Sarah Cryer

Research Interests

Coastal Biogeochemistry, Carbon Cycle, Ocean Acidification, Biogeochemical Sensors

Education

University of Southampton (September 2018 – Present)
PhD in Oceanography
Thesis Title: River to Reef: Inorganic Carbon Cycling in the Belizean Coastal Zone
In my PhD I examine the influence of river water on the interplay between the ecology and biogeochemistry of the tropical coastal environment. I employ a multidisciplinary approach including fixed-point observatories, an autonomous surface vehicle equipped with biogeochemistry sensors, and discrete water sampling to (i) analyse the use of autonomous technology for monitoring coastal biogeochemistry (ii) investigate drivers in diel cycles in pH and O_2 on a coral reef and (iii) the drivers of coastal carbonate chemistry in a river fed, tropical coastal environment.

University of St Andrews (September 2017 – September 2018)
Master of Science in Geochemistry **Distinction**
Research Project: The combined effects of ocean acidification and copper on the physiological responses of the tropical coral *Stylophora* sp.
- Assessed the impact of increased pCO_2 and copper on coral physiology (calcification, photosynthesis and respiration rates). *Published*

University of Edinburgh (September 2012 – May 2016)
Bachelors of Science (Hons) Environmental Geoscience **2:1 (68%)**
Final Year Dissertation: Identifying Submarine Groundwater Discharge and Investigating its Impacts on Coral Reefs in Southern Akumal Bay, Mexico (A).

Publications

Cryer, S.E., Evans, C, Fowell, S.E., Carvalho, F., Brown, P., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J.A., Sanders, R. and Loucaides, S. (2023). Characterising reef net metabolism via the diel co-variation of pH and dissolved oxygen from high resolution in situ sensors. *Global Biogeochemical Cycles*, 37**.** doi.org/10.1029/2022GB007577

Cryer, S.E., Schlosser, C., Allison, N., 2022. The combined effects of ocean acidification and copper on the physiological responses of the tropical coral *Stylophora pistillata*. Mar. Environ. Res. 176, 105610. doi.org/10.1016/j.marenvres.2022.105610

Cryer, S., Carvalho, F., Wood, T., Strong, J.A., Brown, P., Loucaides, S., Young, A., Sanders, R., Evans, C., 2020. Evaluating the sensor-equipped autonomous surface vehicle c-worker 4 as a tool for identifying coastal ocean acidification and changes in carbonate chemistry. J. Mar. Sci. Eng. 8, 1–18. doi.org/10.3390/jmse8110939

Felgate, S. L., Barry, C. D. G., Mayor, D. J., Sanders, R., Carrias, A., Young, A., Fitch, A., Mayorga-Adame, C. G., Andrews, G., Brittain, H., **Cryer, S.E**., Evans, C.D., Goddard-Dwyer, M., Holt, J., Hughes, B.K., Lapworth, D., Pinder, A., Price, D.M., Rosado. S., Evans, C. (2021). Conversion of forest to agriculture increases colored dissolved organic matter in a sub-tropical catchment and adjacent coastal environment. *Journal of Geophysical Research: Biogeosciences*, 126, doi.org/10.1029/2021JG006295

Cryer, S.E., Brown, P., Strong, J.A., Carvalho, F., Flohr, A., Wood, T., Felgate, S., Andrews, G., Rosado, S., Young, Goddard-Dwyer, M., Mawji, E., Loucaides, S., Sanders, R. and Evans, C (In Prep)**.** Controls over pH in a river-fed tropical coastal ocean environment.

Scholarships & Funding Acquisition

IUGG Travel Award, March 2023 - €350

The Challenger Society Travel Award, September 2022 - £500

International Coral Reef Society's Student Travel Grants, April 2022 - €510

International Coral Reef Society, European Chapter Conference Grant, May 2021 - €195.00

CLASS Scholarship, October 2019 - £2,500 to conduct fieldwork in Belize & sample analysis.

NEXUSS Capital Fund, July 2019 - £35,000 to purchase a pCO_2 sensor.

BONUS INTEGRAL Scholarship, June 2019 - £2,000 for IOCCP and BONUS INTEGRAL Biogeochemical Sensor Summer School

University of Edinburgh Craig Memorial Fund, 2016 - £250 for final year dissertation fieldwork

Research & Field Experience

University of Southampton, UK. September 2018 – Present.

- Collect and analysed samples for a number of biogeochemical parameters which included using a VINDTA (DIC), Dickson Alkalinity Titrator (TA), Apollo-PICARRO (DIC & $\delta^{13}C_{DIC}$), Gas Bench Mass Spec ($\delta^{13}C_{DIC}$), ICP-OES, Winkler Titration (O_2), Fluorimeter (chlorophyll) and spectrophotometer (CDOM).

University of Southampton, UK. January 2020 – Present. *Demonstrator & Exam Invigilator*

- Demonstrating aboard the universities research vessel for undergraduate modules Coastal & Estuarine Oceanography 2 and Physics of the Ocean. Teaching students how to use a CTD and collect samples for nutrient analysis.

National Oceanography Centre, UK. February – March 2021. *Sensor Data Archivist*

- Preparing and submitting biogeochemical sensor data collected using the autonomous surface vehicle C-worker and discrete water samples collected in Belize as part of the Commonwealth Marine Economies Programme.
- Working with large datasets, quality control of data and liaising with British Oceanographic Data Centre (BODC) to ensure data was publication ready.

Commonwealth Marine Economies Programme, Belize. October - November 2019

- Led the assessment of the use of autonomous surface vehicle as a biogeochemistry tool for coastal monitoring, planned and conducted calibration sampling.
- Deployment of two stationary ocean acidification sensors on Belize Barrier Reef.

Commonwealth Marine Economies Programme, Belize. November 2018

- Biogeochemical parametrisation of coastal waters in Belize (Water sampling, autonomous surface vehicle operations, ROV operations).

University of Edinburgh, Akumal, Mexico. June - July 2015, *Undergraduate Dissertation*

- Identifying submarine groundwater vents through salinity, nitrate and nitrite measurements, mapping hydrography of the bay and collecting and analysing algal samples to identify longer trends in nutrient input into the bay. All data was collected using a kayak, snorkelling and/or scuba equipment.

Frontier Madagascar, Nosy Be, Madagascar. February - September 2017, *Marine Research Officer*

- Conducting coral reef health assessment through snorkel and SCUBA surveys, training of volunteers in fish and invertebrate ID, mapping of mangrove forest and running beach cleans. Planned both volunteer and staff duties as well as writing the quarterly science report and training the incoming Principal Investigator.

Conferences

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J., Sanders, R. and Loucaides, S. Characterising reef net metabolism via the diel co-variation of pH and dissolved oxygen from high resolution in situ sensors. *Challenger AMBIO Conference, Plymouth, UK*. (Oral Presentation) 6th – 8th Sept. 2023

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J., Sanders, R. and Loucaides, S. Changes in pH and dissolved oxygen on Caribbean Reefs. *Reef Conservation UK Annual Meeting, London, UK.* (Poster Presentation). 3rd December 2022

Cryer, S., Brown, P., Carvalho, F., Flohr, A., Strong, J., Felgate, S., Woods, T., Andrews, G., Rosado, S., Young, A., Goddard-Dwyer, M., Loucaides, S., Sanders, R. and Evans, C. The Role of Riverine Input in Coastal Ocean Acidification: A Case Study from Belize. *5th International Symposium on the Ocean in a High CO_2 World, Lima, Peru*. (Oral Presentation) 13th – 16th September 2022.

Cryer, S., Brown, P., Carvalho, F., Flohr, A., Strong, J., Felgate, S., Woods, T., Andrews, G., Rosado, S., Young, A., Goddard-Dwyer, M., Loucaides, S., Sanders, R. and Evans, C. Investigating coastal carbonate chemistry using an ASV. *Challenger 150: The Challenger Society Conference,* London, UK..
(Oral Presentation) 6th – 8th September 2022. ***Highly Commended Presentation***

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J., Sanders, R. and Loucaides, S. Changes in pH and dissolved oxygen on Caribbean Reefs. *15th International Coral Reef Symposium, Bremen, Germany,* (Oral Presentation). 3rd – 8th July 2022

Cryer, S., Felgate, S., Brown, P., Carvalho, F., Strong, J., Woods, T., Andrews, G., Rosado, S., Young, A., Goddard-Dwyer, M., Loucaides, S., Sanders, R. and Evans, C. The role of the Belize River in localised coastal ocean acidification *(*No. EGU22-4789). *Copernicus Meetings, Vienna, Austria* (Oral Presentation). 23rd – 27th May 2022. ***Top 20% of ECR Talks***

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J., Sanders, R. and Loucaides, S. Changes in pH and dissolved oxygen on Caribbean Reefs*. 15th International Coral Reef Symposium, Bremen, Germany* (Oral Presentation). 3rd – 8th July 2022

Cryer, S., Felgate, S., Brown, P., Carvalho, F., Strong, J., Woods, T., Andrews, G., Rosado, S., Young, A., Goddard-Dwyer, M., Loucaides, S., Sanders, R. and Evans, C. The role of the Belize River in localised coastal ocean acidification *(*No. EGU22-4789). *Copernicus Meetings, Vienna, Austria* (Oral Presentation). 23rd – 27th May 2022.

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J., Sanders, R. and Loucaides, S. Diagnosing Coral Reef Degradation from the 'Metabolic Pulse'*. Ocean Sciences Meeting 2022 (virtual)*. AGU. (Oral Presentation). 24th Feb – 4th March 2022**.**

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., Strong, J., Sanders, R. and Loucaides, S. Linking metabolic cycles to stages of degradation on Caribbean reefs. *Reef Conservation UK Meeting, Edinburgh* (Speed Talk). 27th Nov 2021

Cryer, S., Evans, C., Fowell, S., Carvalho, F., Ludgate, J., Andrews, G., Rosado, S., Young, A., Degallerie, D., Theophille, D., and Loucaides, S. Changes in pH and dissolved O_2 on Barrier Reefs: Case Studies from Belize, Dominica and Fiji. *14th International Coral Reef Symposium, Bremen, Germany (virtual)* (Oral Presentation). 19th-23rd July 2021.

Cryer, S., Evans, C., Carvalho, F., Fowell, S., Martincic, U., Andrews, G., Rosado, S., Young, A., N'Yeurt de Ramon, A. and Loucaides, S. Ecosystem composition and environmental factors as drivers of pH on Barrier Reefs (No. EGU21-12156). *Copernicus Meetings.* (Oral Presentation). 19th-30th April 2021.

Cryer, S., Brown, P., Carvalho, F., Wood, T., Andrews, G., Rosado, S., Young, A., Lampitt, R., Loucaides, S., Sanders, R. and Evans, C., February. Harnessing autonomous technologies and discrete water sampling to investigate the role of high pCO_2 river inputs on coastal acidification: A case study from the Belize River and Mesoamerican Barrier Reef. In *Ocean Sciences Meeting 2020*. AGU. (Oral Presentation). 16-21 February 2020.

Cryer, S.E., Strong, J., Carvalho, F., Wood, T., Le Bas, T., Wardell, C., Sanders, R., and Evans, C. A CAMEL in Belize: using an autonomous surface vehicle to trace the Belize River plume. *Marine Autonomy and Technology Showcase*, National Oceanography Centre Southampton, (Oral Presentation). 12th -14th November 2019.

Cryer, S.E., and Allison, N. The combined effects of ocean acidification and copper on the physiological responses of the tropical coral *Stylophora* sp. *Marine Alliance for Science and Technology Scotland 8th Annual Science Meeting,* Glasgow. (E-Poster) 31st October - 2nd November 2018.

Invited Presentations

2021 **CMEP Advanced Scientific Techniques to Inform Integrated Coastal Zone Management, Southampton, U.K.** What else can the data tell us?

2020 **AXA Coral Live.** Human Impacts on the Reef.

2019 **Commonwealth Marine Economies Programme Workshop, Southampton. U.K.** Tracing the Belize River plume using an autonomous vehicle.

Data Publications

Cryer S.E., Wood T.G., Strong J.A, Carvalho F., Young A., Evans C. (2023). Biogeochemical and hydrographic data collected using the autonomous surface vehicle C-worker 4 in Belize - 2018. British Oceanographic Data Centre, National Oceanography Centre, NERC, UK. doi:10.5285/bbeca9d9-15e1-0ce3-e053-6c86abc0ebc8

Cryer S.E., Wood T.G., Strong J.A, Carvalho F., Young A., Evans C. (2023). Biogeochemical and hydrographic data collected using the autonomous surface vehicle C-worker 4 in Belize - 2019. British Oceanographic Data Centre, National Oceanography Centre, NERC, UK. doi:10.5285/bc0031c7-7a09-04a6-e053-6c86abc0f054

Cryer S.E., Felgate S.L., Goddard-Dwyer M., Strong J.A., Andrews G., Barry C.D.G., Dumousseaud C.C., Mawji E., Rosado S., Sanders R., Young A. and Evans C. (2021). Discrete water samples for biogeochemical parameters collected in line with autonomous surface vehicle C-worker 4 sensor data in Belize's coastal zone - October 2019. British Oceanographic Data Centre, National Oceanography Centre, NERC, UK. doi:10.5285/bed4d407-74a8-4088-e053-6c86abc06ba3

Felgate S.L., **Cryer S.E.**, Barry C.D.G., Mayor D.J., Carrias A., Andrews G., Brittain H., Dumousseaud C.C., Fitch A., Hughes B.K., Hunt J.E., Lampitt R.S., Lapworth D.J., Evans C.D., Strong J.A., Wardell C., Le Bas T., Mawji E., Rosado S., Sanders R., Young A., Evans C.(2021). Discrete water samples for biogeochemical parameters collected in the Belize River, tributaries, estuary and surrounding coastal ocean - Belize, 2018. British Oceanographic Data Centre, National Oceanography Centre, NERC, UK. doi:10.5285/bed4d407-74ab-4088-e053-6c86abc06ba3

Felgate S.L., Barry C.D.G., **Cryer S.E**., Mayor D.J., Carrias A., Andrews G., Brittain H., Dumousseaud C.C., Evans C.D., Fitch A., Hunt J.E., Lapworth D.J., Mawji E., Pinder A., Price D., Rosado S., Sanders R., Young A., Evans C. (2021). Discrete water samples for biogeochemical parameters collected in the Belize River and tributaries - 2019. British Oceanographic Data Centre, National Oceanography Centre, NERC, UK. doi:10.5285/bed4d407-74ad-4088-e053-6c86abc06ba3

Additional Skills

Proficiency in Matlab.

PADI Rescue Diver and BSAC Assistant Instructor with 200 logged dives, including >100 survey.

Experience in Baseline Survey Protocol for Coral Reef Health Assessment.

RYA Level II Powerboat.

Some experience using ArcGIS, PHREEQ, The Geochemist Workbench, Python.

Full Clean Driving Licence.

Dual Nationality – UK & USA.

Training Courses

NEXUSS Grand Challenge, Scottish Association of Marine Science. August 2021

- Using sensors and ASVs to locate a lost object in the bay.

International Ocean Carbon Coordination Project (IOCCP) and European Union's BONUS Integrated Carbon and Trace Gas Monitoring for the Baltic Sea (INTEGRAL) Biogeochemical Sensor Summer School 2019, Sven Lovén Centre for Marine Sciences. 9th - 20th June 2019

- Best operation of pH, pCO_2, oxygen and bio-optic sensors; involved principles behind different sensors, deployment and data processing.

NEXUSS Robotics Course, Scottish Association of Marine Science. 28th - 30th May 2019

- Introduction to Control Feedback, Robotic Programming and Piloting

Software Carpentry, University of Southampton. 13th-14th March 2019

- Using version control with GIT, GITHub and basics of Python.

NERC Advanced Training Short Course (ATSC) Ocean Gliders: Autonomous Monitoring of the Marine Environment, University of East Anglia. 7th - 11th January 2019

- Hands-on experience of ocean gliders as well as theoretical knowledge of how gliders and their sensors work.

Volunteering & Other Experience

International Carbon Ocean Network of Early Career (ICONEC). December 2022 – Present

- Steering Committee Member & Social Media Representative
- Founding member of ICONEC and steering committee.
- Secretary role (Jan 2022 – May 2022).

University of Southampton. July- August 2023, *Postgraduate Researcher Project Officer*

- Worked with Postgraduate Development Team to create materials for incoming postgraduate researchers (PGRs). Involved researching and writing content for a new PGR brochure.
- Create a video using Powtoon for both neurotypical and neurodivergent audiences to advertise PGR mentoring.

National Oceanography Centre Environment Advisory Group. September 2018 – April 2022.

- Post graduate representative, attending regular meetings, liaising with students of environmental action being taken at NOC, participating in switch off events and working with canteen to make lunch options more environmentally friendly.

The Mullany Fund. January 2021 – April 2021, *Mentor*

- Online mentoring for high school students interested in Marine Science

AXA Coral Live. November 2020

- Guest Speaker, Human Impacts on the Reef

Solent University Sub-Aqua Club. March 2019 – March 2020, *Assistant Instructor*

- Teaching confined skills to scuba diving students.

Atoll Volunteers, Naifaru, Maldives. November 2016 - February 2017, *Volunteer Coordinator*

- Running a volunteer programme, which included recruiting international volunteers, visa applications, turtle rehabilitation and running educational tours for tourists.