

E5 NERC Summer Research Experience Placements 2026

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1. Supervisor (s) - Name, email and affiliation
I. Amelia Penny, Amelia.Penny@ed.ac.uk (UoE School of GeoSciences)
2. Student Mentor (current PhD student) Name, email and affiliation
Adam Murphy, Adam.Murphy@ed.ac.uk (UoE School of GeoSciences)
3. Department/School
School of GeoSciences
4. Placement Project Title
Ecological effects of dynamic oxygen levels in the sea: An evidence synthesis
5. Job purpose
This project aims to establish the state of knowledge on how dynamic oxygen levels affect ecological communities, using an evidence synthesis approach focused on systematic, rigorous, reproducible literature review. The intern will be expected to collaborate with their supervisor and mentor throughout the project, conduct their project activities, and engage with training and networking opportunities.
6. Host and project outline
Purpose of the project: Oxygen levels in the oceans have fallen in the past 50 years, which may pose a threat to marine ecosystems [1]. However, this decline is not uniform over time or space. Marine oxygen levels can vary widely over a range of timescales from hours to years [2], creating a complex set of different dynamics whose impacts on ecosystems are not well understood. Living things can respond differently to fluctuating and stable environmental conditions, even when the average state of the environment is the same [3]. Compounding the issue, marine species have a wide range of tolerances to low oxygen levels over time; some can tolerate only minutes of low oxygen, while others survive for months [4]. There is extensive and growing literature documenting changes in marine oxygen levels over time and their associated effects on local ecological communities, but the documented impacts are highly variable [5]. This

project aims to establish the state of knowledge on how dynamic oxygen levels affect ecological communities. It will investigate whether there are general patterns in community responses to different oxygen dynamics, and also evaluate trends in the types of organisms, timescales and oxygen dynamics which have been studied, to identify knowledge gaps.

Activities: The project will use established methods for evidence synthesis which are increasingly in demand in ecology and environmental science [6]. Evidence synthesis involves defining specific criteria for including literature in the review, systematic literature search and screening, extracting information from the literature and transparent reporting of review methodology. The advantage of this approach is that it creates a reproducible synthesis of the evidence, with reduced biases compared to a less systematic review, and therefore more reliable conclusions [7].

The intern will work collaboratively with their supervisor and mentor to conduct the review, using an online platform designed for collaborating on systematic reviews. They will participate in defining the criteria for the review, screening publications, extracting data, and analysing results. The intern will receive training in evidence synthesis methods, quantitative skills and coding in the R programming language.

The intern will be a member of the Ecology Across Timescales lab at the School of GeoSciences, and will participate in weekly group meetings and coding clubs. It is expected that this project may lead to a publication, in which case there will be an opportunity to participate in authoring a manuscript once the placement is complete. The intern will also have the opportunity to present their results and network with researchers from a range of institutions and subject areas at the Early Career Symposium of the Centre for Adapting to Changing Environments (<https://environmentalchange.ed.ac.uk/>).

Timeline:

Weeks 1-2: Meeting the research group, training on review methodology and use of the online platform, and working with supervisor to conduct initial literature search and refine inclusion criteria for the review.

Weeks 3-5: Screening literature and meeting regularly with supervisor and mentor.

Weeks 6-7: Extracting and summarising data, including working with R for data handling and statistical analysis.

Week 8: Completing the project, establishing main results, preparing results for presentation, and making a plan for dissemination of the results after the placement is complete.

References:

- [1] Schmidtko, S., Stramma, L., & Visbeck, M. (2017). Decline in global oceanic oxygen content during the past five decades. *Nature*, 542(7641), 335-339.
- [2] Altieri, A. H., & Diaz, R. J. (2019). Chapter 24 - Dead zones: oxygen depletion in coastal ecosystems. In Sheppard, C. (Ed.) *World Seas: An Environmental Evaluation (Second Edition)* (pp. 453-473). Academic Press.
- [3] Cabrerizo, M. J., & Marañón, E. (2022). Net effect of environmental fluctuations in multiple global-change drivers across the tree of life. *Proceedings of the National Academy of Sciences*, 119(32), e2205495119.
- [4] Vaquer-Sunyer, R., & Duarte, C. M. (2008). Thresholds of hypoxia for marine biodiversity. *Proceedings of the National Academy of Sciences*, 105(40), 15452-15457.
- [5] Diaz, R. J., & Rosenberg, R. (1995). Marine benthic hypoxia: a review of its ecological effects and the behavioural responses of benthic macrofauna. *Oceanography and Marine Biology: An Annual Review*, 33, 245-303.
- [6] Halpern, B. S., Boettiger, C., Dietze, M. C., Gephart, J. A., Gonzalez, P., Grimm, N. B., et al. (2023). Priorities for synthesis research in ecology and environmental science. *Ecosphere*, 14(1), e4342.
- [7] Cornell University Library (2026, March 26) A Guide to Evidence Synthesis: What is Evidence Synthesis? <https://guides.library.cornell.edu/evidence-synthesis/intro>.

G. Main responsibilities

- Conducting a systematic literature review in collaboration with supervisor (70%).
- Training in evidence synthesis, quantitative skills, coding in R and presenting work (15%).
- Preparing results for dissemination through poster presentations, talks and/or preparing a written report (10%).
- Networking, through participation in research group meetings and symposium (5%).

Key contacts and relationships

- Amelia Penny (supervisor). Will have regular meetings with the intern to discuss their project, agree tasks, and deliver the majority of their training. Will work with the intern at all stages of the project, including refining search terms, screening literature, and extracting and analysing data.
- Adam Murphy (student mentor). Will meet regularly with the intern, may contribute to their training and will be involved in the development of the project.

H. Knowledge, skills and experience required for the role

Attribute	Essential	Desirable
Education, Qualifications & Training	<ul style="list-style-type: none">• Currently undertaking an undergraduate degree in ecology, environmental science, life science or a related discipline.• Mostly very good or excellent marks in modules completed so far.	<ul style="list-style-type: none">• Completed a module which includes some training in quantitative skills.• Some familiarity with using the R programming language.
Knowledge & Experience	<ul style="list-style-type: none">• A strong interest in marine ecosystems and environments.• Strong time management and organisational skills.• Willingness to work collaboratively as part of a small team.• Experience of searching for, reading and extracting information from research literature.	<ul style="list-style-type: none">• Experience of producing written reports to a high standard.

I. Planning and organising

- Working independently for periods during the placement, perhaps for a few days at a time. Project work during those intervals will be planned with support from the supervisor and mentor, but the intern will organise their time while working independently.
- Planning and organising the communication of their results to the supervisory team and research group, and potentially to a conference audience.
- Optionally, proposing topics for discussion at lab group meetings and coding clubs.

J. Problem solving
<ul style="list-style-type: none"> • Solving challenges with accessing literature or datasets, by searching across multiple sources or using library resources. • Working with new software tools, data and code, including handling error messages or solving minor coding problems. • Participating in coding clubs, where we work together as a lab group to solve coding challenges.
K. Decision making
<ul style="list-style-type: none"> • Deciding search terms and inclusion criteria for the evidence synthesis, in collaboration with the supervisory team. • Identifying approaches to visualising and analysing results.
L. Length and timing of placement
8 weeks. Start date to be agreed.
M. Budget
<i>No additional research costs are requested for this project.</i>
N. Location and Equipment
<p>This project will take place in the School of GeoSciences at the University of Edinburgh Kings Buildings Campus, though there is scope for the intern to work remotely if they choose to.</p> <p>The intern will require a desk space at Kings Buildings; if a fixed desk space is not available then work spaces will be booked for them during their placement.</p> <p>The intern will need a laptop to use for their project work, though if they do not have one it will be possible to borrow one.</p>
O. Health & Safety requirements
N/A
P. Job hazards specific to the role
<p>This role may result in potential exposure to certain hazards as listed below. These will be risk assessed by the school or department, which may require you to participate in, for example, health surveillance or follow other health and safety requirements.</p> <ul style="list-style-type: none"> • Other - Please specify: Desk work at a computer.
Q. Alternative/adjusted placement (remote placement only).
<i>This project could be conducted remotely, if required.</i>