Metadata for Water chemistry from the Red River Delta, Vietnam, 2018 to 2020

# Data access and citation

You can access the data from <https://doi.org/10.5285/7e35e760-0ca2-4290-8970-464ead03055d>

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# Sampling regime

The sampling took place in rivers of the Red River Delta within around 100km of Hanoi (20° 57’ 56.52” N 105° 48’ 16.78” E).

There are ten sampling stations along the Red River:

Yen Bai (H1);

Vu Quang (H2);

Hoa Binh (H3);

Son Tay (H4);

Ha Noi (H5);

Gian Khau (H6);

Quyet Chien (H7);

Nam Dinh (H8);

Truc Phuong (H9);

Ba Lat (H10)

There are eleven stations along the Day River:

Phung Dam (D1);

Mai Linh Bridge (D2);

Ba Tha (D3);

Te Tieu Bridge (D4);

Que Bridge (D5);

Do Bridge (D6);

Doan Vy Bridge (D7);

Non Nuoc Bridge (D8);

Do Thong (D9);

Do Muoi (D10);

Nhu Tan (D11).

The locations (latitude/ longitude) of individual sites are given in the dataset.

# Collection/Generation/Transformation Methods

Sampling took place once per month at each station. The sampling started in February 2018 and ended in January 2020. Surface water samples were collected into a Nalgene bottle and stored at 4°C before analysis within 48 h.

The seasonal timing of sampling was designated, dependent on whether the sample was collected in the dry (November-April) or rainy (May-October) season.

Geographical (latitude-longitude) position of each sampling point was recorded using a GPS.

Temperature, pH, dissolved oxygen, salinity, and turbidity were measured in situ with a Hydrolab Sonde DS5 (USA).

# Analytical methods

TDN, TDP, NO3-N, NO2-N, NH4-N, SO42-, and TA were determined according to (APHA, 1912) with ﬁltration (Whatman GF/F; 0.7µm pore size) for soluble parameters. TA was measured on ﬁltered samples and determined by the single-point titration method using methyl orange and phenolphthalein as indicators, respectively. NO3-N was determined by quantitative reduction to NO2-N on a cadmium column, followed by colorimetric determination at 540 nm of nitrite using the Griess reaction (Standard method 4500-NO3 E; APHA, 1912). The NO2-N protocol followed that for NO3-N without the reduction step. NH4-N was determined colorimetrically at 640 nm by the phenol hypochlorite method (Standard method 4500-NH3 F. phenate; APHA, 1912). The Kjeldahl digestion method was used for TDN analysis (Standard method 4500-Norg B; APHA, 1912). To determine TDP, ﬁltered samples were oxidized by (NH4)2S2O8 in H2SO4 to convert all phosphorus to phosphates (PO4) before PO4 determination. SO42- ion concentration was determined by the turbidity method by conversion to a barium sulfate suspension and spectrophotometric measurement relative to known standards (4500 SO4-2 E; APHA, 1912).

Chlorophyll and carotenoid pigments were extracted from filter papers at -4°C for 12 hours in acetone: methanol: water (80:15:5), followed by filtration through a PTFE 0.22μm filter, and evaporation under nitrogen gas. Dried extracts were then re-dissolved in a solution of (70:25:5) acetone, ion-pairing reagent (IPR; 0.75 g of tetrabutylammonium acetate and 7.7 g of ammonium acetate in 100 mL water) and methanol. Samples were separated and quantified using an Agilent 1200 series HPLC separation module, quaternary pump, with an ODS Hypersil column (205 × 4.6 mm; 5 μm particle size) and photo-diode array detector, using modification conditions of Chen et al. (Chen et al, 2002). Pigments were quantified using commercial standard calibrations (DHI, Denmark) and identified using absorbance spectra and retention times. Pigment concentrations are reported as nanomoles of pigment per liter of water filtered.

# Quality control

The pH and oxygen electrodes were calibrated between sampling campaigns and the pH precision and accuracy was ±0.01. For colorimetric chemical analyses, calibration standards were run alongside each analysis. Pigment concentrations were calculated from peak areas using an 8-point calibration with commercial standards and identifications were aided using an extract of grass to evaluate retention time drift of Chl a, Chl b and lutein.

# Details of data structure and units of recorded values

There are 44 columns of data as described below

| **Col no.** | **Col name** | **Description** |
| --- | --- | --- |
| 1 | Site name | Common name of location |
| 2 | Site code | H and D codes assigned to each site |
| 3 | Date | In text format dd-mm-yyyy |
| 4 | Date (formatted) | In date format dd-mm-yyyy |
| 5 | Month | Month in the calendar year (1-12) |
| 6 | Year | Year of sampling |
| 7 | Season | WET/DRY |
| 8 | Lattitude | Decimal degrees N |
| 9 | Longitude | Decimal degrees E |
| 10 | Time | Time of sampling hhmm |
| 11 | T-C | Temperature °C |
| 12 | DO mgO2/l | Dissolved oxygen in mg/L |
| 13 | Sal ppt | Salinity (ppt) |
| 14 | pH | pH units |
| 15 | Turbidity NTU | Nephelometric turbidity units (NTU) |
| 16 | Conductivity uS/cm | Specific conductivity in µS/cm |
| 17 | TDS mg/l | Total dissolved solids in g/L |
| 18 | NO3-N mgN/l | Nitrate as N in mg/L |
| 19 | NO2-N mgN/l | Nitrite as N in mg/L |
| 20 | NH4-N mgN/l | Ammonium as N in mg/L |
| 21 | Ntot mgN/l | Total nitrogen in mg/L |
| 22 | SRP - PO4-P mgP/l | Soluble reactive phosphorus, phosphate as P in mg/L |
| 23 | TSP - PO4-P mgP/l | Total soluble phosphorus as P in mg/L |
| 24 | Ptot mgP/l | Total phosphorus in mg/L |
| 25 | SiO2 mgSiO2/l | Silicate in mg/L |
| 26 | SiO2 mgSi/l | Silicate as Si in mg/L |
| 27 | Alkalinity (mol/L) | Total alkalnity in mol/L |
| 28 | Alkalinity (umol/L) | Total alkalinity in µmol/L |
| 29 | Na(mg/l) | Sodium ions in mg/l |
| 30 | Mg (mg/l) | Magnesium ions in mg/L |
| 31 | K (mg/l) | Potassium ions in mg/L |
| 32 | Ca (mg/l) | Calcium ions in mg/L |
| 33 | Cl-(mg/l) | Chloride ions in mg/L |
| 34 | SO4 (mg/l) | Sulphate ions in mg/L |
| 35 | Fucoxanthin nmol/L | Fucoxanthin concentrations in nmol/L |
| 36 | Violaxanthin nmol/L | Violaxanthin concentrations in nmol/L |
| 37 | Diadinoxanthin nmol/L | Diadinoxanthin concentrations in nmol/L |
| 38 | Diatoxanthin nmol/L | Diatoxanthin concentrations in nmol/L |
| 39 | Lutein nmol/L | Lutein concentrations in nmol/L |
| 40 | Zeaxanthin nmol/L | Zeaxanthin concentrations in nmol/L |
| 41 | Canthaxanthin nmol/L | Canthaxanthin concentrations in nmol/L |
| 42 | Chl a nmol/L | Chlorophyll a concentrations in nmol/L |
| 43 | Chl a'1 nmol/L | Chl a derivative concentrations in nmol/L |
| 44 | Chl a'2 nmol/L | Chl a derivative concentrations in nmol/L |

# References

APHA, Standard methods for the examination of water and wastewater (Vol. 2). American Public Health Association (1912).

Chen, N., Bianchi, T. S., McKee, B. A., & Bland, J. M. (2001). Historical trends of hypoxia on the Louisiana shelf: application of pigments as biomarkers. *Organic Geochemistry*, *32*(4), 543-561.