

Project Proposal Form – 2022 entry

Project Title	OU8 - Tropical forest carbon, habitat structure, and faunal biodiversity: implications for conservation
University (where student will register)	The Open University
Which institution will the student be based at?	As above
If other	
Theme (Max. 2 selections)	Climate & Environmental Sustainability <input checked="" type="checkbox"/> Organisms & Ecosystems <input checked="" type="checkbox"/> Dynamic Earth <input type="checkbox"/>
Key words	
Supervisory team (including institution & email address)	PI: Dr. Kadmiel Maseyk (OU; kadmiel.maseyk@open.ac.uk) Co-I: Dr. Julia Cooke (OU; julia.cooke@open.ac.uk); Dr. Phil Wheeler (philip.wheeler@open.ac.uk); Dr. Dan Exton (Operation Wallacea; dan.exton@opwall.ac.uk)
Is the project co-designed by a student?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Is the PhD suitable for part time study?	Yes <input checked="" type="checkbox"/> This is a requirement of NERC

Project Highlights:

- Tropical forest ecology and field work in a unique biogeographic region
- Working with a range of ecological and Earth observation data for new understanding of priority conservation metrics
- Partnership with innovative conservation research organisation

Overview:

Tropical forests are critical ecosystems for biodiversity, carbon storage and climate regulation, but ongoing forest clearance and the uncertain impacts of climate change pose significant risks to these ecosystems. Deforestation and forest degradation are responsible for about 15% of greenhouse gas (GHG) emissions globally and in some countries, including Indonesia, are the main source of GHGs. Carbon fluxes in tropical forests are large, but uncertainty remains as to the current state and future trajectory of the carbon balance of these ecosystems. Long-term records of biomass are critical for understanding trends and drivers of ecosystem carbon dynamics and their relationship with important conservation metrics, but such datasets are rare. Satellite data is now widely used to study forest biomass over larger spatial scales, and the increasing length of these records enables the study of temporal dynamics as well. However, ground-truth data is essential for the validation of satellite measurements and associated estimates of carbon stocks.

For the last twelve years, Operation Wallacea have been monitoring forest growth through extensive stem diameter measurements at three sites on Buton Island, Indonesia (Harrison et al 2019). Buton

Island is a part of the Sulawesi island group and is located in Wallacea, a distinctive biogeographical region that marks the transition from South-east Asia to Australasia (Supriatna 2017). Wallacea is rich in biodiversity but is particularly notable for very high levels of faunal endemism: upwards of 40% of birds and 90% of (land-based) mammals (Martin 2017). Sulawesi is an ecoregion of high global conservation importance due to its high endemism, which is also related to its complex geology, but remains poorly studied. The monitoring sites are located within large tracts of tropical lowland limestone karst forest, one of the more endangered forest types of the region, but to date this data set has not been interrogated in great detail (Cannon et al 2007). In addition to the tree growth data, faunal biodiversity data has been collected from the sites, providing a unique opportunity to investigate relationships between ecosystem carbon and conservation metrics of biodiversity and endemism. This project will involve analysis of existing Operation Wallacea datasets, satellite data and field measurements to investigate factors influencing tropical forest carbon dynamics, as well as explore novel relationships between habitat structure, biodiversity and endemism.



Figure 1: Tropical forest at Lambusango, Buton Island, one of the project research sites.

Alt-text: Photograph showing tropical trees in the foreground and forest under blue sky in the distance.

Methodology:

This project will work with records of tree diameter (DBH) measurements from sites on Buton Island, that already exceed 12 years and are ongoing. This data will be used to develop biomass and carbon stock estimates for the sites using allometry and to explore factors underlying the variability and trends in the data. This biomass data will be used to ground-truth remote sensing data in order to extend the analysis in time and space across the region. Field work will involve contributing to the ongoing biomass data collection, but also will involve collecting new data sets including measurements of leaf optical properties related to the remote sensing data and leaf functional and structural traits related to biomass and carbon estimates. Relationships between faunal biodiversity and conservation metrics from the site will also be explored, which will in turn be expanded to a global view using other datasets from Operation Wallacea. The period of fieldwork will be up to 8 weeks, and you will work together with the other members of Operation Wallacea.

Training and skills:

Students will be awarded CEN2 Training Credits (CTCs) for participation in CEN2-provided and 'free choice' external training. One CTC equates to 1/2 day session and students must accrue 100 CTCs across the three years of their PhD.

You will gain experience in ecological and Earth observation data handling and analysis and statistical computing, practical field skills, and analytical techniques. You will receive all necessary training in instrument use. You will also be supported in the development of your skills in field planning and project management, including liaising with external organisations and international partners. You will also have the opportunity to gain teaching experience through the training and co-ordination of the school student teams who assist with sourcing the habitat datasets on Buton. A rich and varied training programme is available to OU PG students which includes sessions on academic writing, research design and data management, career development communicating your research, as well as opportunities to get involved in public engagement, media and remote digital teaching.

Partners and collaboration:

[Operation Wallacea](#) will be a CASE partner on this project, which will provide you with the opportunity to gain experience working within a successful conservation research organisation.

COVID-19 Resilience of the Project:

The field work could be affected in the event of travel restrictions. A large part of the project relies on external data (existing data bases and Earth Observation data) so timing of the field work is somewhat flexible around the more Covid-resilient aspects. Follow-up lab work will be on dried samples (i.e. not time critical) so therefore can be delayed or timed to fit accordingly with any lab access limitations. In the event field access is not possible, this component will be shifted to either other data sources or a local field-based component.

Possible timeline:

Year 1: Familiarisation, organisation and initial analysis of Sulawesi data sets, access and process Earth observation data, and field data collection (early June – early August).

Year 2: Second field season, finalise analysis of Sulawesi data. Op Wall placement. Attend BES Annual meeting.

Year 3: Extend analysis to other Operation Wallacea data sets and final data analysis. CEN2 placement. Attend EGU conference.

Year 4: Complete writing up.

The student will be encouraged to participate in local and international meetings and develop their own networks through the course the PhD.

Further reading:

Cannon, C., Summers, M., Harting, J., and Kessler, P.J.A. (2007) Developing Conservation Priorities Based on Forest Type, Condition, and Threats in a Poorly Known Ecoregion: Sulawesi, Indonesia. *Biotropica*, 39, pp. 747 - 759. doi: [10.1111/j.1744-7429.2007.00323.x](https://doi.org/10.1111/j.1744-7429.2007.00323.x)

Harrison, B., Martin, T.E. and Mustari, A.H. (2019) The accuracy of volunteer surveyors for obtaining tree measurements in tropical forests. *Ambio*. Early view version available at: <https://link.springer.com/article/10.1007/s13280-019-01147-4#citeas>

Supriatna, J. (2017) Wallacea: a living laboratory of evolution. *The Conversation*. Available at: <https://theconversation.com/wallacea-a-living-laboratory-of-evolution-85602> (Accessed 1 October 2019).

Martin, T.E. (2017) *The Biological importance of the Buton forests*. Operation Wallacea: Old Bolingbroke. Available at <https://www.opwall.com/uploads/2018/12/The-biological-importance-of-the-Buton-Forests.pdf> (Accessed 30 October 2019).

Powling, A., Phillips, A., Pritchard, R., Segar, S.T., Wheeler, R. & Mardiasuti, A. (2015) The Vegetation of Lambusango Forest, Buton, Indonesia. *Reinwardtia*, 14, 265:286. doi: [10.14203/reinwardtia.v14i2.1671](https://doi.org/10.14203/reinwardtia.v14i2.1671)

Further details:

We invite applications from students with a strong background in plant, ecosystem or tropical ecology, physiology or remote sensing, an interest in global change processes and an enthusiasm for field work and independent research.

Please contact Kadmiel Maseyk, kadmiel.maseyk@open.ac.uk for further information.

The successful student will join a well-established team researching environmental and ecosystem processes and a vibrant postgraduate community at the Open University.

Applications should include:

- an academic CV containing contact details of three academic references
- a CENTA application form, downloadable from: [CENTA application](#)
- and an Open University application form, downloadable from: [Home OU application form](#) (if you are resident in the UK) or an [Overseas OU application form](#) (if you are an international applicant).

Applications must be sent to STEM-EEES-PHD@open.ac.uk by Friday 7th January 2022 (12 pm, noon)