Time-series pH data from methods development of Durafet pH sensors for use in laboratory experiments in 2016 and 2017 (pHVAR project)

Website: https://www.bco-dmo.org/dataset/723336
Data Type: experimental
Version: 1

Project
» OCE PRF: Track 2 (International) Indirect effects in a changing ocean: a case study of seagrass photosynthesis and mussel physiology (pHVAR)

Contributors	Affiliation	Role
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Coverage

Temporal Extent: 2016-06-17 - 2017-02-27

Dataset Description

Time-series pH data from methods development of Durafet pH sensors for use in laboratory experiments. This time series was conducted at Villefranche-sur-Mer, France in June of 2016 and February of 2017.

Average spectrophotometric pH measurements collected during this experiment are available in a separate dataset:
Durafet methods development: replicate spectrophotometric pH measurements
https://www.bco-dmo.org/dataset/723785

These data are presented in the following publication:

Kapsenberg, L., Bockmon, E. E., Bresnahan, P. J., Kroeker, K. J., Gattuso, J. P., & Martz, T. R. (2017). Advancing ocean acidification biology using Durafet® pH electrodes. Frontiers in Marine Science, 4, 321. doi:10.3389/fmars.2017.00321

Methods & Sampling

These data originate from methods development of UDA-Durafet pH electrodes. Briefly, pH electrodes are calibrated against spectrophotometric pH measurements prior to the experiment. A post-calibration spectrophotometric pH measurement is used to correct the time series to the same pH value at the time of sampling, at the end of the experiment. Upon conclusion of the experiment, spectrophotometric pH measurements are used to identify any change in electrode performance. The precision of pH measurements

is 0.008 (Kapsenberg et al., 2017). Data are not corrected for any offset in post-experiment spectrophotometric pH measurement.

Sampling and analytical procedures (Spectrophotometric pH measurement using purified m-cresol) are Dickson et al. 2007.

References:

Dickson, A. G., Sabine, C. L., & Christian, J. R. (2007). Guide to best practices for ocean CO2 measurements. PICES Special Publication 3, p. 191.
Available at http://cdiac.ess-dive.lbl.gov/ftp/oceans/Handbook_2007/Guide_all_in_one.pdf

Kapsenberg, L., Bockmon, E. E., Bresnahan, P. J., Kroeker, K. J., Gattuso, J. P., & Martz, T. R. (2017). Advancing ocean acidification biology using Durafet® pH electrodes. *Frontiers in Marine Science*, *4*, 321. doi:10.3389/fmars.2017.00321

Data Processing Description

BCO-DMO data manager processing notes:
* added column "Experiment_Type" with values "Durafet_Test" and "Durafet_Experiment."
* Added ISO format time stamp
* two different timestamp formats in the originally named "Time" column. Changed the format of the numeric values to match the rest of the dataset (Timestamp_local, dd-mm-yy HH:MM)
* pH values rounded to 3 decimal places based on precision specifications and communication with PI.

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Data Files

File
Durafet.csv (Comma Separated Values (.csv), 724.60 KB) MD5:71fda40fd3156e46769baac3ea971d8d Primary data file for dataset ID 723336

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Parameters

Parameter	Description	Units
Experiment_Type	Experiment type	unitless
Timestamp_local	Local timestamp (France, CET/CEST) in format "dd-mm-yy HH:MM"	unitless
ISO_DateTime_UTC	ISO timestamp based on the ISO 8601:2004(E) standard in format YYYY-mm-ddTHHZ (UTC)	unitless
pH_1A	pH from Durafet unit 1 electrode A	total hydrogen ion scale
Temp_1A	Temperature from Durafet unit 1 electrode A	degrees Censius

pH_1B	pH from Durafet unit 1 electrode B	total hydrogen ion scale
Temp_1B	Temperature from Durafet unit 1 electrode B	degrees Censius
pH_2A	pH from Durafet unit 2 electrode A	total hydrogen ion scale
Temp_2A	Temperature from Durafet unit 2 electrode A	degrees Censius
pH_2B	pH from Durafet unit 2 electrode B	total hydrogen ion scale
Temp_2B	Temperature from Durafet unit 2 electrode B	degrees Censius
pH_3A	pH from Durafet unit 3 electrode A	total hydrogen ion scale
Temp_3A	Temperature from Durafet unit 3 electrode A	degrees Censius
pH_3B	pH from Durafet unit 3 electrode B	total hydrogen ion scale
Temp_3B	Temperature from Durafet unit 3 electrode B	degrees Censius
pH_4A	pH from Durafet unit 4 electrode A	total hydrogen ion scale
Temp_4A	Temperature from Durafet unit 4 electrode A	degrees Censius
pH_4B	pH from Durafet unit 4 electrode B	total hydrogen ion scale
Temp_4B	Temperature from Durafet unit 4 electrode B	degrees Censius

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Instruments

Dataset-specific Instrument Name	Honeywell UDA2182 and Honeywell Durafet III pH electrodes
Generic Instrument Name	pH Sensor
Generic Instrument Description	An instrument that measures the hydrogen ion activity in solutions. The overall concentration of hydrogen ions is inversely related to its pH. The pH scale ranges from 0 to 14 and indicates whether acidic (more H+) or basic (less H+).

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Project Information

OCE PRF: Track 2 (International) Indirect effects in a changing ocean: a case study of seagrass photosynthesis and mussel physiology (pHVAR)

Coverage: NW Mediterranean Sea

NSF abstract:

One of the major goals of ocean acidification research is to understand how ecosystem functioning and services will change in the future. In this project, the fellow will assess the influence of pH variability on an ecologically and economically important mussel species, under future ocean pH and temperature conditions. The research will be conducted at Laboratoire d'Océanographie de Villefranche-sur-Mer, France in collaboration with international host scientist Dr. Jean-Pierre Gattuso and sponsoring scientist Dr. Todd Martz (Scripps Institution of Oceanography, USA). By hosting a workshop, the fellow will introduce pH sensors to European students and scientists and promote the use of field data in the design of biological experiments. The project supports the training of a postdoctoral fellow and two undergraduate student interns. Results and data from this project will be disseminated at conferences and through open-access publications and data repositories.

Experiments investigating the effects of ocean acidification on marine organisms often ignore the spatio-temporal variability in seawater pH that is present in coastal marine ecosystems. Such heterogeneity in pH may provide temporal refuge from corrosive seawater under future levels of acidification. Utilizing a combination of field and lab experiments, this project will evaluate the influence of pH variability and interactive effects of warming and acidification on mussel physiology through several levels of biological organization. Should variability in pH provide beneficial effects on mussel development and growth, results of the project provide an avenue for local management of ocean acidification in coastal regions and aquaculture practices.

This project produced the following publications:

Kapsenberg, L., Miglioli, A., Bitter, M. C., Tambutté, E., Dumollard, R., and Gattuso, J. P. (2018) Ocean pH fluctuations affect mussel larvae at key developmental transitions, Proceedings of the Royal Society B: Biological Sciences, 285, 20182381, doi: 10.1098/rspb.2018.2381.

Kapsenberg, L, EE Bockmon, PJ Bresnahan, KJ Kroeker, J-P Gattuso, and TR Martz (2017) Advancing ocean acidification biology using Durafet® pH electrodes. Frontiers in Marine Science 4: 321. doi:10.3389/fmars.2017.00321

Kapsenberg, L, S Alliouane, F Gazeau, L Mousseau, and JP Gattuso (2017) Coastal ocean acidification and increasing total alkalinity in the northwestern Mediterranean Sea. Ocean Science 13: 411-426. doi:10.5194/os-13-411-2017

Kapsenberg, L, DK Okamoto, J Dutton, and GE Hofmann (2017) Sensitivity of sea urchin fertilization to pH varies across a natural pH mosaic. Ecology and Evolution 7: 1737-1750. doi:10.1002/ece3.2776

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1521597

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