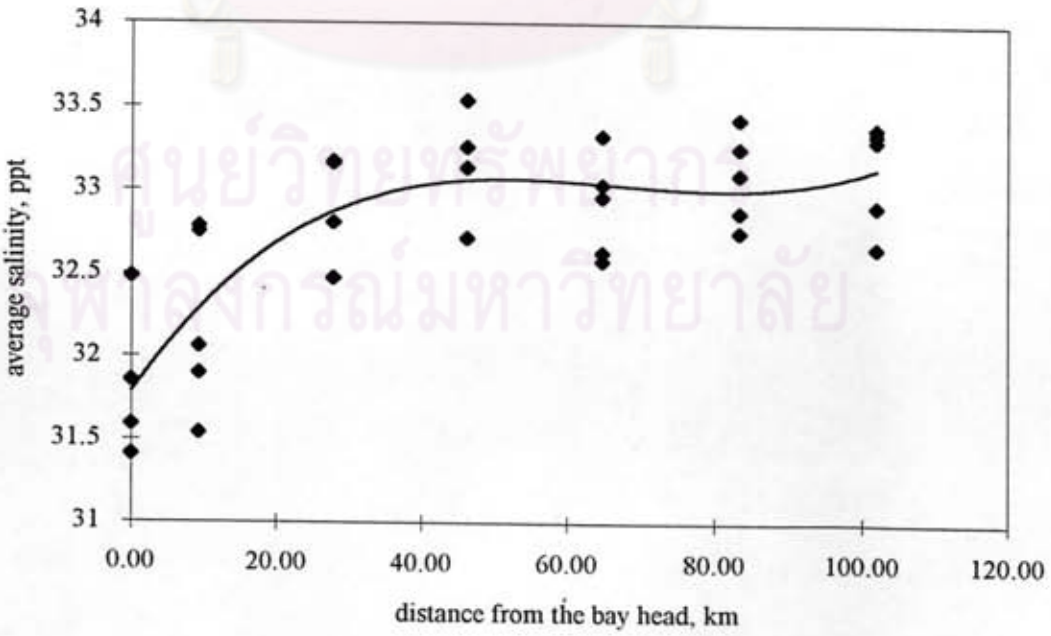


Appendix D (continued)

Seotember 1989



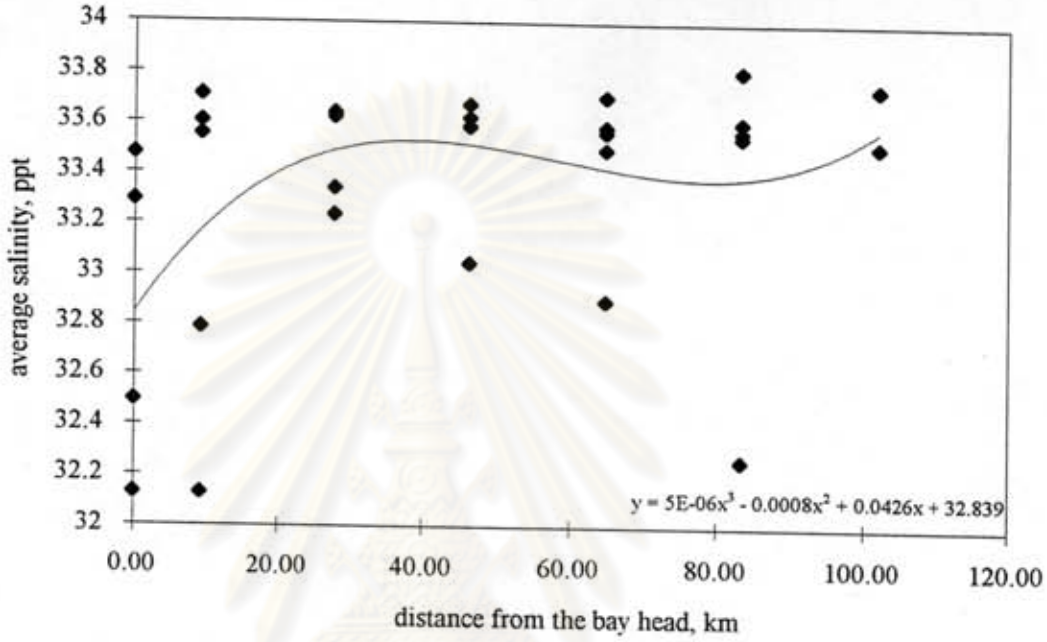
October 1989



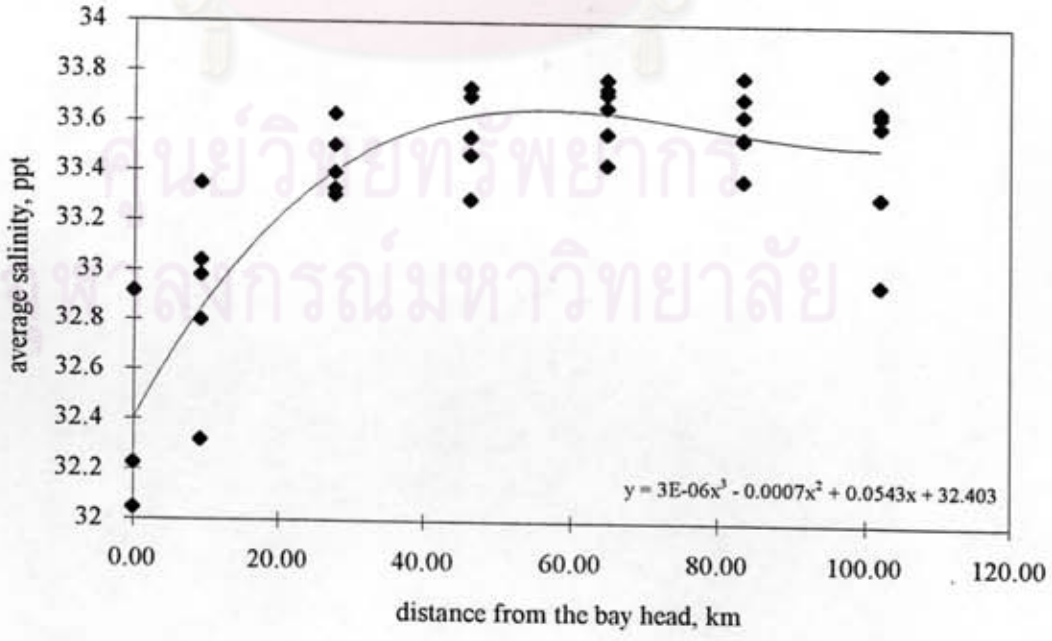
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

November 1989

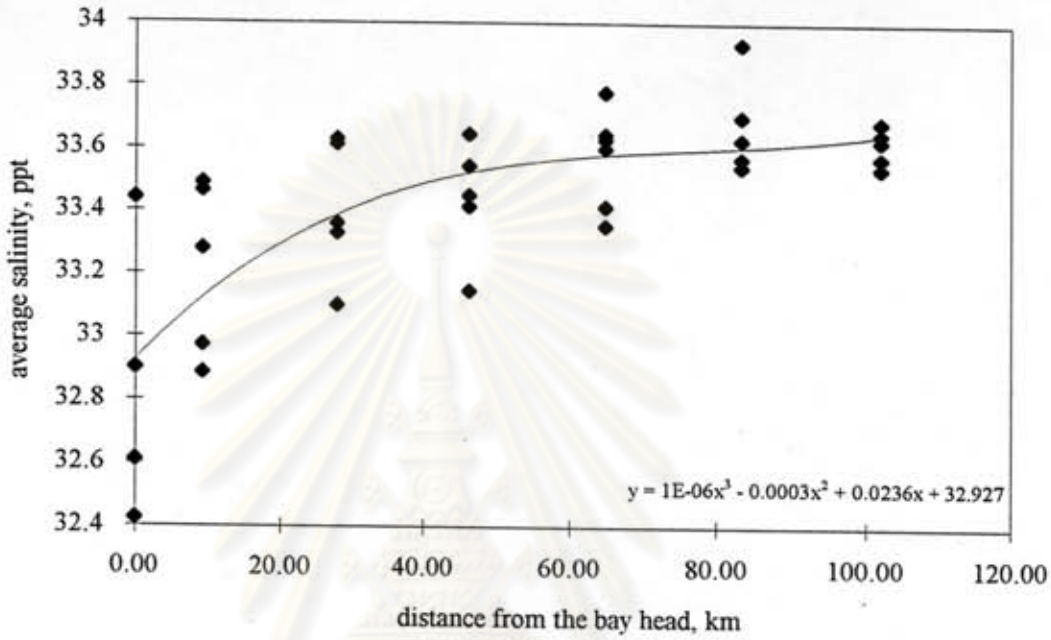


January 1990

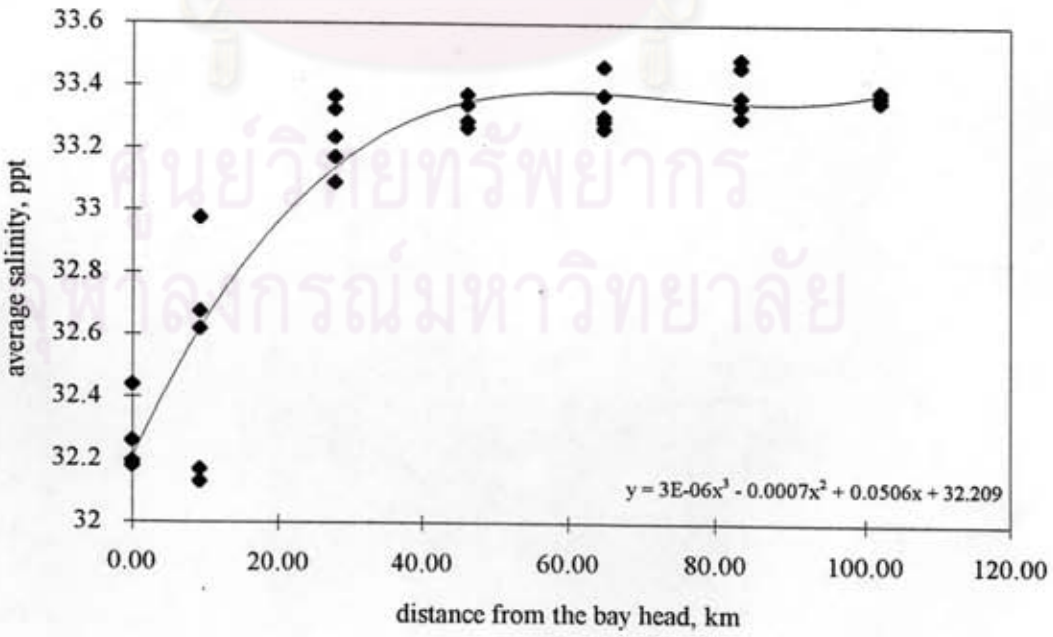


Appendix D (continued)

March 1990



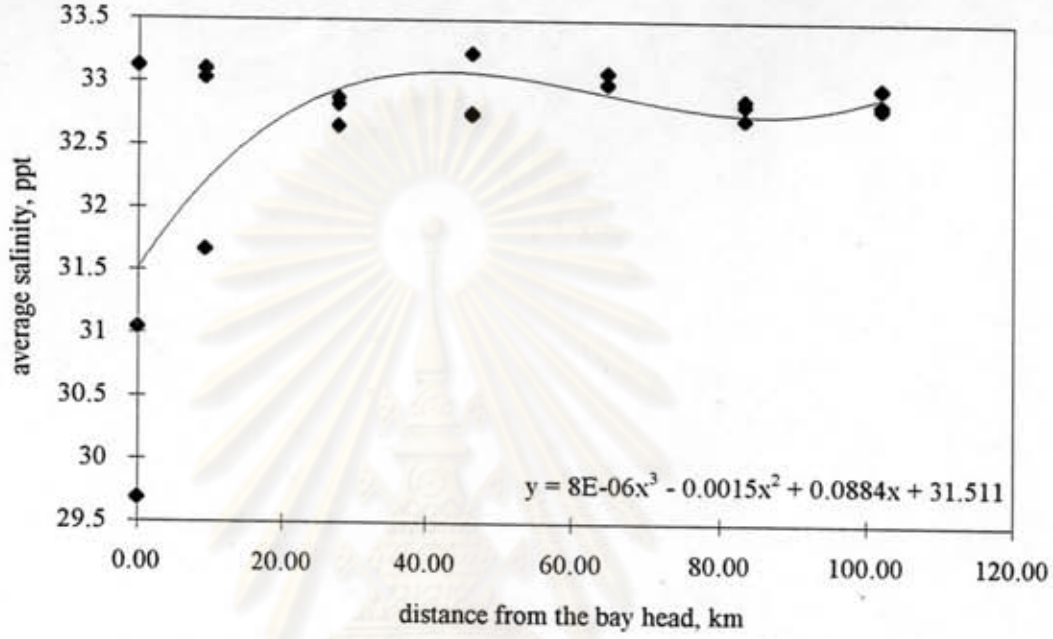
May 1990



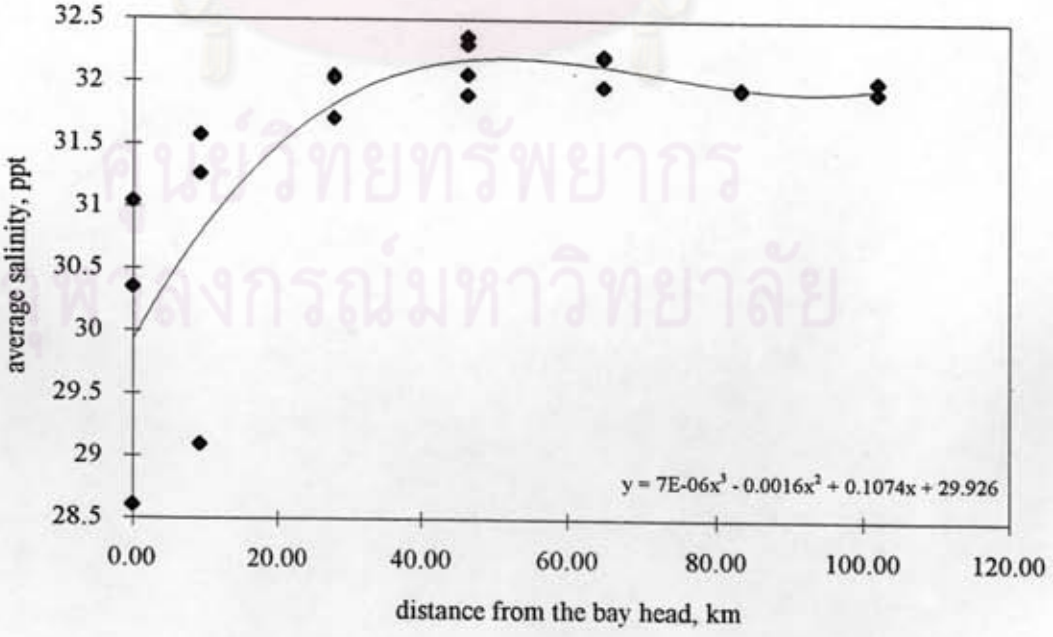
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

February 1992

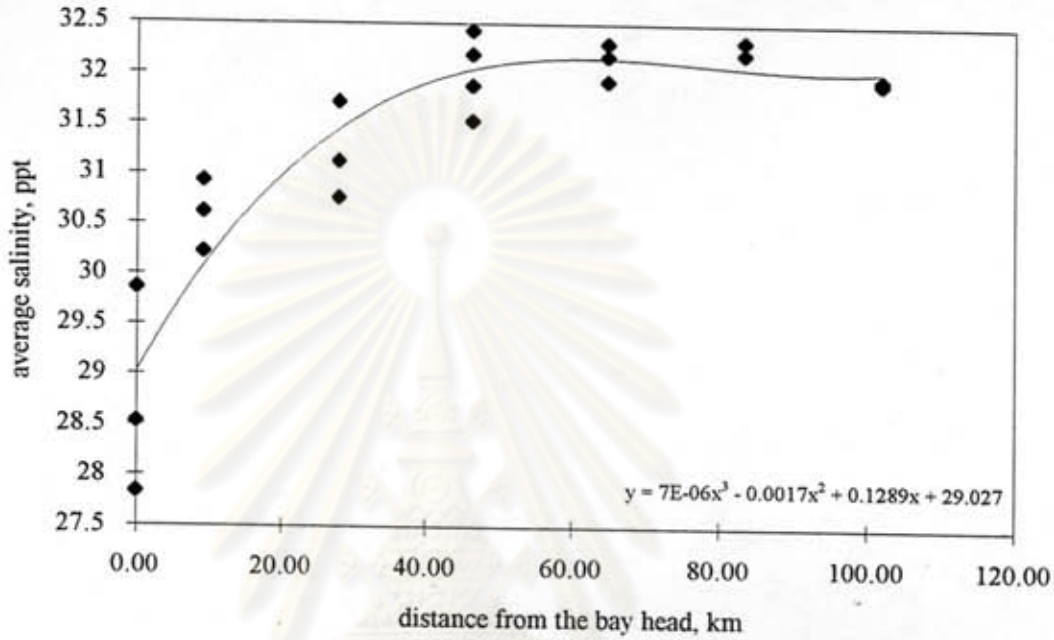


April 1992

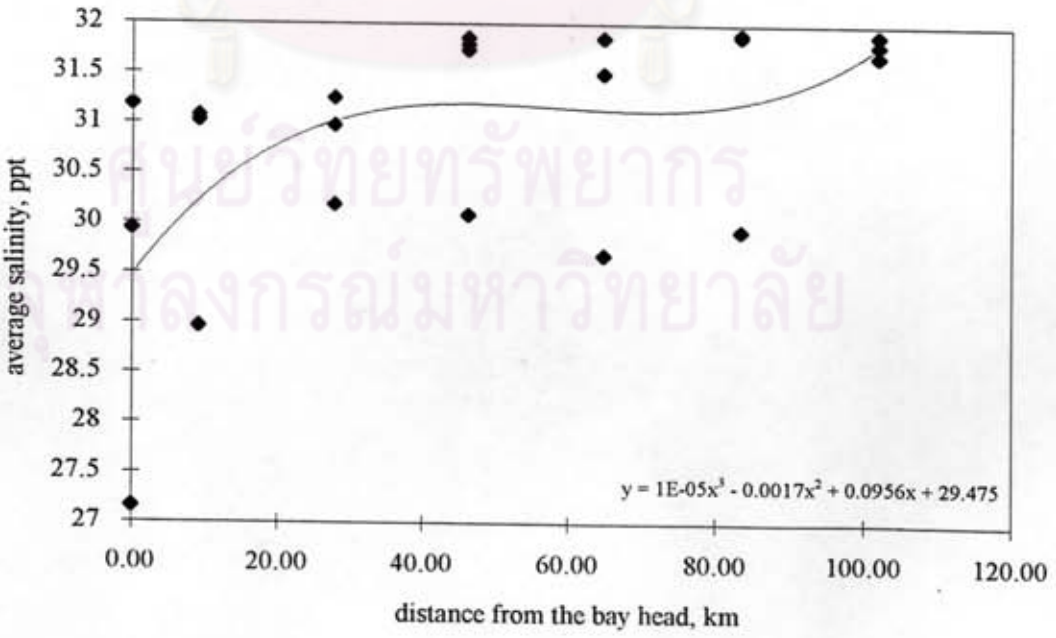


Appendix D (continued)

July 1992



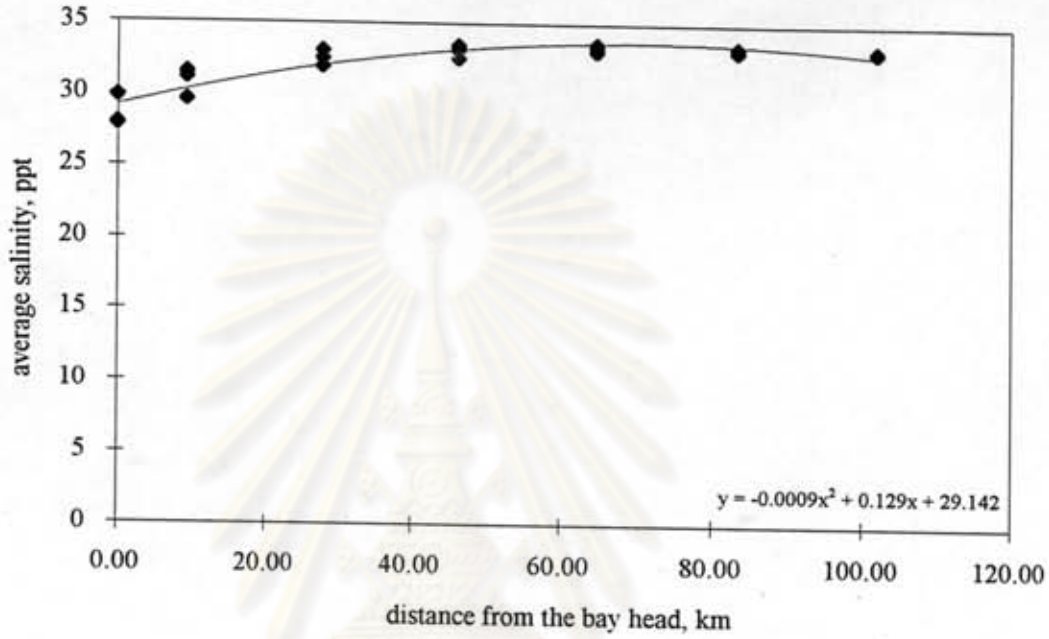
November 1992



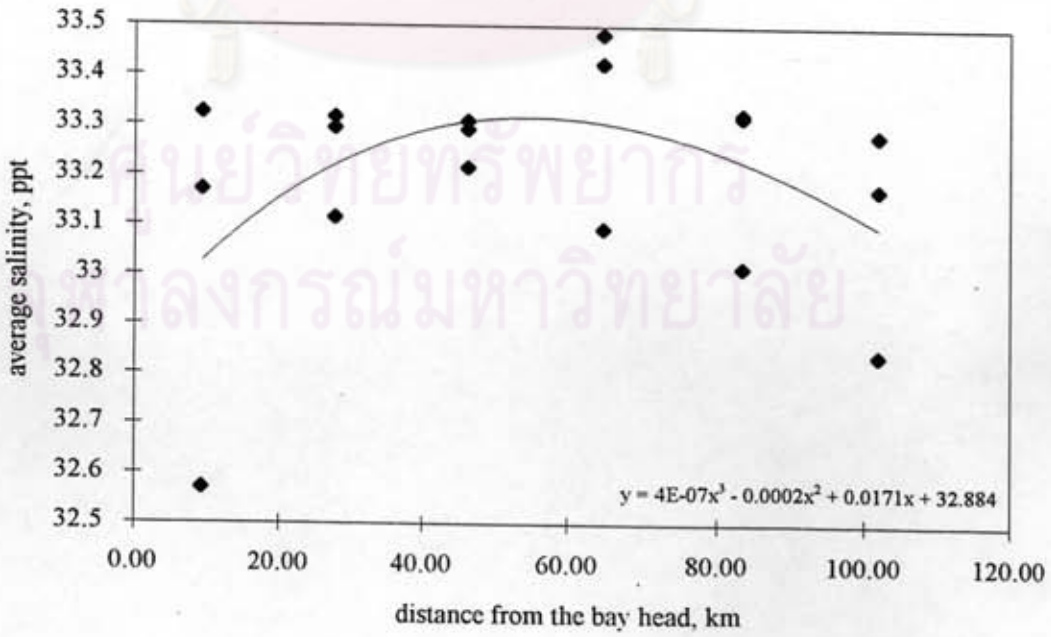
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix D (continued)

May 1993

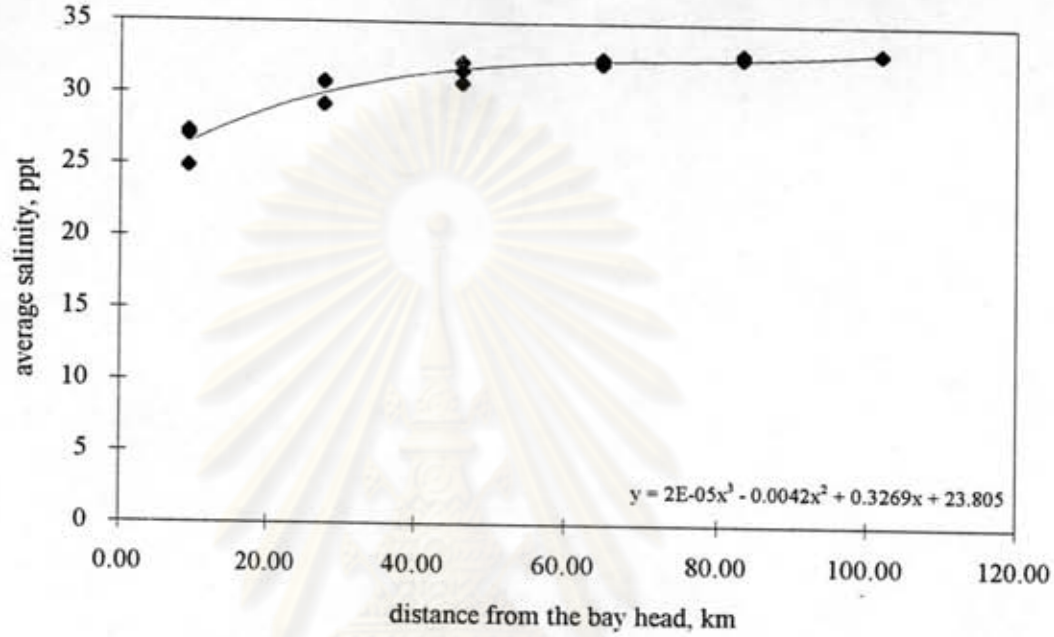


March 1994

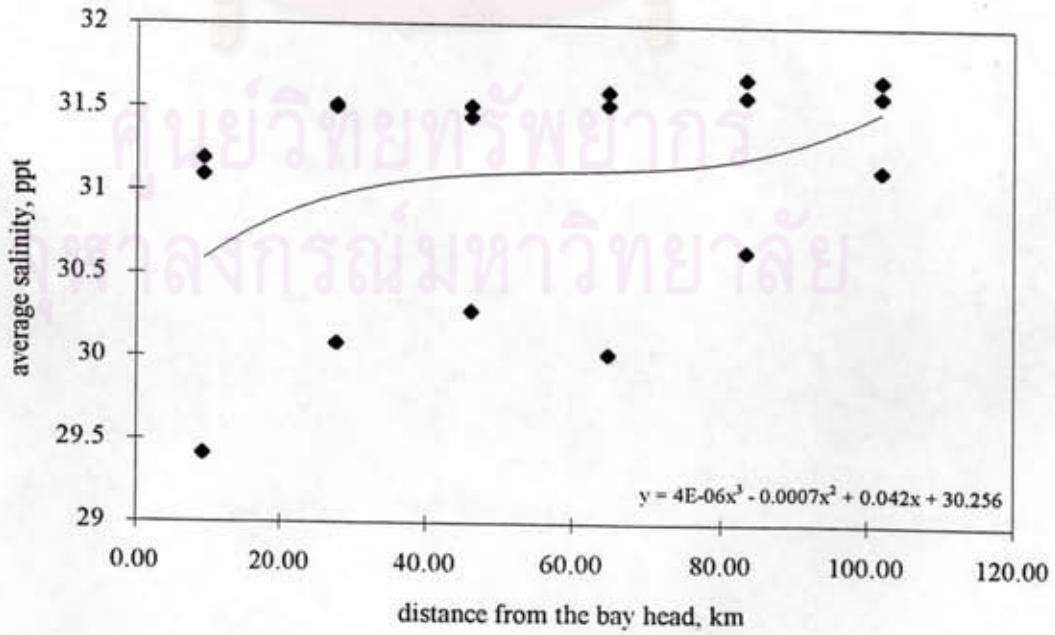


Appendix D (continued)

August 1994



December 1994

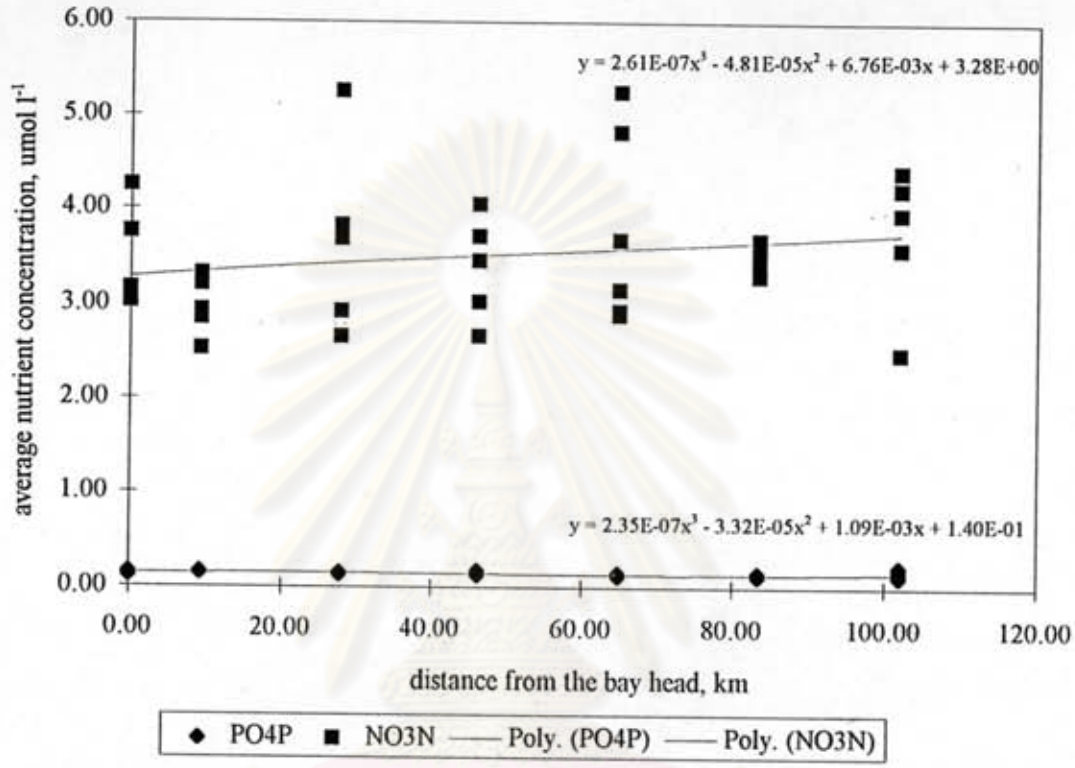


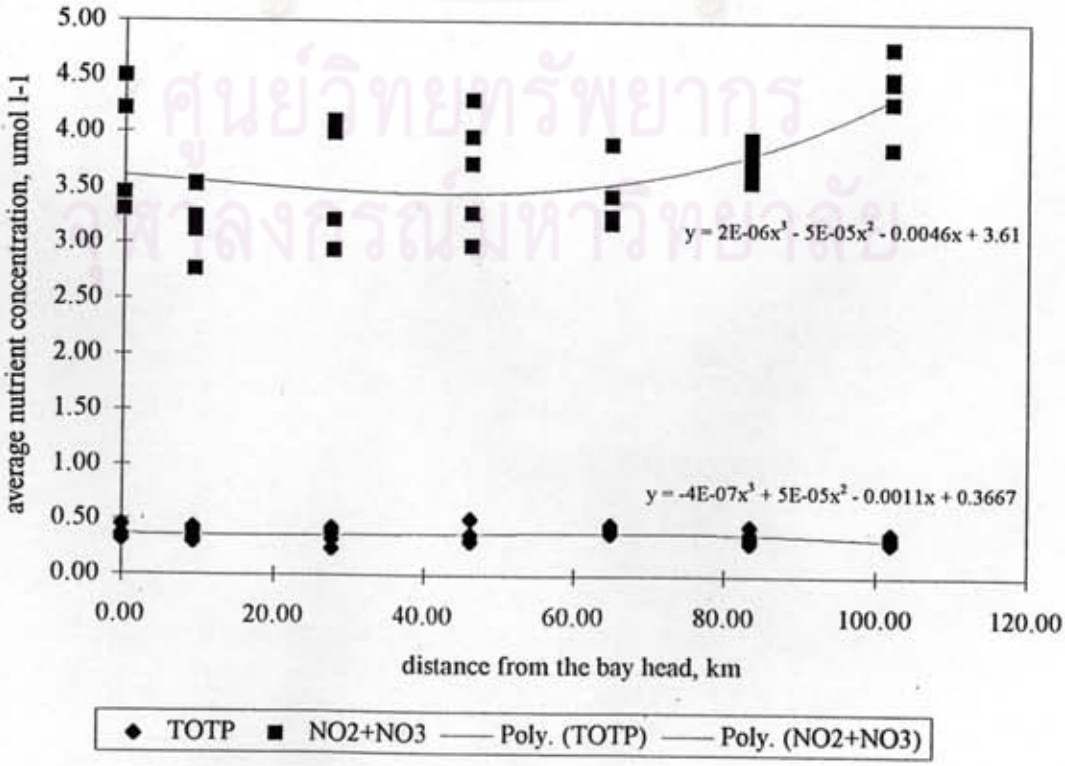
ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix E

The relationship between nutrient and distance from the bay head
(estimating for the nutrient gradient substitution term)

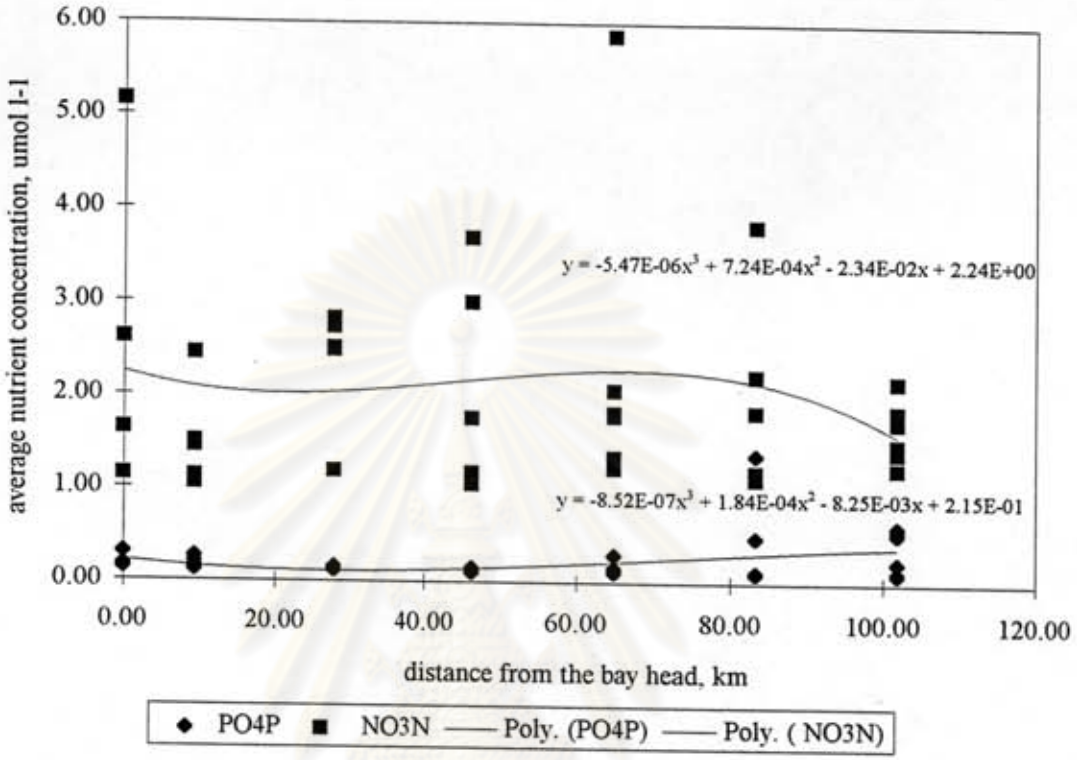
January 1989

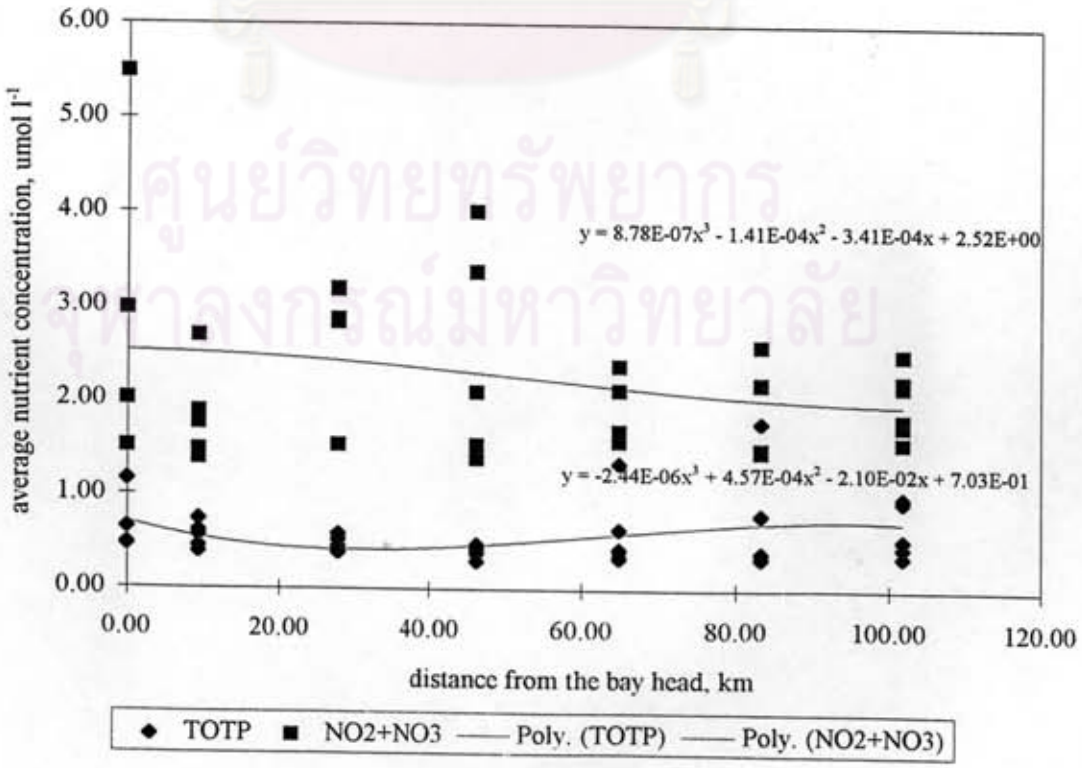




Appendix E (continued)

February 1989

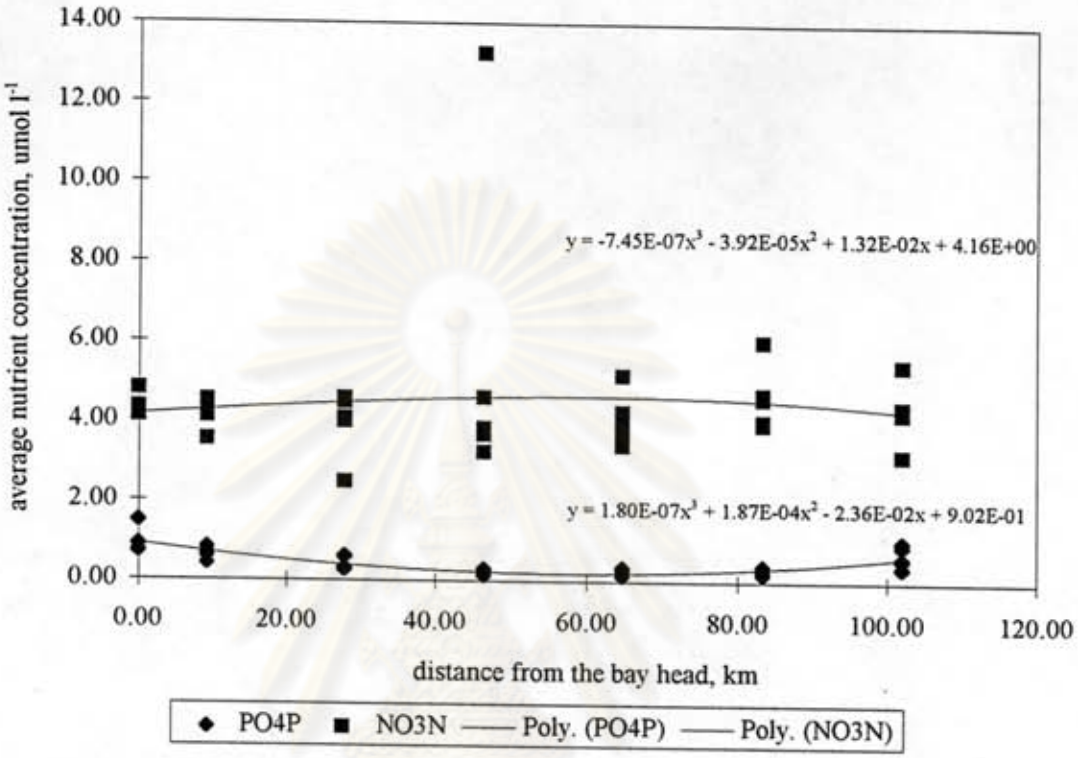


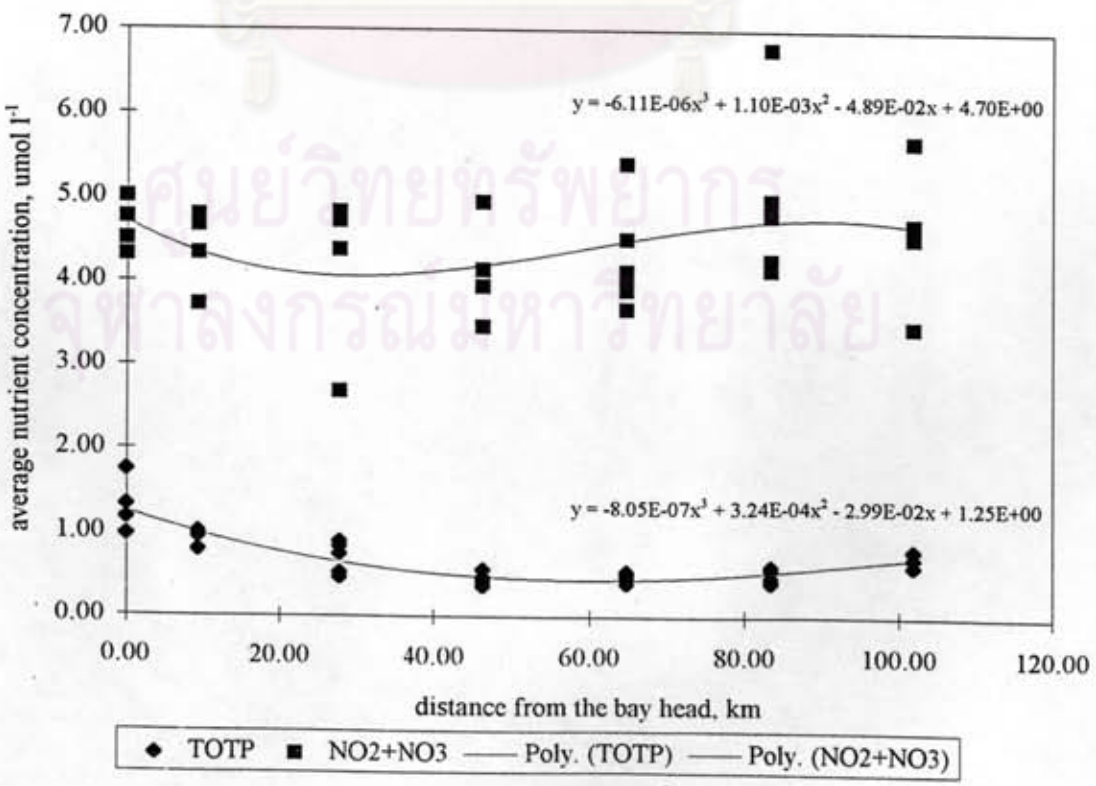


ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix E (continued)

April 1989

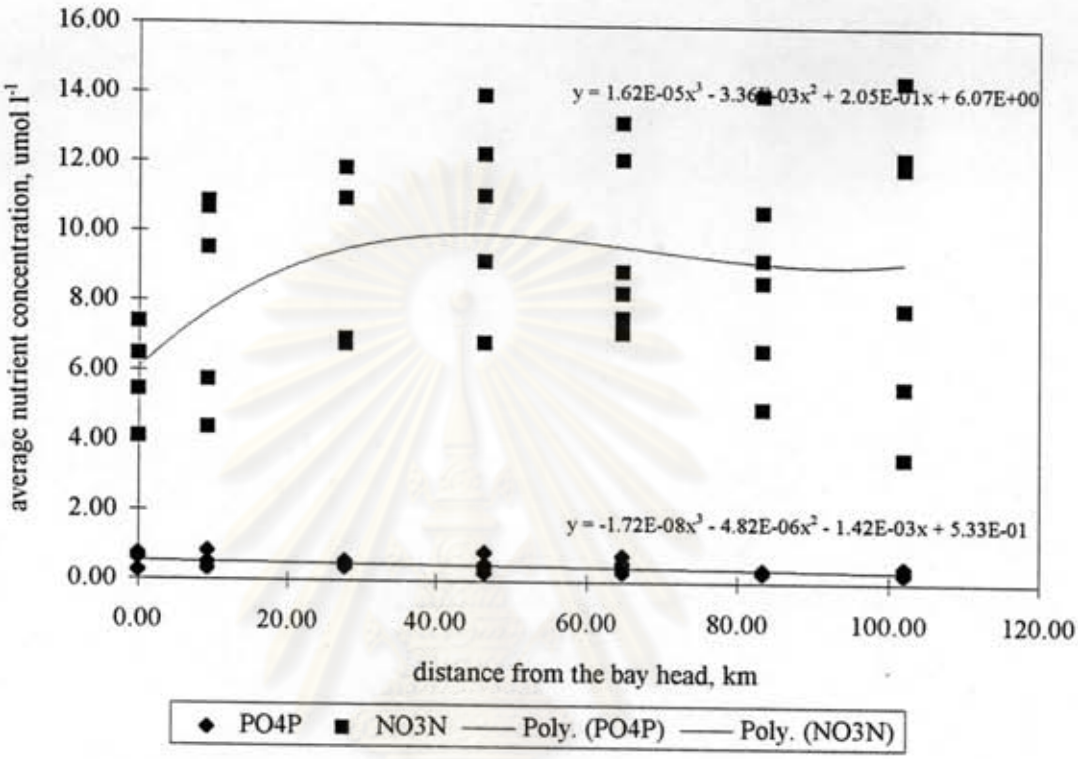


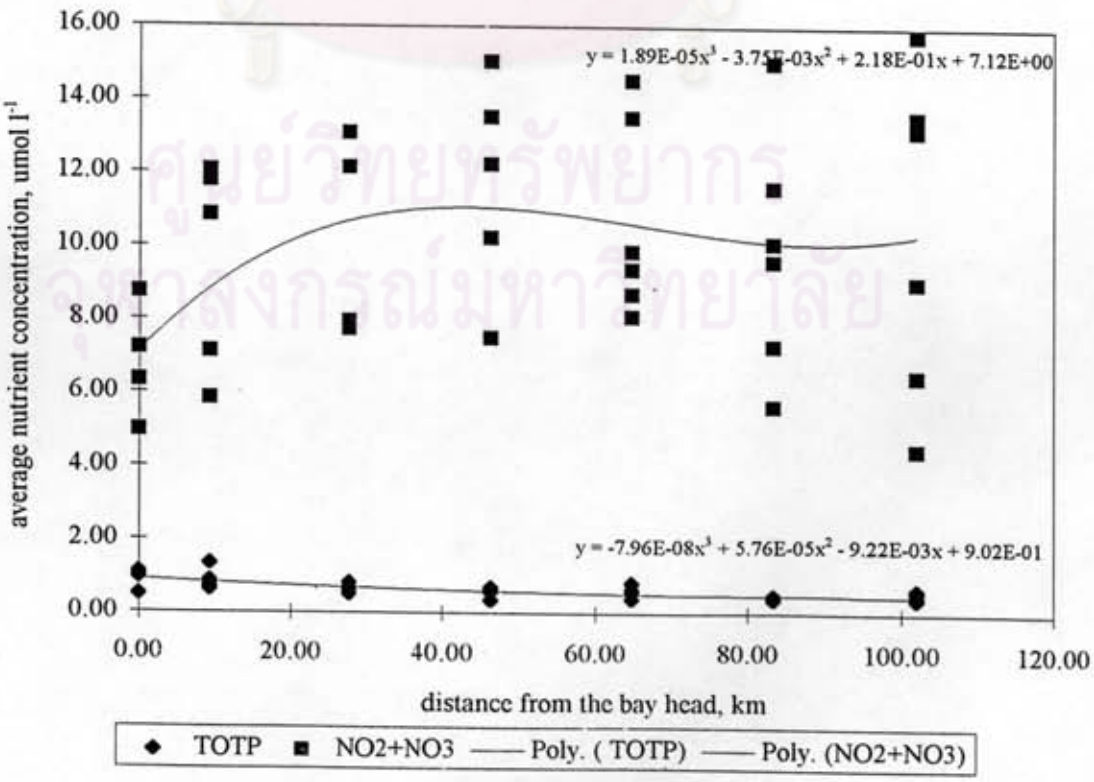


ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix E (continued)

May 1989

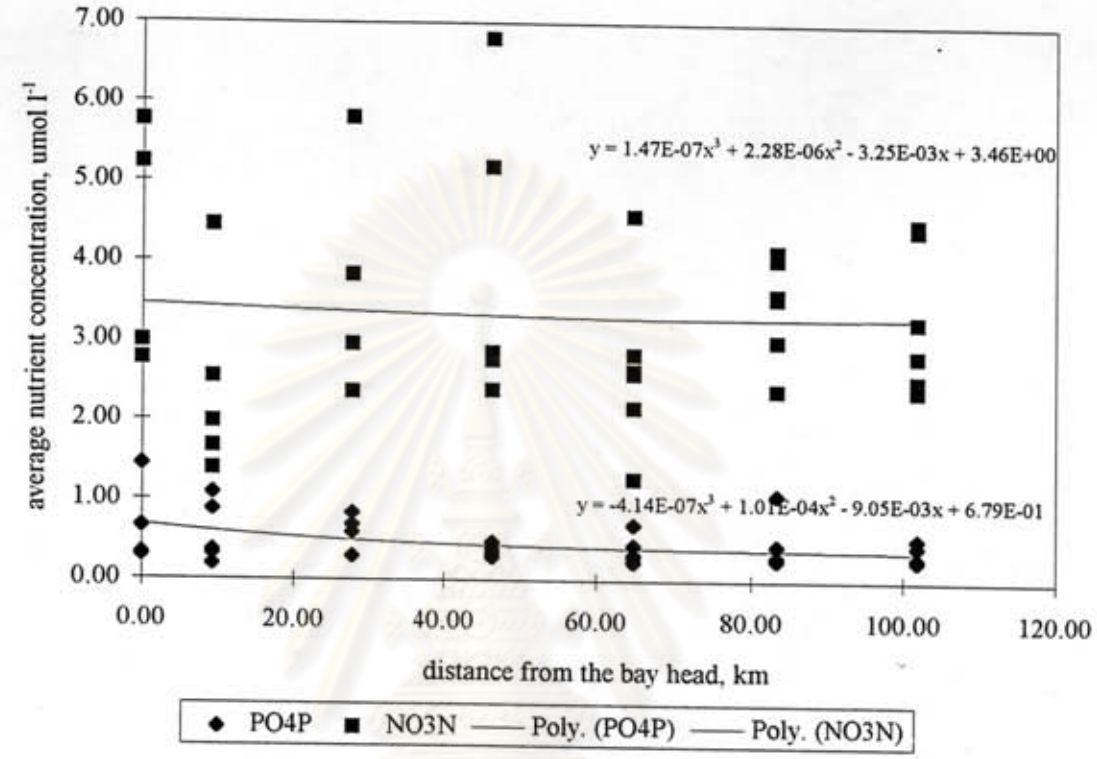


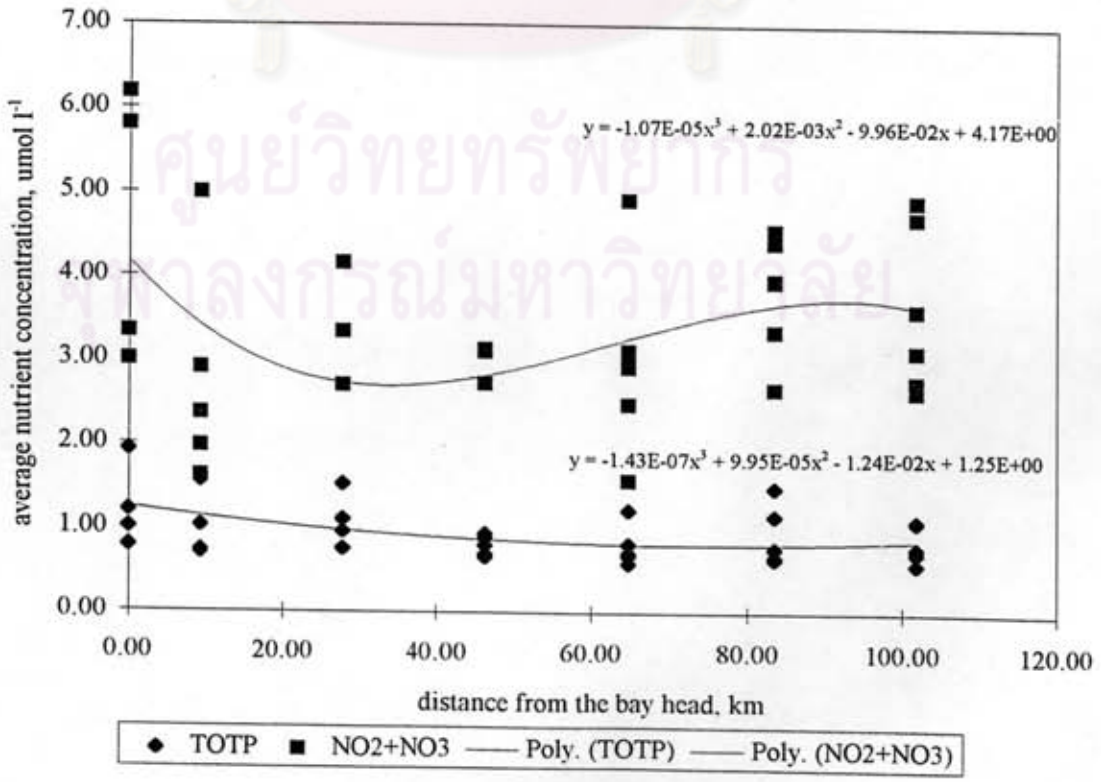


ศูนย์วิทยทรัพยากร
จุฬาลงกรณ์มหาวิทยาลัย

Appendix E (continued)

June 1989





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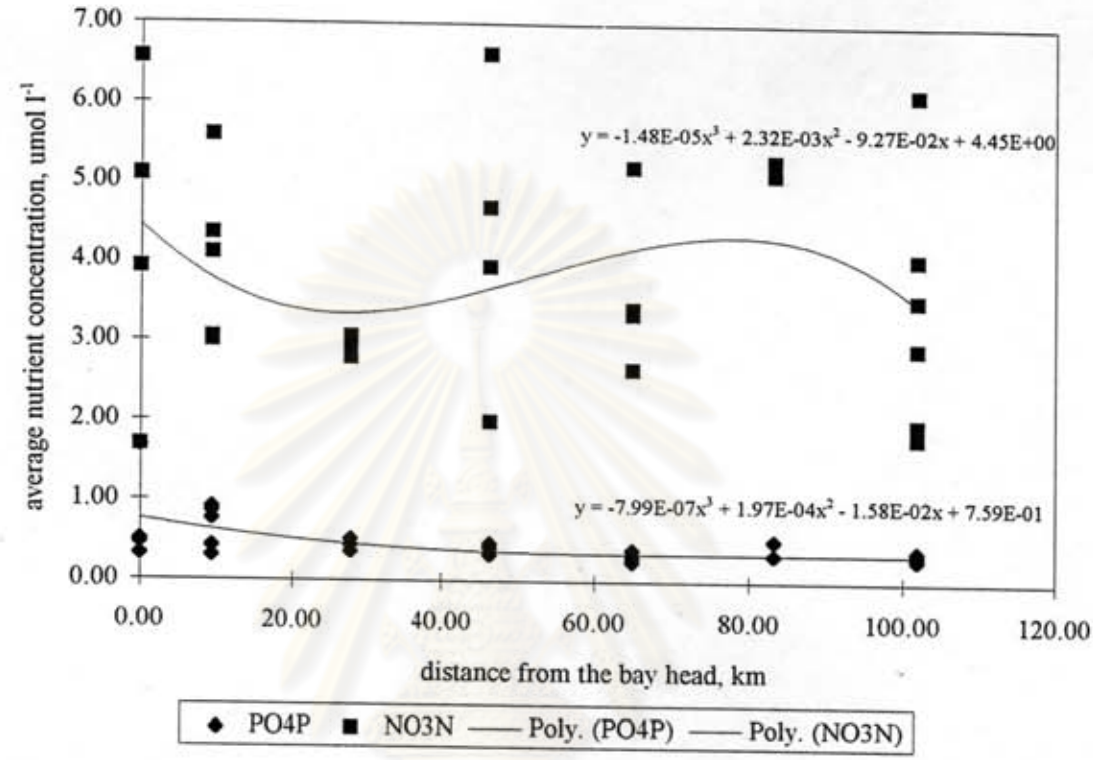
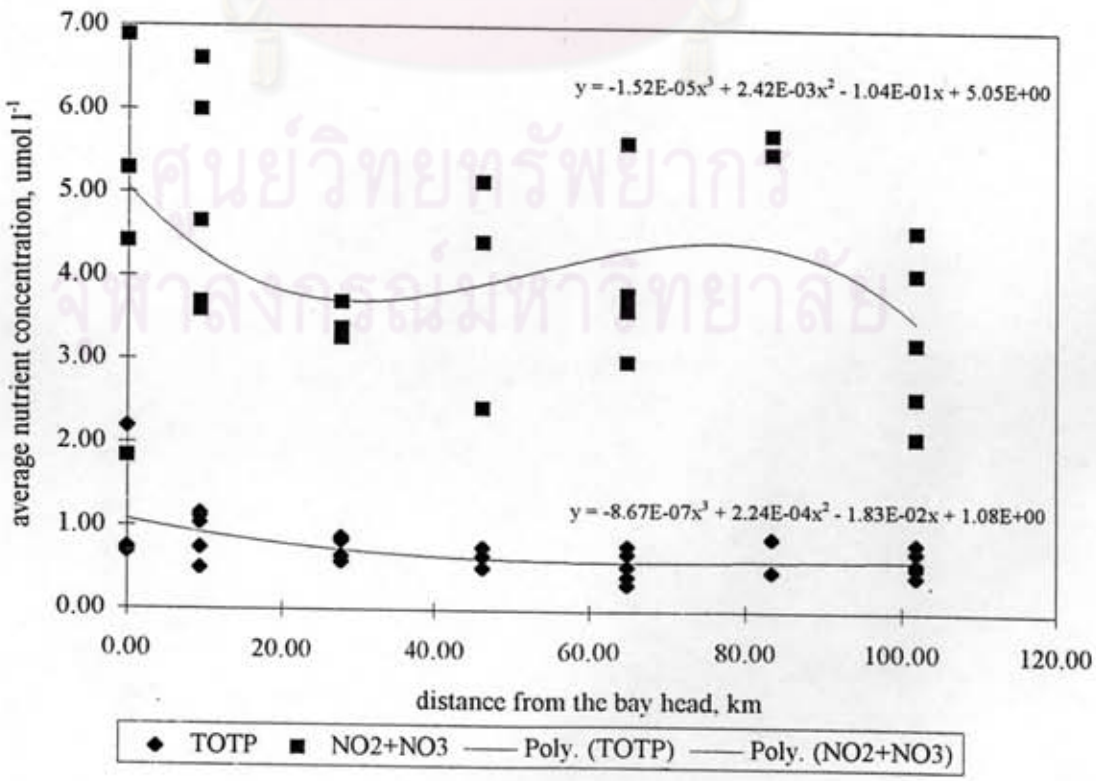
จุฬาลงกรณ์มหาวิทยาลัย

Appendix E (continued)

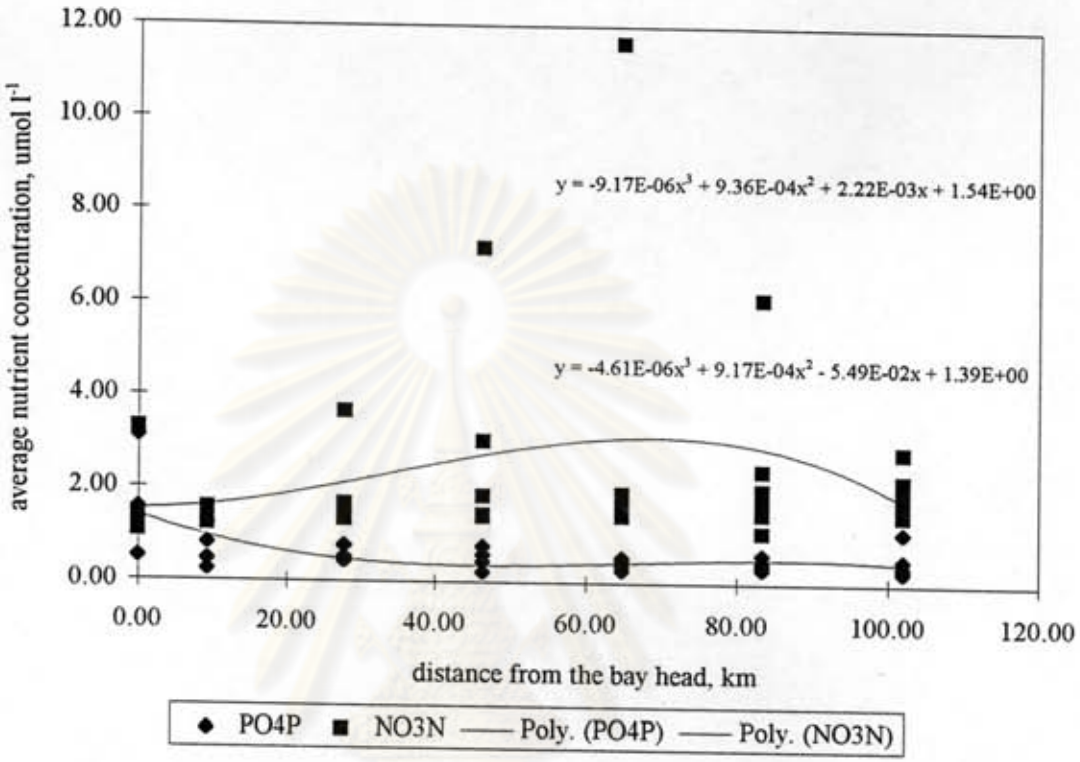
July 1989

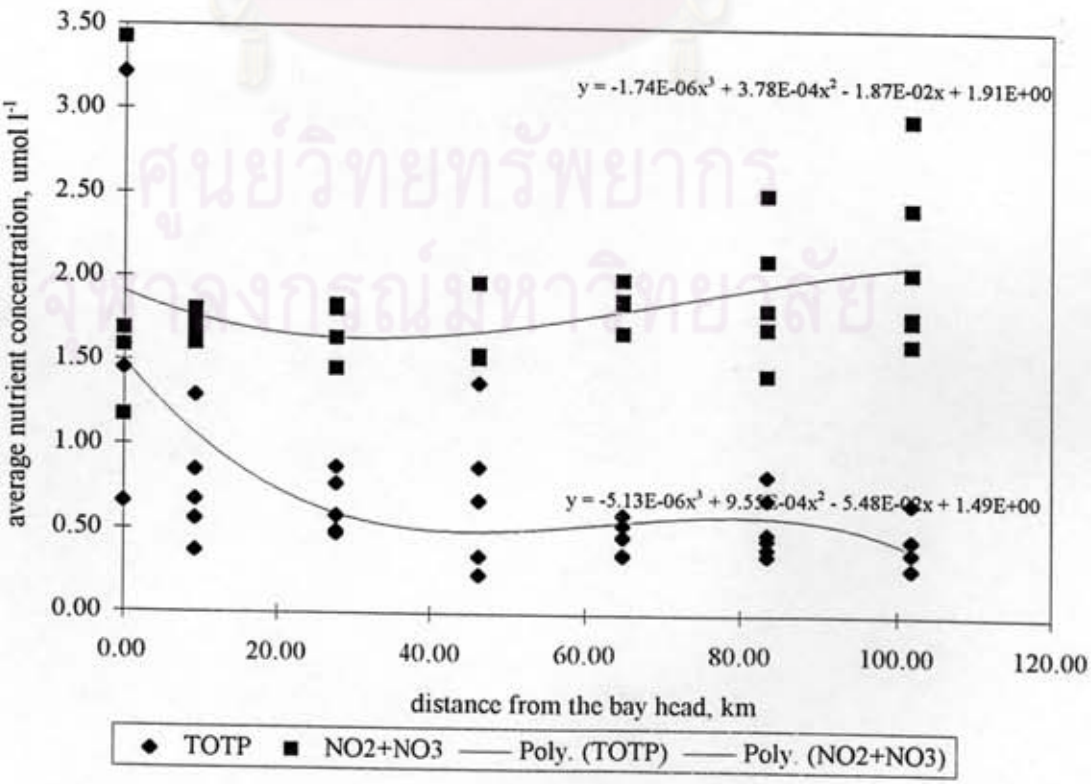




Appendix E (continued)

August 1989





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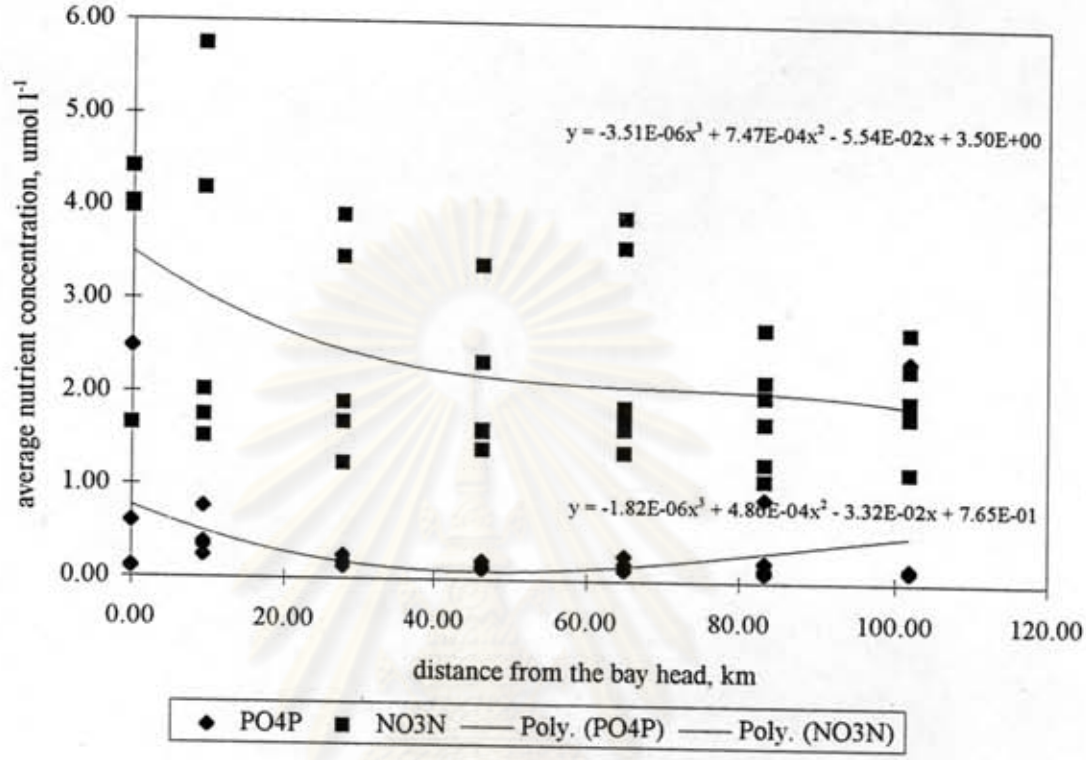
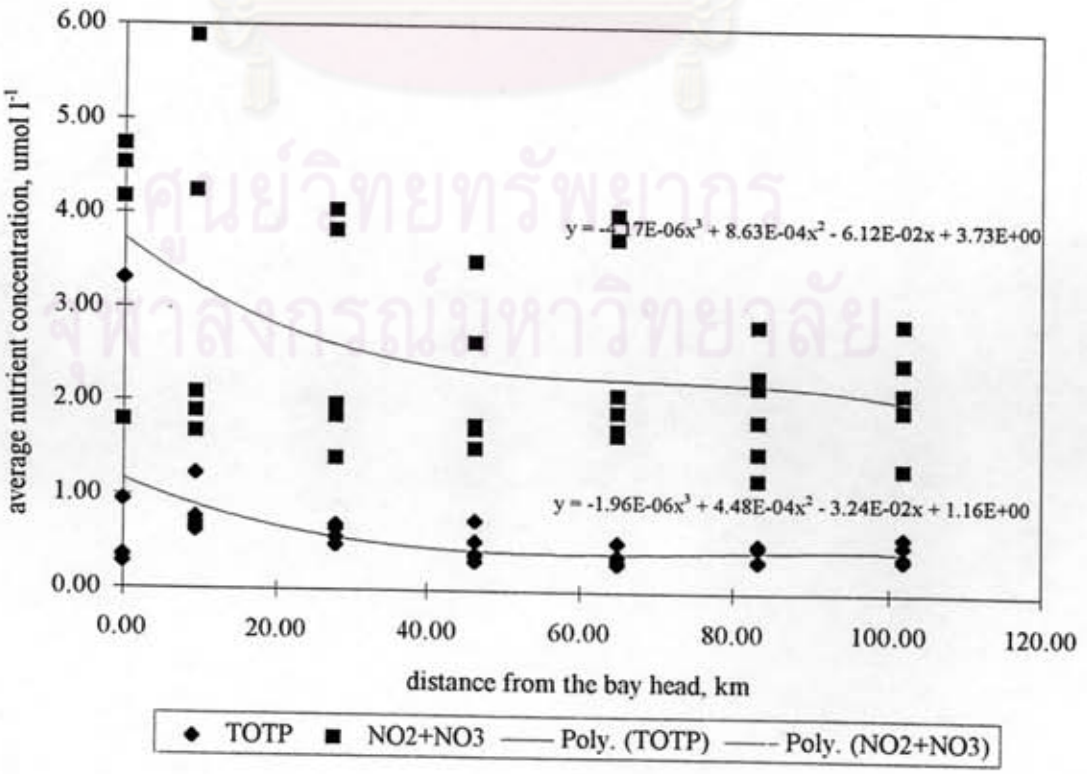
จุฬาลงกรณ์มหาวิทยาลัย

Appendix E (continued)

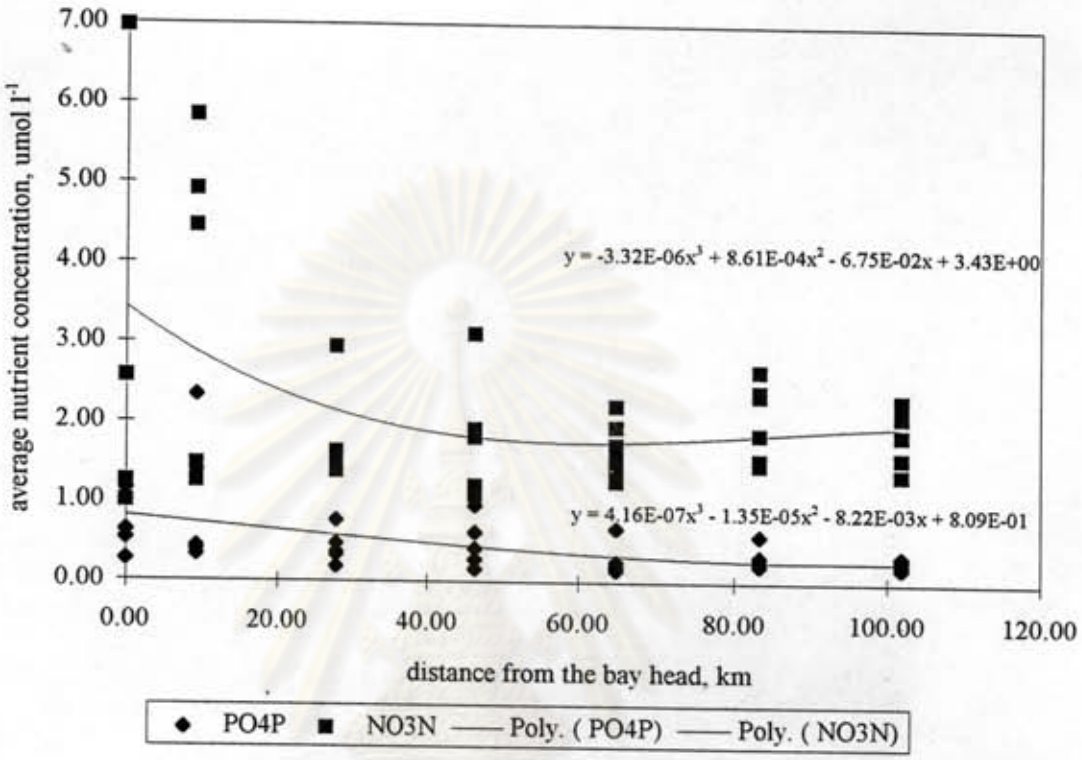
September 1989

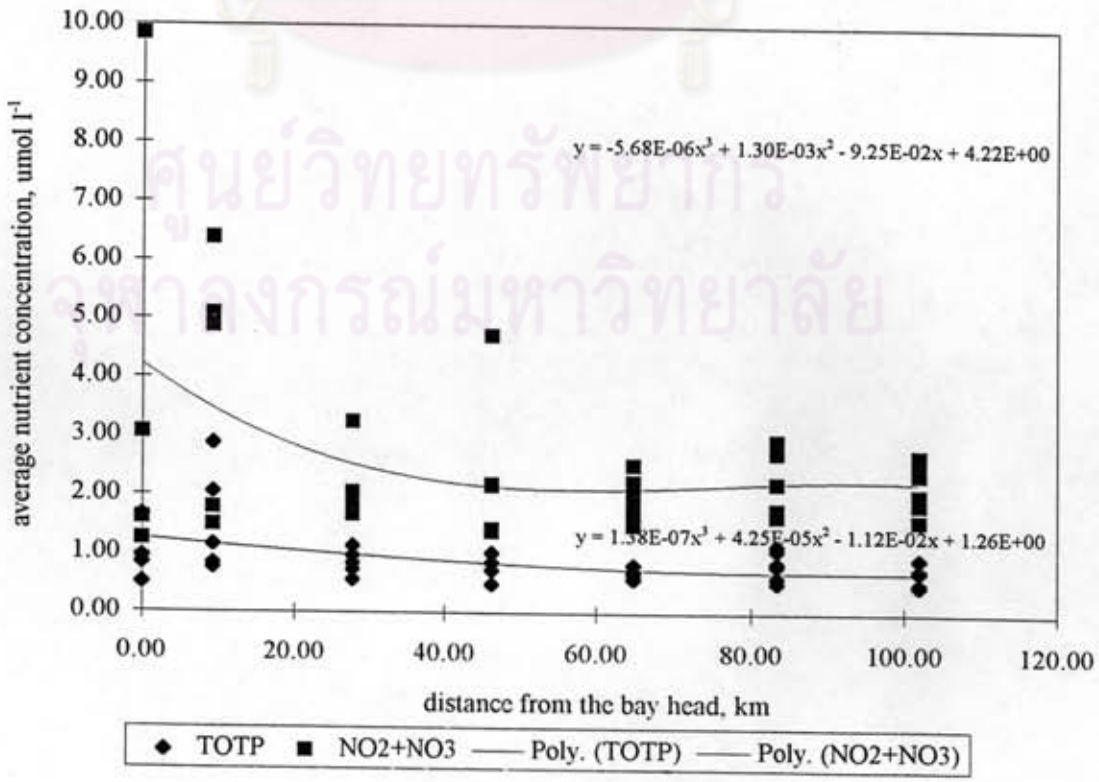




Appendix E (continued)

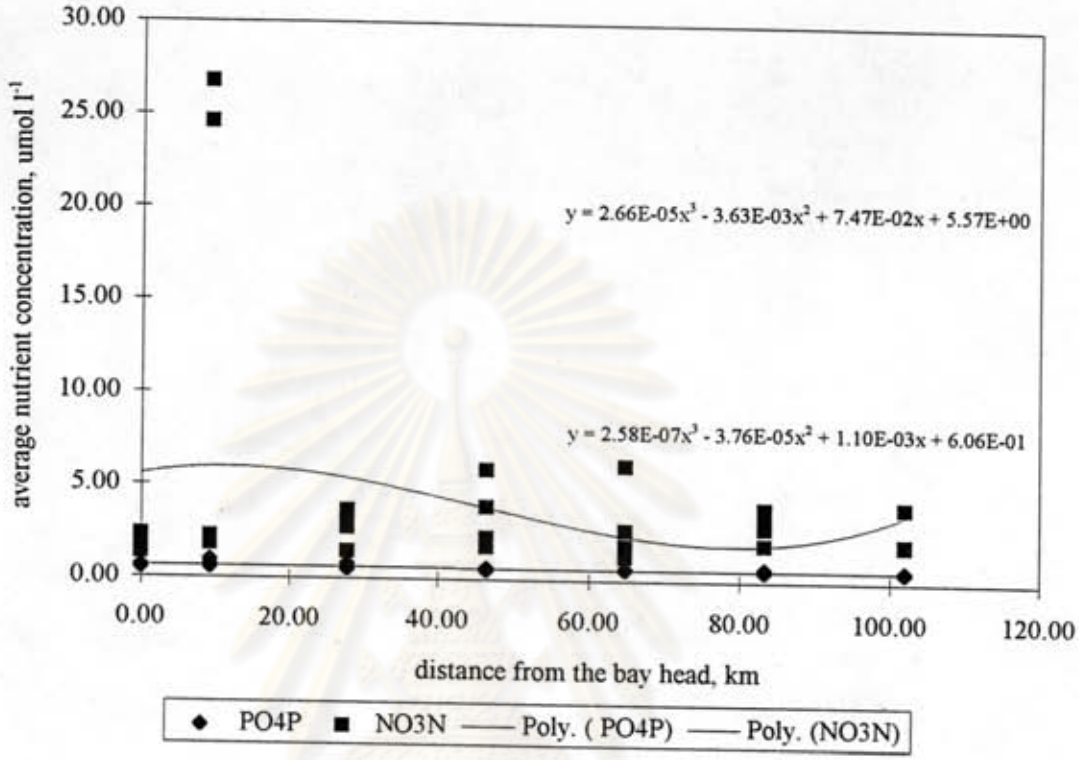
October 1989

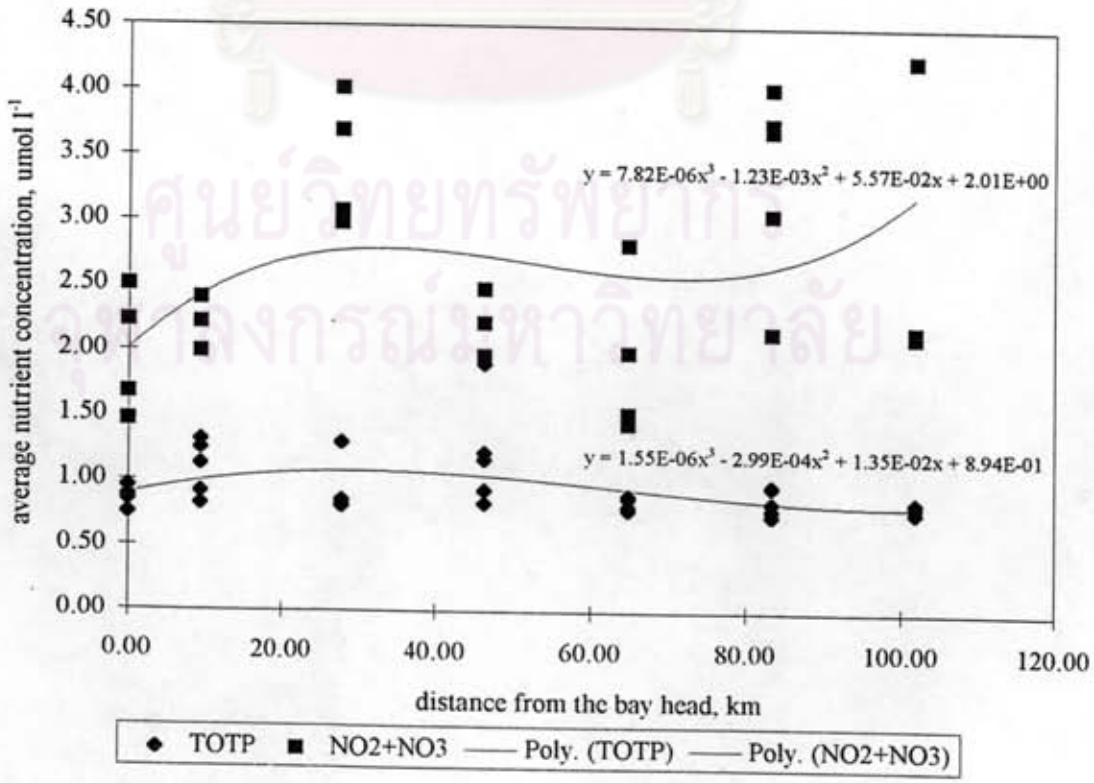




Appendix E (continued)

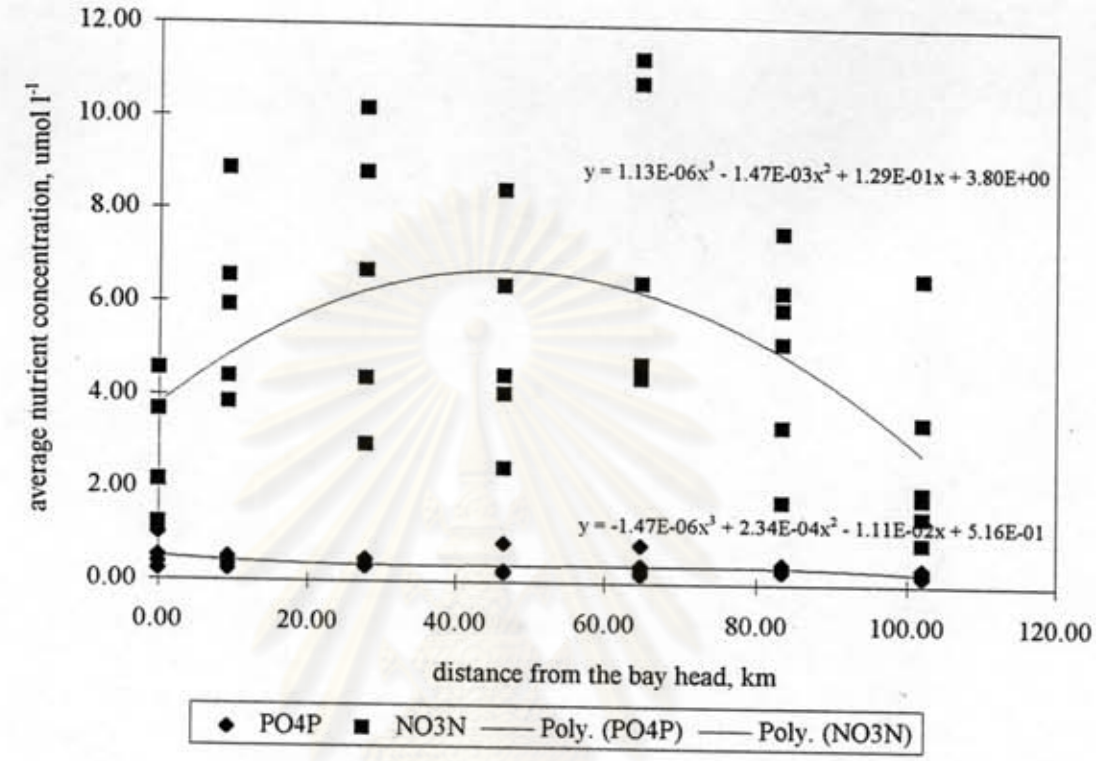
November 1989

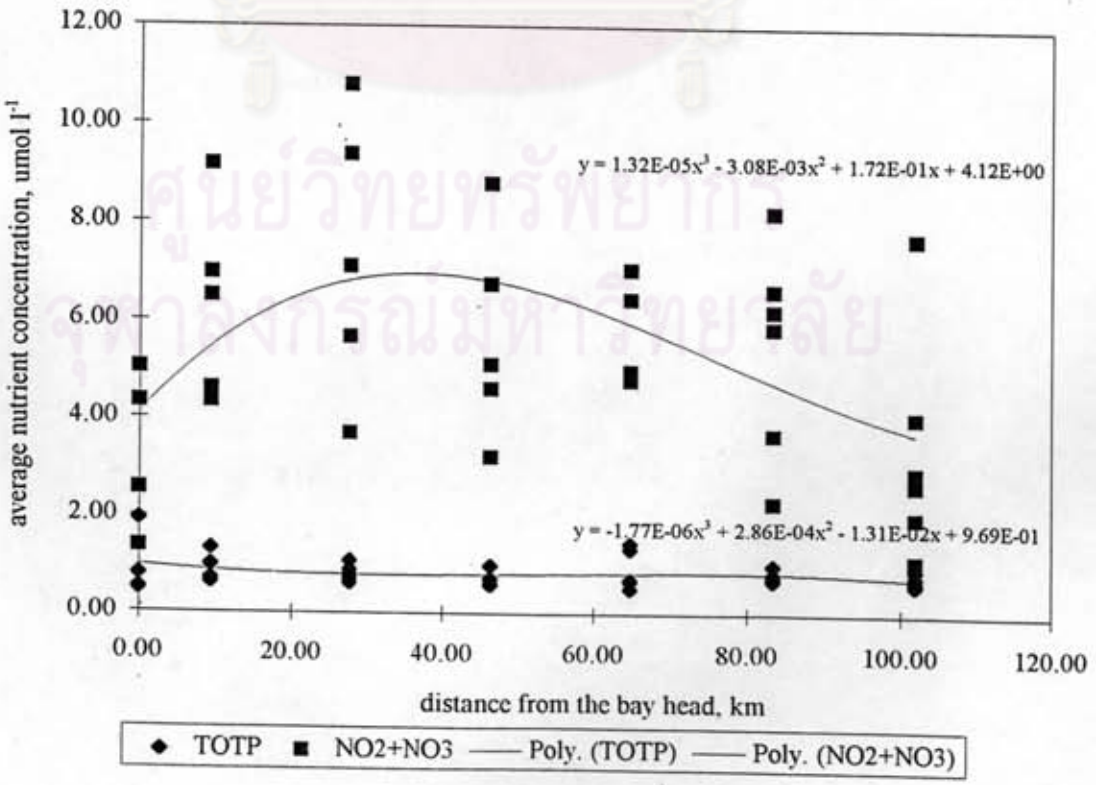




Appendix E (continued)

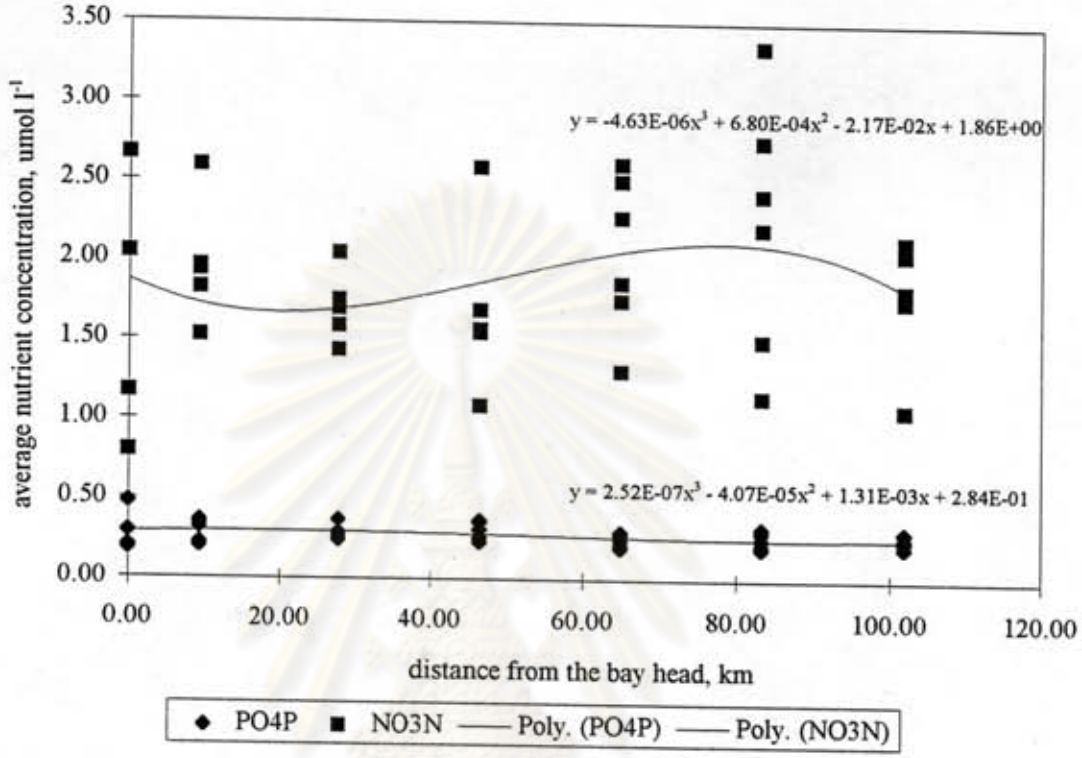
January 1990

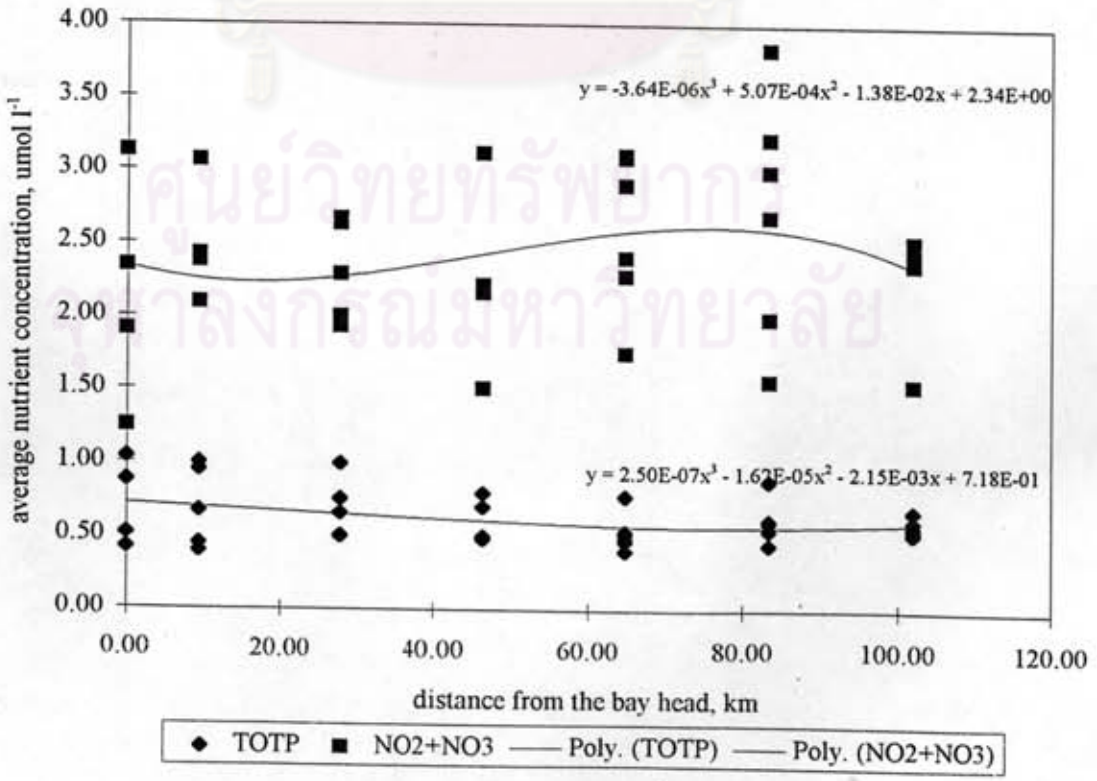




Appendix E (continued)

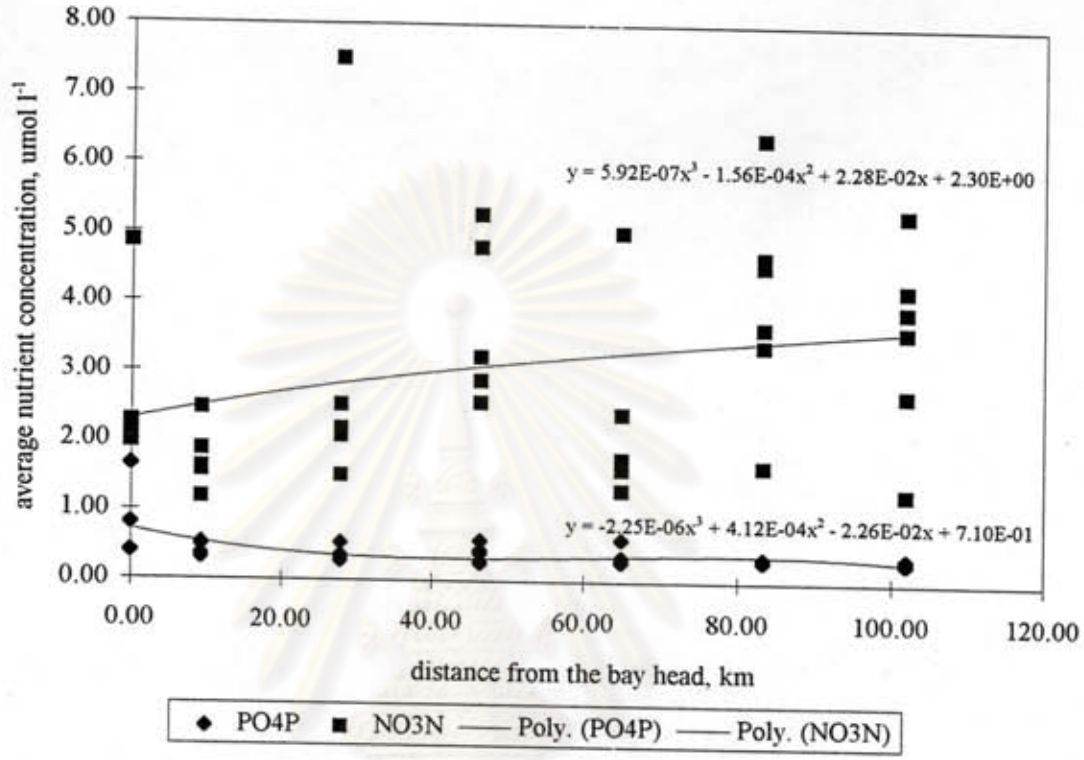
March 1990

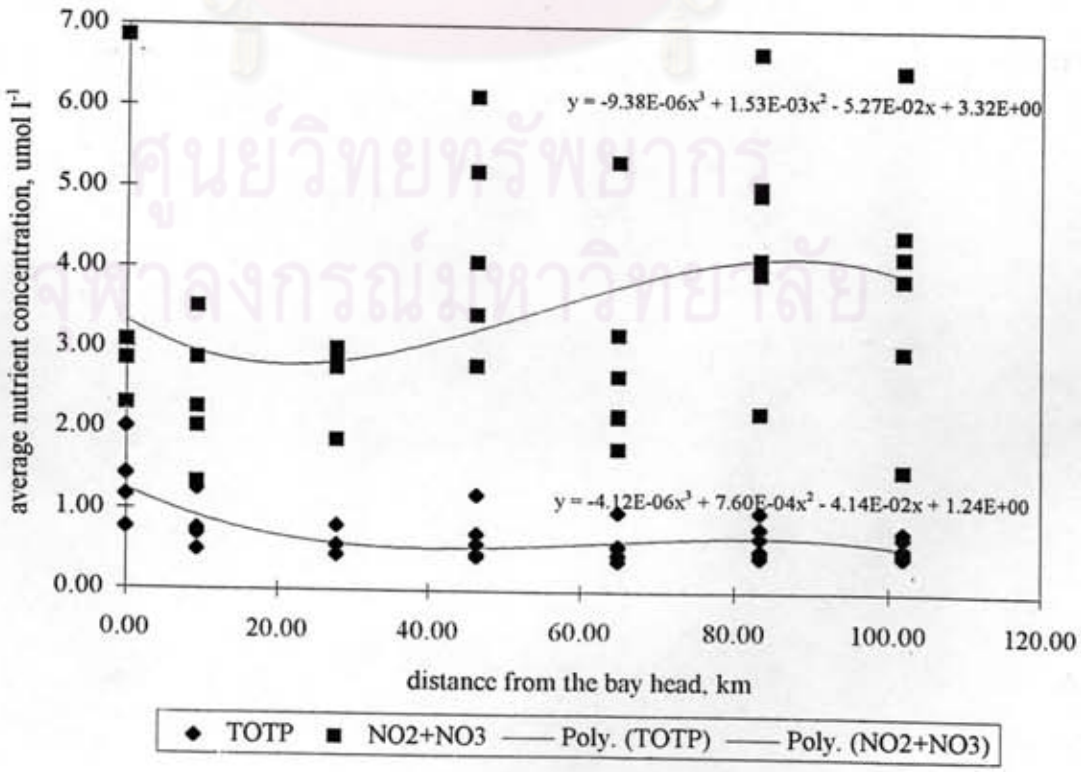




Appendix E (continued)

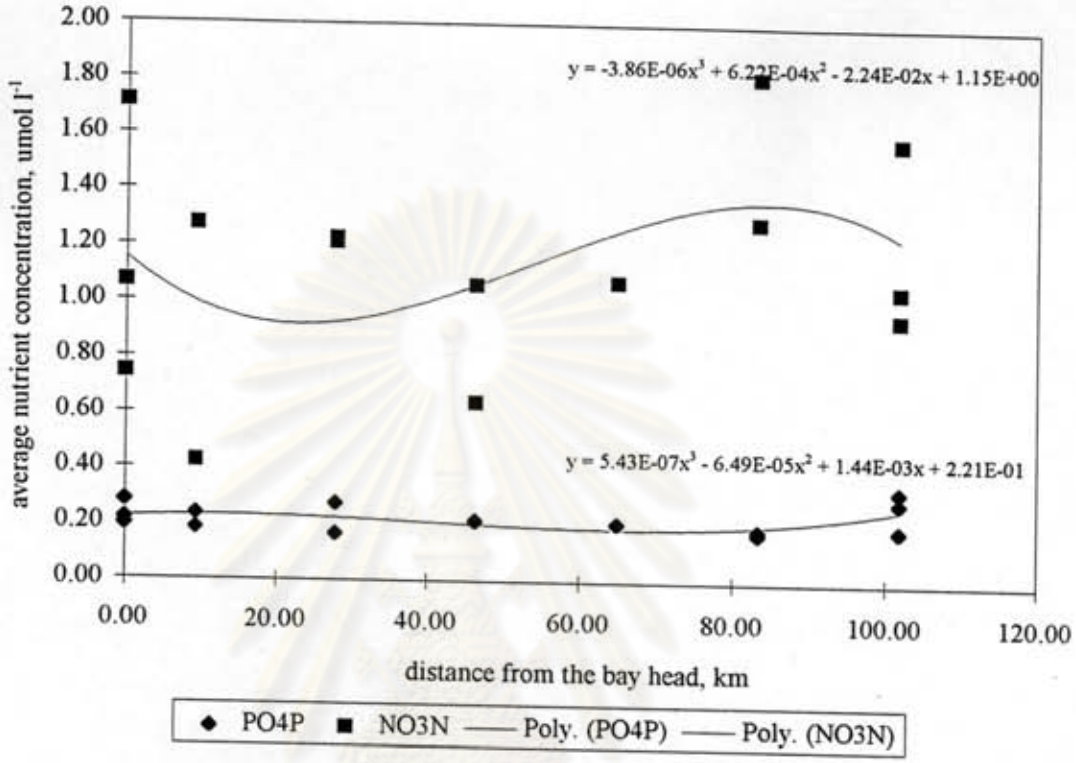
May 1990

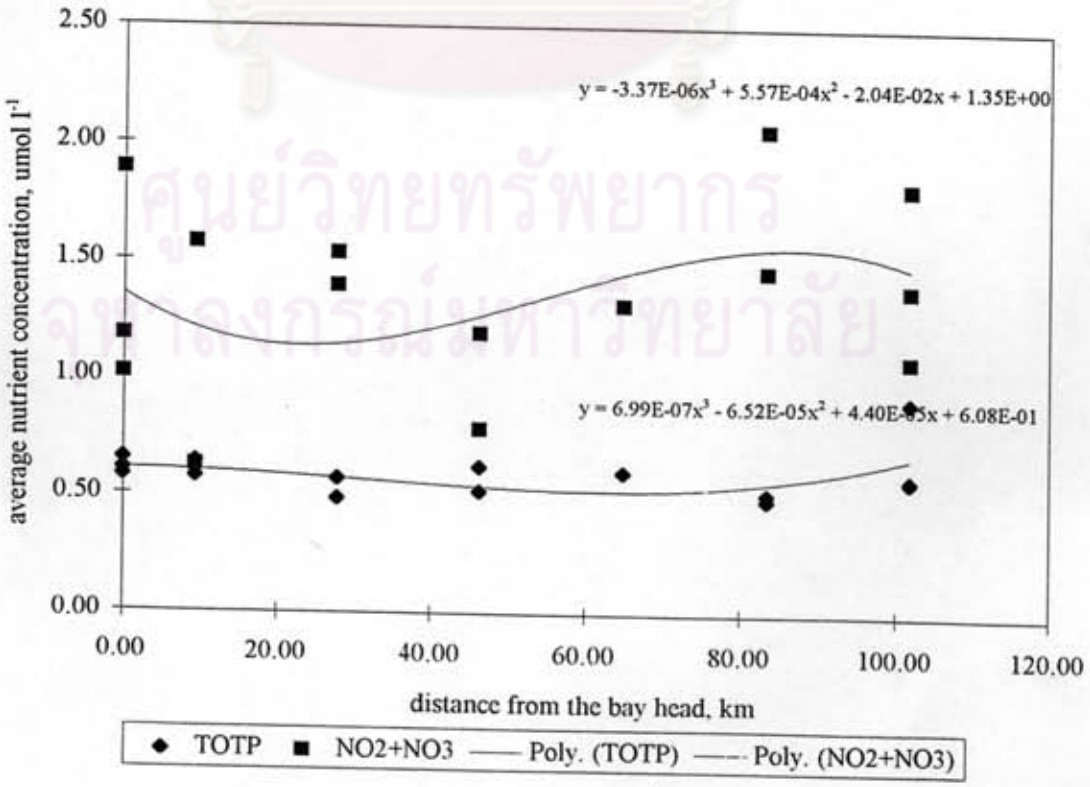




Appendix E (continued)

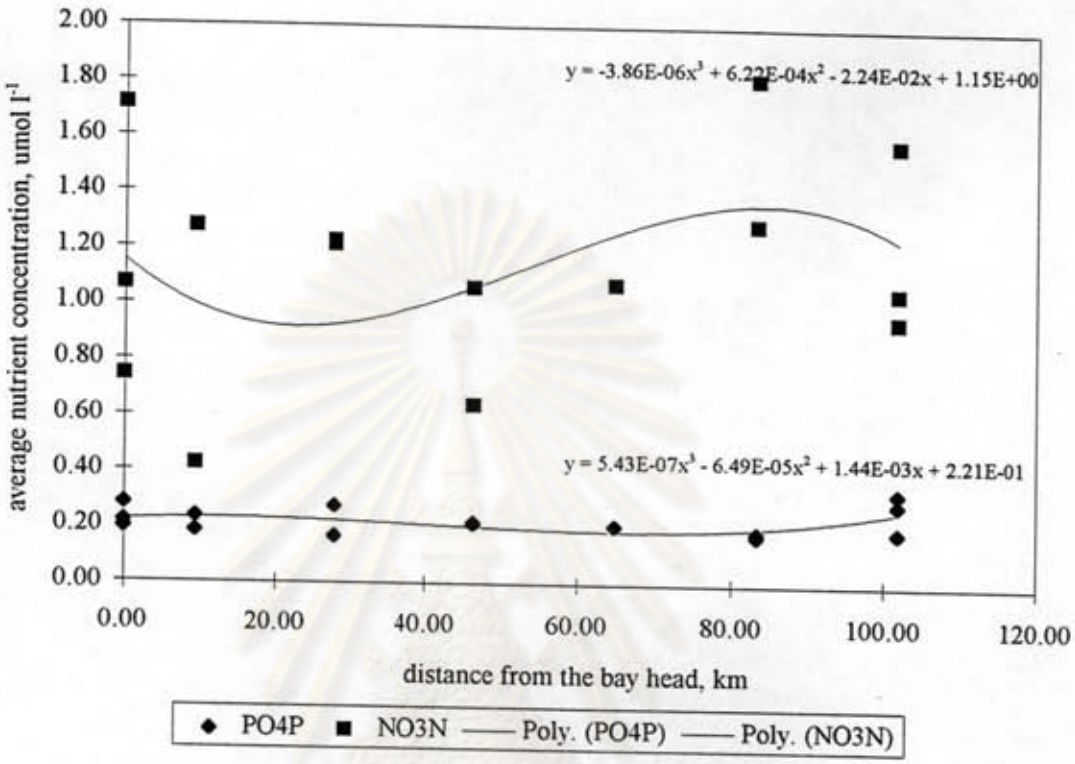
February 1992

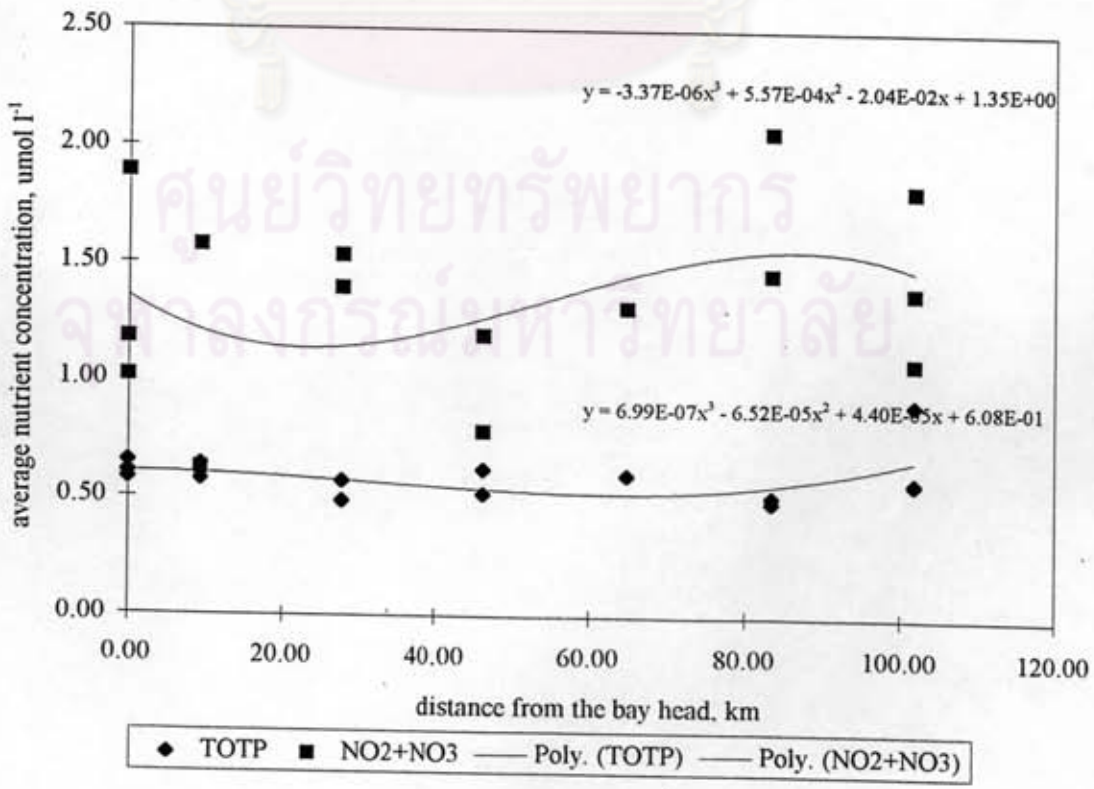




Appendix E (continued)

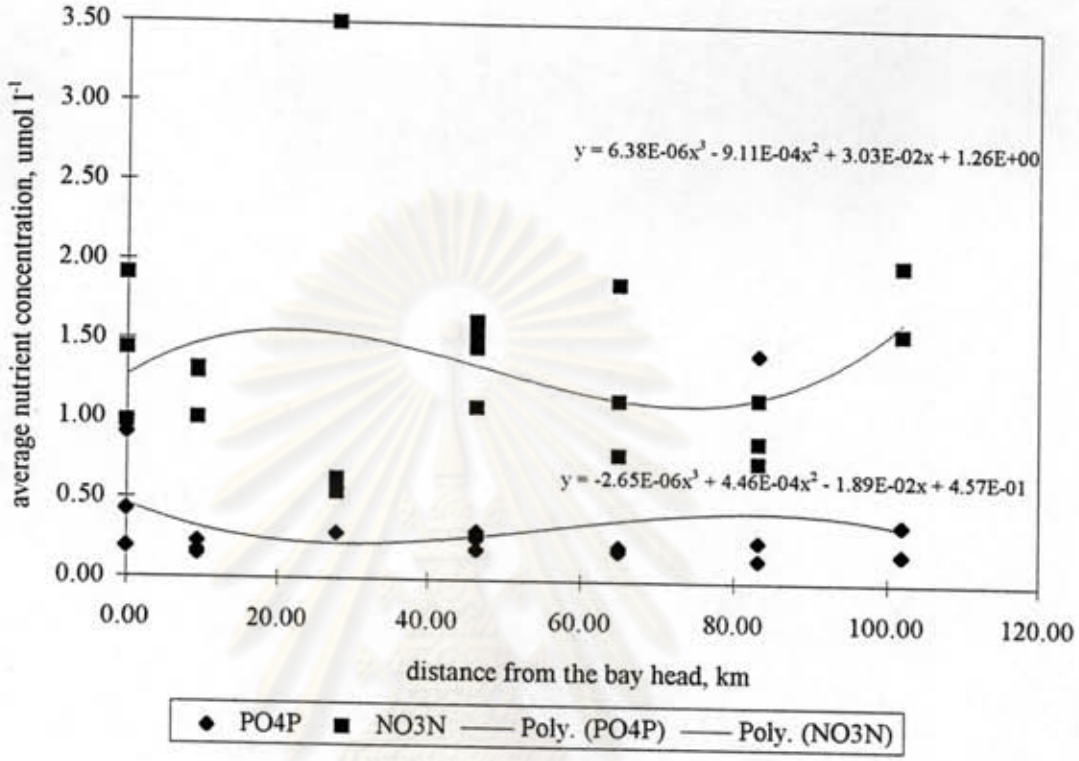
February 1992

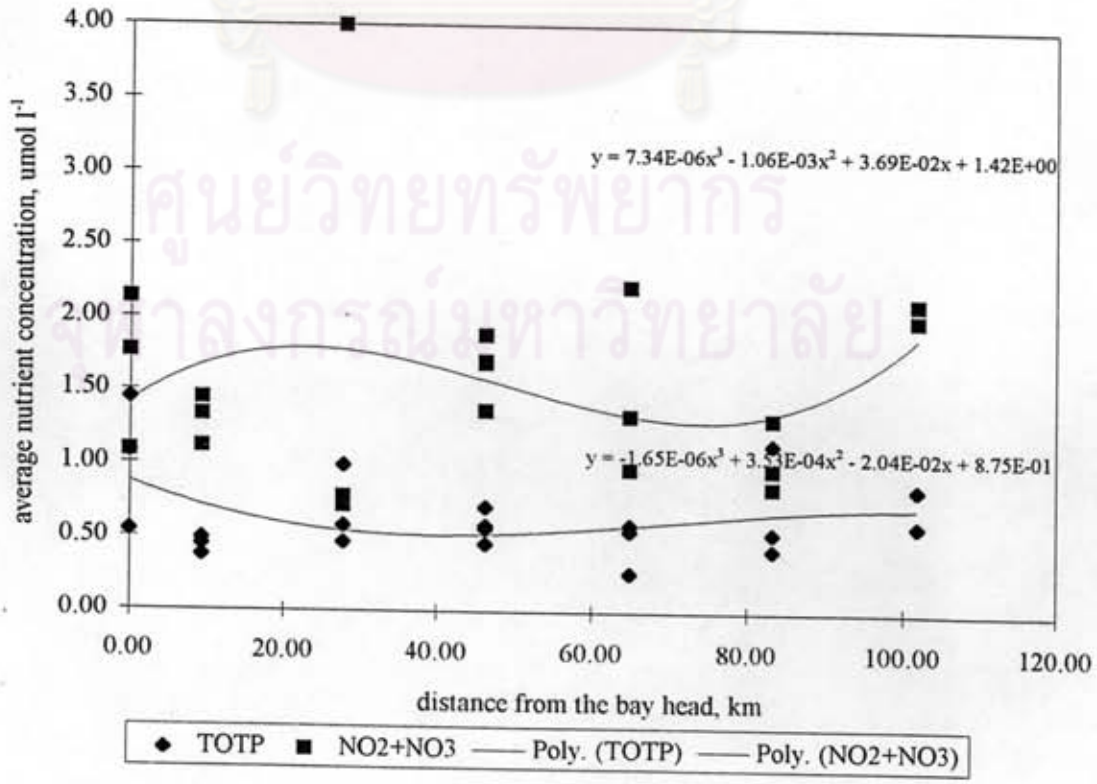




Appendix E (continued)

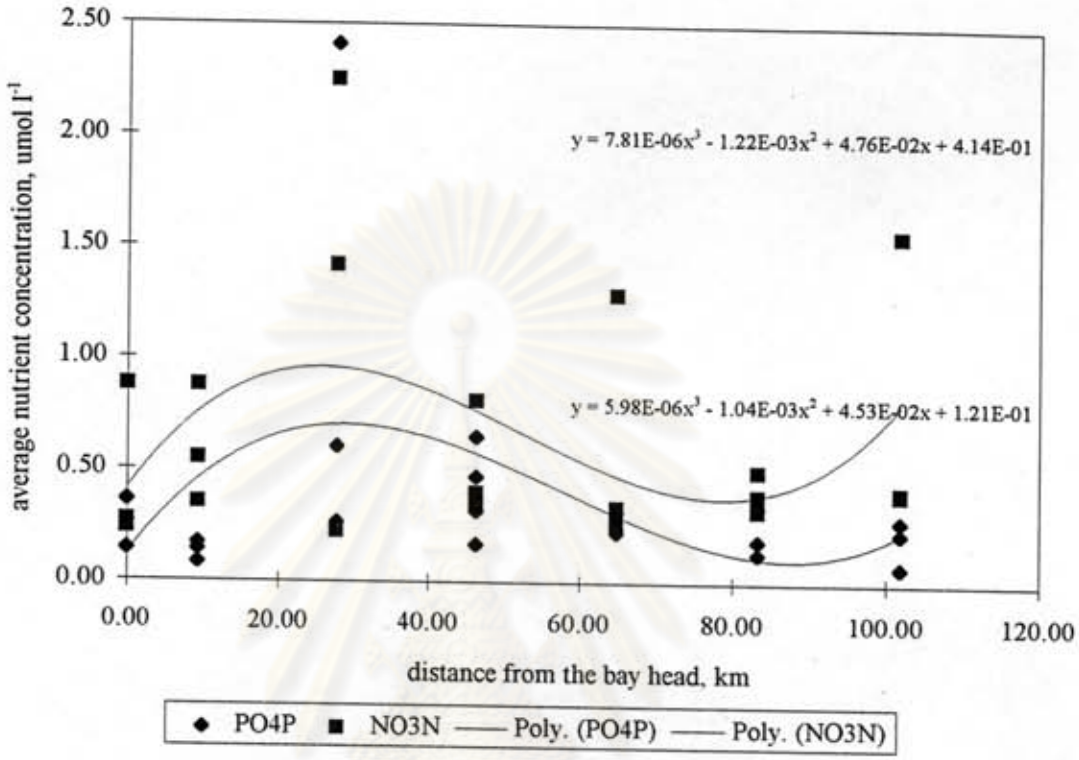
April 1992

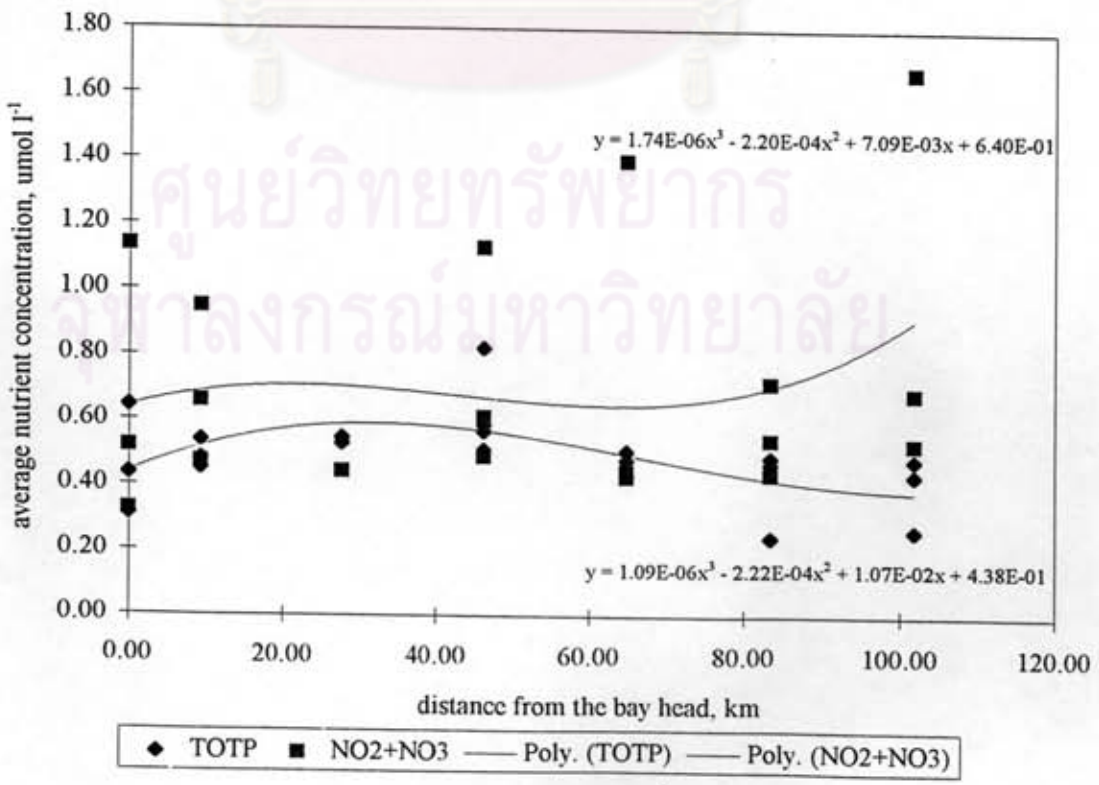




Appendix E (continued)

July 1992





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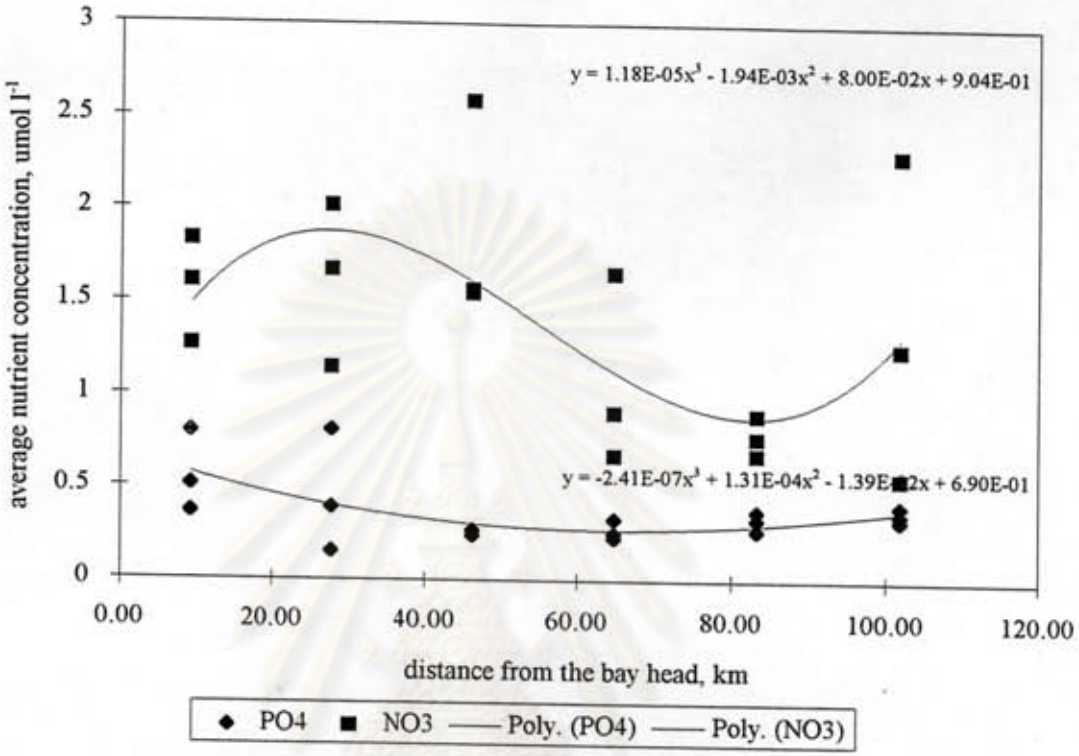
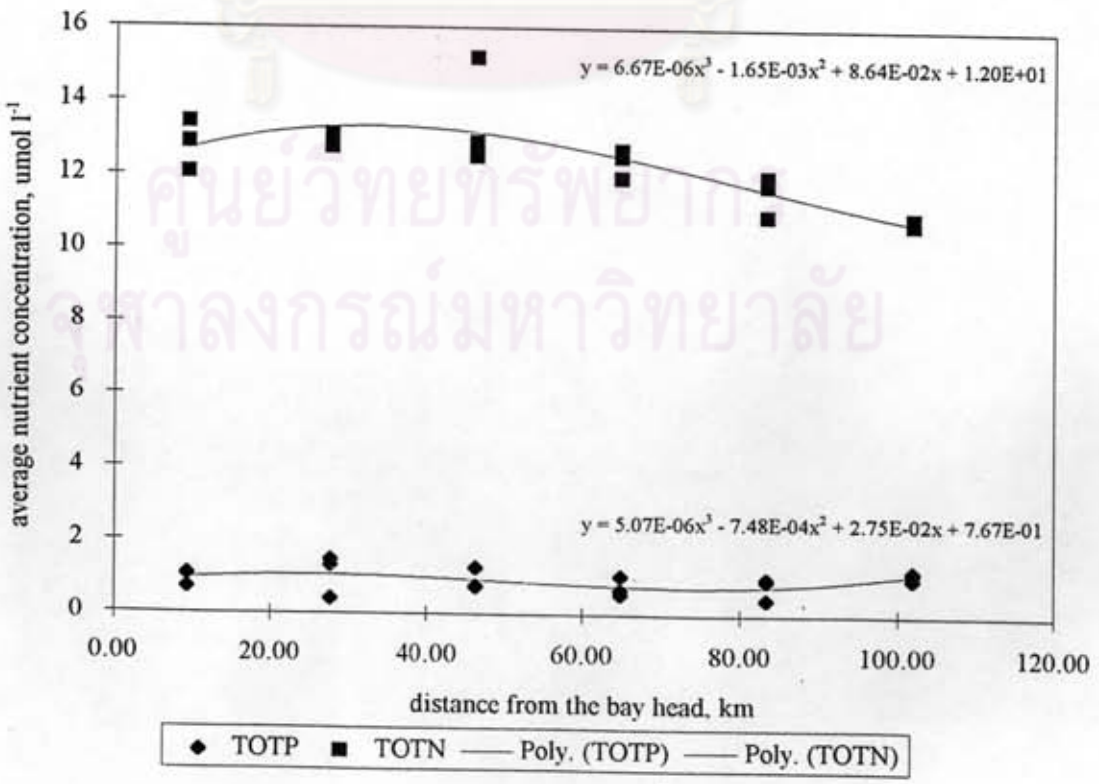
Appendix E (continued)

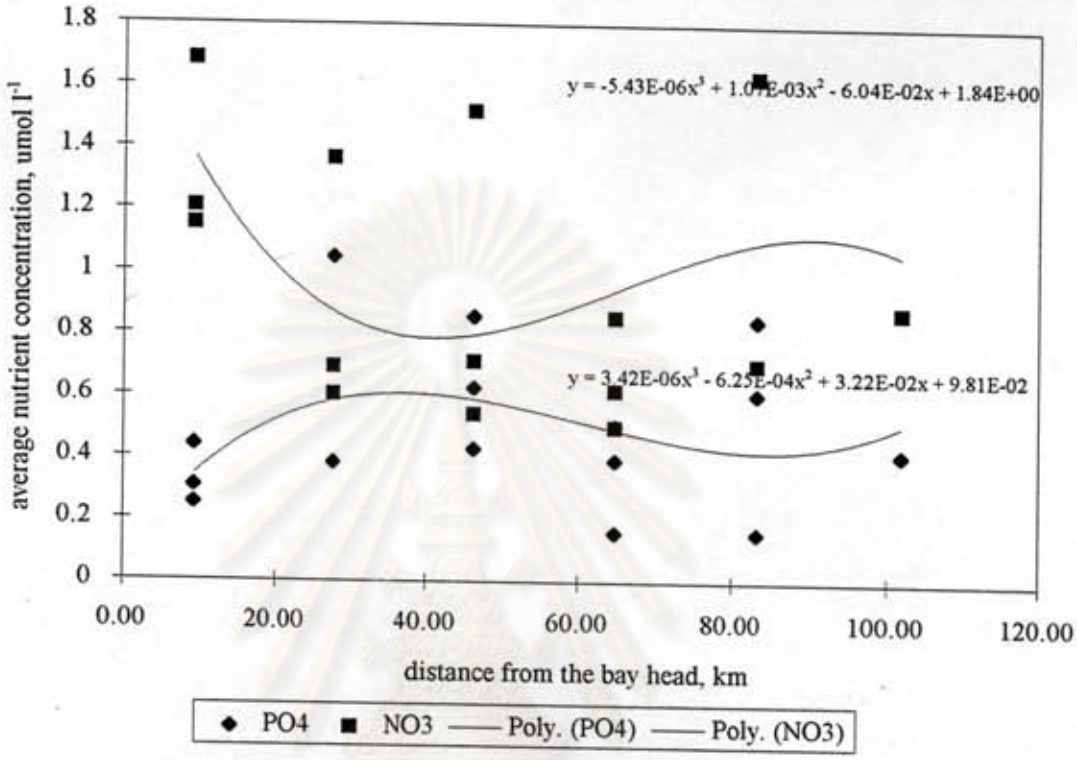
March 1994

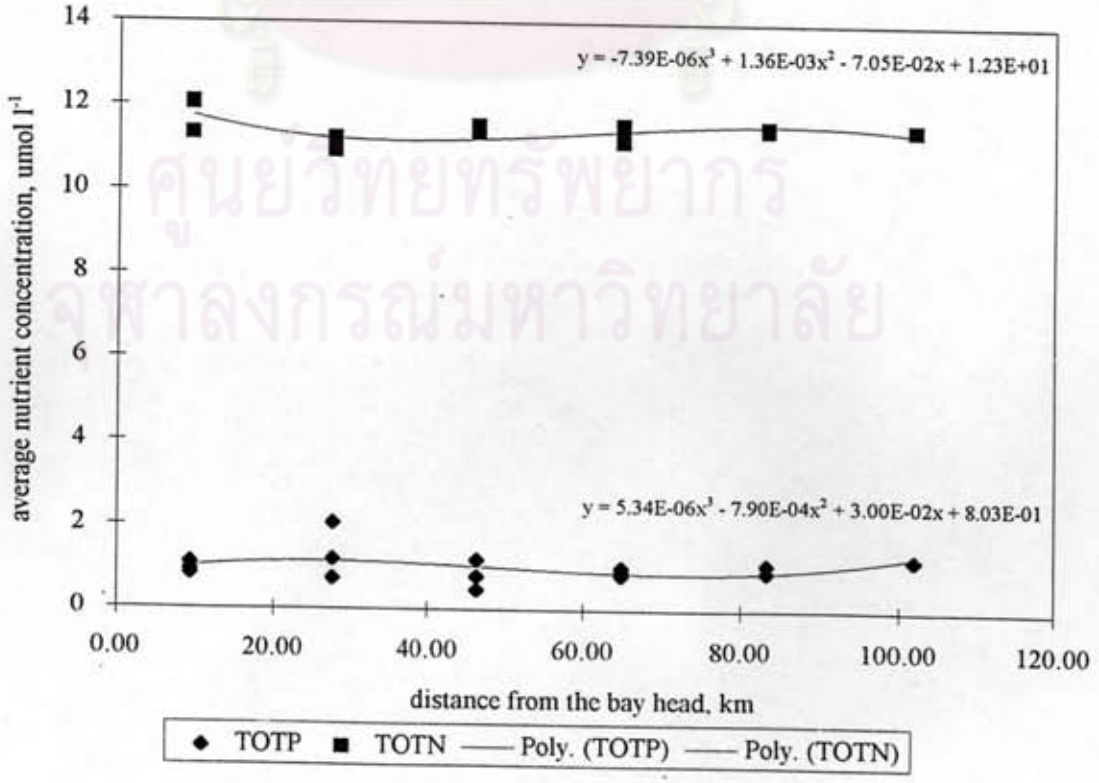




Appendix E (continued)

August 1994





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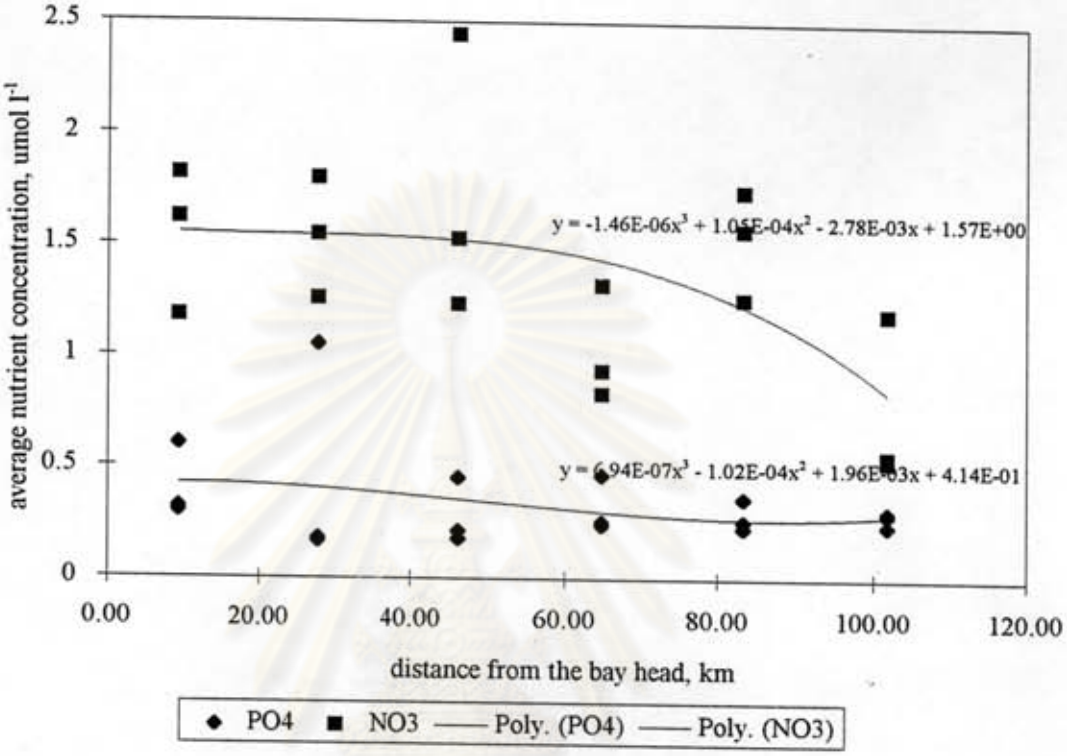
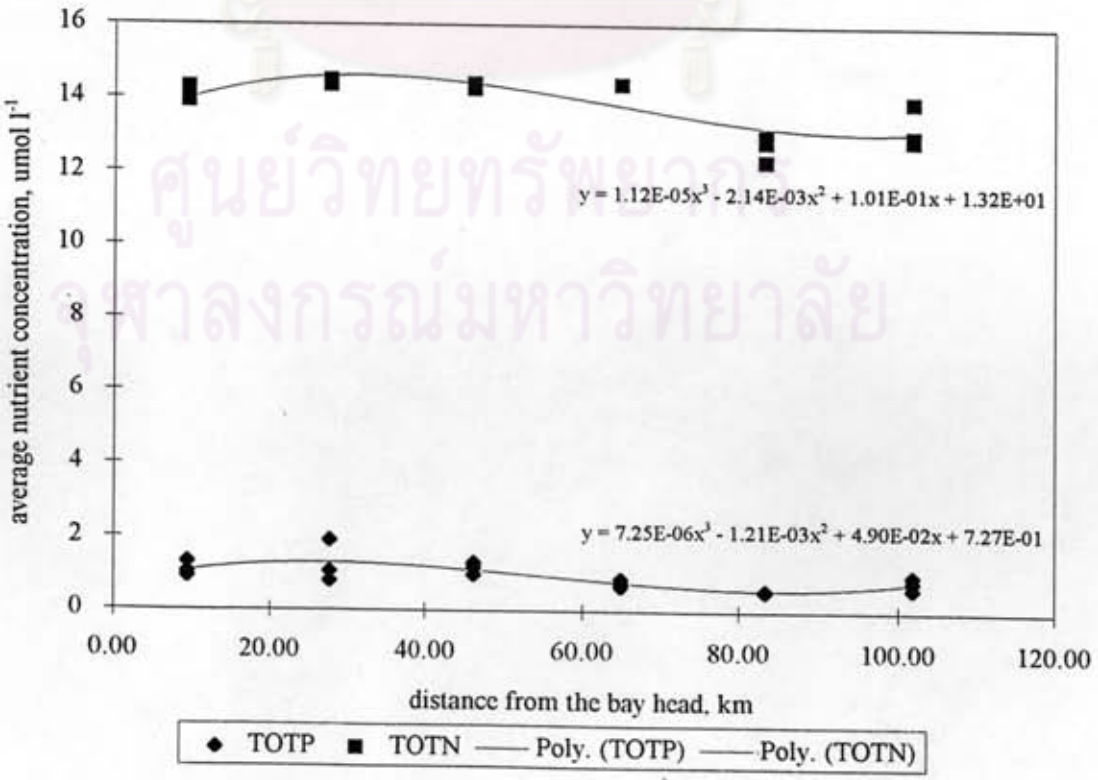
Appendix E (continued)

December 1994





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BIOGRAPHY

Miss Teeraporn Wiriwutikorn was born on July, 17 1971 in Bangkok, Thailand. She received her bachelor degree of Science in Environmental Science from Faculty of Science and Technology, Thammasat University, Bangkok, Thailand, in 1992. After graduation, she has continued her advanced study at Inter-Department of Environmental Science, Graduate School, Chulalongkorn University. She also received postgraduate scholarship from Pollution Control Department, Ministry of Science Technology and Environment. At the present, she works as a environmentalist in the Pollution Control Department of Thailand.

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