



BRIDGES Research Program
Fisheries and Biodiversity in the Western Indian Ocean

CALL FOR PHD THESES 2026

PROPOSED TOPICS



CALL FOR PHD THESES 2026: SELECTED TOPIC

FISHRUN

Making the invisible visible: non-commercial fisheries in ecosystem-based and maritime uses management in La Réunion

Abstract

Fishing provides food and, in island countries, produces more than half of animal protein (FAO 2024). The different sectoral patterns in the Indian Ocean compared with other ocean basins are likely to be due to the region's high dependence on small-scale fisheries (Zeller et al., 2023).

Small-scale coastal fisheries present a wide variety of situations and practices, most of which are poorly understood and not included in assessment and management processes. However, they can represent a significant proportion of practitioners, fishing effort and catches. Regardless of the motivations and status of these fisheries (recreational, subsistence / formal, informal), it is essential to take them into account in order to manage the resources they exploit sustainably. However, integrating these previously overlooked activities into management processes faces several challenges due to a lack of knowledge about these activities and the risk of stakeholders not accepting new rules.

In La Réunion island, where in 2023, 323 commercial fishers were recorded (Guyader et al., 2026) the number of recreational fishers was estimated between 30 000 to 40 000, either fishing from a boat or from the shore (Garnier, 2021).

Despite this, only commercial fishing activities are currently monitored and regulated. Furthermore, assessment of fish stock status and the selection of management measures for commercial fisheries in La Réunion rely exclusively on data derived from the commercial sector. However, numerous studies indicate that recreational fishing continues to expand and exerts at least comparable pressure to commercial fishing on the island's coastal and pelagic marine ecosystems. Furthermore, while some long-standing illegal practices, such as explosive fishing have been eradicated, others persist and their impact on the socio-ecosystem remain unclear, particularly in the context of the gradual degradation of coral reefs driven by climate change and multiple local stressors. These trends support the need to incorporate non-commercial fisheries into 1) a more precise characterisation of fishing practices in La Réunion and 2) the analysis of their impacts on marine ecosystems together with other marine uses - especially commercial fishing, - and the services provided to society, in order to 3) design and assess realistic management scenarios to ensure the sustainability of fisheries and the resilience of La Réunion's marine socio-ecosystem.

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EQOCEAN

Who Benefits from Marine Conservation? Assessing Social Equity in the Southwest Indian Ocean

Abstract

Marine conservation measures have become central responses to climate change, biodiversity loss, and international commitments to marine ecosystems, notably the objective of protecting 30% of marine areas by 2030 under the Kunming–Montreal Global Biodiversity Framework (Dawson et al., 2024). Among these measures, marine protected areas (MPAs) represent the dominant tool for marine and coastal conservation (Andrachuk et al., 2025), particularly in the South-West Indian Ocean, where their implementation involves multi-level dynamics engaging states, donors, non-governmental organizations, researchers, and local communities.

While MPAs can generate ecological and socio-economic benefits, a growing body of research highlights their negative social impacts. These impacts disproportionately affect small-scale fishers, female-headed households, and Indigenous or local communities (Baker et al., 2023; Cinner et al., 2014; Hampton-Smith et al., 2024;), in contexts shaped by colonial legacies and structural inequalities (Andrachuk et al., 2025; Hauck et al., 2014). These findings raise critical questions regarding the extent to which social equity is effectively integrated into conservation instruments, despite its central role in ensuring their effectiveness and legitimacy (Jacquemont et al., 2022).

This PhD project examines the extent to which marine conservation in the South-West Indian Ocean integrates social equity, and identifies the factors shaping this integration. It is guided by three core hypotheses addressing the recognition of local knowledge systems, inclusive participation in governance processes, and the legal recognition of customary rights.

The project adopts a comparative, multi-level approach combining analysis of policy frameworks, governance arrangements, and the lived experiences of local populations. It is based on two case studies: the Marine Nature Reserve of Réunion Island and the Maputo Special Reserve and Ponta do Ouro Partial Marine reserve (Mozambique), for which existing and newly collected data allow a long-term analysis of socio-ecological effects. The methodology integrates document analysis, interviews, participatory methods, and comparative analysis. Expected outcomes include an assessment of the integration of social equity into conservation policies and practices, and the formulation of operational recommendations to enhance the effectiveness, social justice, and legitimacy of MPAs.

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RIFSYCC

Understanding the Resilience of Island Food Systems to Climate Change

Abstract

Island food systems are increasingly vulnerable to climate change, environmental degradation, and growing dependence on imported food products. This research aims to develop an analytical framework to assess how climate hazards affect island food systems and to identify pathways for strengthening their resilience. The study focuses on two case studies in the Western Indian Ocean—Mayotte and the Union of Comoros—which share a common colonial history but have followed distinct socio-economic and governance trajectories. These contrasting contexts provide a valuable opportunity to examine how historical, institutional, and environmental factors influence food system resilience to climate-related shocks such as cyclones.

The research adopts a multidisciplinary social-ecological systems approach combining historical analysis, mixed quantitative and qualitative data collection, and modelling techniques. Household surveys will assess the impacts of extreme climate events on farming and fishing livelihoods, complemented by analysis of dietary trends, trade statistics, food production data, and stakeholder interviews. Value chain analysis will be used to examine aquatic food availability and distribution. Trade networks will be analysed using econometric gravity models and network centrality indicators to evaluate how climate shocks affect food system connectivity. Bayesian Network models will integrate ecological, socio-economic, and climate variables to assess vulnerabilities, trade-offs, and policy scenarios, particularly regarding marine protected areas, fisheries management, and trade policies.

Expected outcomes include a comparative historical analysis of island food system development, vulnerability assessments linking climate hazards to food and nutrition security, and predictive models identifying thresholds and resilience pathways. The research will also evaluate synergies and trade-offs between aquatic food production, marine biodiversity conservation, and climate adaptation. Ultimately, the study aims to provide evidence-based policy recommendations to support climate-resilient, nutritionally adequate, and sovereign island food systems.

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SWIOMPA

Integrated planning of marine protected areas to co-benefit biodiversity conservation and ecosystem services delivery in the south-western Indian Ocean

Abstract

The southwestern Indian Ocean is home to exceptional marine biodiversity, which is essential both for maintaining ecosystem processes and for human populations that depend on fishing for their well-being and way of life. However, the sustainability of these socio-ecological systems is increasingly threatened by overfishing and climate change. In this context, the 30x30 targets of the Kunming-Montreal Global Biodiversity Framework call for the implementation of new Marine Protected Areas (MPAs) within a framework that transcends national jurisdictions.

With this thesis project tightly articulated with the BRIDGES program, we aim to contribute both to better biodiversity conservation by identifying where to create or strengthen marine protected areas in the BRIDGES regional site including the Scattered Island, and to greater sustainability and adaptation to climate change in artisanal fisheries. To do this, we will combine information on biodiversity, human activities (including fishing), and ecological connections between marine habitats. Working closely with researchers, fishermen, and local and regional decision-makers, we will develop decision-making tools to compare different spatial planning scenarios in order to assess their co-benefits for conservation and fishing. The ultimate goal is to propose solutions for transitioning to sustainability that are effective, realistic, and adapted to regional challenges.

CALL FOR PHD THESES 2026: SELECTED TOPIC

LEK-IG Mayotte

Local Ecological Knowledge and Interactive Governance in Mayotte's Small-scale Fisheries

Abstract

Small-scale fisheries are central to coastal livelihoods, food security, and marine biodiversity conservation, yet fishers' knowledge and practices are often insufficiently integrated into governance frameworks. This PhD project investigates the interactions between local ecological knowledge, small-scale fishing practices, and conservation institutions in Mayotte, a French overseas territory characterized by a postcolonial context, high ecological value, and persistent social tensions. Despite the creation of the Mayotte Marine Natural Park in 2010, conservation policies are frequently perceived as top-down and poorly adapted to local realities, generating conflicts, limited compliance, and governance inefficiencies.

The project addresses the overarching research question: How do the relationships between local ecological knowledge, small-scale fishing practices, and conservation institutions condition the possibilities for more inclusive and adaptive marine governance? Framed within the concept of interactive governance, the project examines both the system-to-be-governed (fishers, practices, and socio-ecological dynamics) and the governing system (rules, institutions, and management instruments), and their interactions in lagoon socio-ecosystems -reef flats, seagrass beds, and adjacent coastal habitats- at the interface of ecological dynamics, livelihoods, and power relations. Methodologically, the thesis combines institutional ethnography, ethno-geographical analysis, and participatory approaches. It documents fishers' knowledge, spatial practices, and adaptive strategies across diverse and marginalized profiles; analyzes how ecosystems and resources are framed, managed, and contested; and observes the co-construction of knowledge and management scenarios in BRIDGES workshops. Beyond documenting "what" knowledge exists, the project emphasizes "who" holds knowledge, "how" it is mobilized, and the role of fishers in decision-making arenas, providing insights into power asymmetries and governance dynamics. Expected contributions include enhancing socio-ecosystem observation, informing vulnerability and risk assessment, and supporting the co-production of context-sensitive governance pathways.

The thesis will produce actionable recommendations for conservation policies, participatory management, and conflict mitigation, with relevance for fishing communities, park managers, and local authorities in Mayotte and other coastal territories of the southwestern Indian Ocean. It also generates transferable methodological insights for BRIDGES, bridging ecological, social, and governance dimensions to foster adaptive, inclusive, and resilient marine governance.

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CALL FOR PHD THESES 2026: SELECTED TOPIC

COASTAL

Cumulative stressors Across land–Sea continuum: An integrated coral–sponge framework for spatial management of Lagoon socio-ecosystems.

Abstract

Mayotte lagoon sustains high biodiversity, coastal protection, and artisanal fisheries essential for local food security. Yet this multifunctional socio-ecosystem is increasingly threatened by cumulative land/watersheds pressures (sedimentation, nutrient enrichment, chemical pollutants, and microbial contamination), compounded by climate change and recent extreme events such as the 2024 mass bleaching followed by a hurricane. Despite ongoing monitoring efforts, reef assessments remain largely based on community-level indicators (e.g., coral cover), that often detect degradation only after visible decline, leaving early and chronic vulnerability processes insufficiently characterized. Moreover, existing protection measures remain limited and are not structured to preserve the overall multifunctionality of lagoon ecosystems.

This PhD project aims to develop an integrated land–sea continuum framework to assess how cumulative land-derived pressures shape the vulnerability of reef-building corals and sentinel sponge species in Mayotte. We hypothesize that reefs exposed to higher cumulative watershed pressures exhibit detectable microbiome destabilization and physiological stress prior to community-level degradation. By combining spatial pressure mapping, seasonal field monitoring, microbiome characterization, ecophysiological biomarkers, and controlled experiments, the project will identify quantitative early-warning bioindicators and validate causal pressure-response relationships. Structured around four axes, the BRIDGES Research Program research will (i) construct cumulative pressure-resilience indices across watershed-reef gradients, (ii) assess multi-scale biological responses (community, individual and population) across contrasted sites, (iii) experimentally validate key stressors and biomarkers and (iv), produce spatially explicit vulnerability gradient and maps integrated with lagoon uses, particularly artisanal fisheries, to support adaptive management. The project operationalises land-sea integration within the BRIDGES program by strengthening integrated observatories (TP2), advancing resilience-based and spatially explicit management tools (TP4), and fostering co-constructed governance with local stakeholders (TP6). By linking cumulative pressures, biological mechanisms and spatial management tools, it delivers transferable vulnerability diagnostics for Mayotte and other territories in the region. Beyond academic advances, this PhD will deliver actionable indicators and spatial diagnostics to inform conservation prioritisation and adaptive lagoon governance, contributing to the resilience of coral reef socio-ecosystems under accelerating global change.

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CALL FOR PHD THESES 2026: SELECTED TOPIC

BRIDGHEAT

Marine Heatwaves and Coastal Pelagic Fisheries in the Southwestern Indian Ocean

Abstract

This BRIDGES PhD project addresses the critical challenge of understanding how marine heatwaves (MHWs) impact coastal pelagic fisheries in the Southwestern Indian Ocean (SWIO), with specific focus on Comoros and Mayotte. Marine heatwaves—prolonged periods of anomalously warm sea surface temperatures—have increased dramatically in frequency, duration, and intensity globally. The SWIO region has experienced significant MHW activity, triggering cascading effects through marine food webs with particularly acute impacts in tropical waters where species live near their thermal tolerance limits.

Research Problem: While industrial tuna fisheries have received considerable attention, artisanal small-scale fisheries remain understudied despite their fundamental importance for coastal livelihoods, food security, and local economies. These fisheries target mainly small tuna and sailfish species that respond rapidly to environmental changes, creating complex effects on resource availability for fishing communities. The research addresses critical knowledge gaps at the intersection of climate science, fisheries ecology, and governance, examining how MHWs affect species availability and catchability through both direct physiological effects and indirect impacts on prey dynamics.

Research Approach: The project employs mixed-methods approaches integrating quantitative environmental and fisheries analyses with qualitative socio-ecological systems investigation across three interconnected parts. Part 1 characterizes coastal MHW patterns using satellite sea surface temperature products, in situ observations, and regional climate projections. Part 2 analyzes relationships between MHW characteristics and artisanal catch data through time series analysis and species distribution modelling. Part 3 contributes to adaptive governance in PC5 through stakeholder engagement and co-development of management recommendations. The research will produce or contribute to a regional MHW atlas, quantified climate-fishery relationships, and evidence-based governance proposals.

Local Partnerships: The project North-South research collaboration roots on equity and knowledge co-production principles. Key local partnerships should include the new Doctoral School at Comoros University, INRAPE (Institut National de Recherche pour l'Agriculture, la Pêche et l'Environnement) in Comoros and the Marine Natural Park in Mayotte. These partnerships are essential for data collection, participatory engagement with fishing communities, and ensuring research relevance to local contexts. The project ideally aims to recruit a local candidate and includes commitments to strengthen regional research capacity through local seminars, training programs, and collaborative knowledge development. This approach ensures the research addresses real governance challenges while building sustainable decision-support structures for coastal fisheries management in the face of increasing climate stress.

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CALL FOR PHD THESES 2026: SELECTED TOPIC

EPIREEF

Quantitative eDNA and epigenetic for reef monitoring and assessment

Abstract

Coral reef ecosystems provide essential ecosystem services, including shoreline protection, nutrient cycling, biodiversity support, and fisheries resources, yet they are increasingly threatened by climate change, ocean acidification, pollution, and coastal development. Monitoring reef ecosystem health and population status of key species is therefore a major scientific and management priority in the Western Indian Ocean. Environmental DNA (eDNA) has emerged as a powerful and non-invasive tool for biodiversity monitoring, allowing species detection from water samples. However, moving from species detection to quantitative population assessment remains one of the major challenges in molecular ecology.

The EPIREEF PhD project aims to develop and validate innovative approaches combining quantitative eDNA and epigenetic information to infer population-level indicators of a reef-associated key species, the sea cucumber *Stichopus chloronotus*. The central research question is whether environmental DNA can move beyond species detection to quantify the health status of exploited reef populations. Two main objectives will structure the research. First, the project will test whether population abundance can be estimated using eDNA by calibrating droplet digital PCR (ddPCR) measurements against independent density estimates obtained from drone imagery and visual surveys across sites with contrasting population densities and anthropogenic pressures. Second, the project will investigate whether DNA methylation markers associated with body size and sex can be identified from tissue DNA and subsequently detected in methylated environmental DNA to infer population size structure and sex ratio.

The project combines field sampling, controlled experiments, molecular analyses, and ecological modelling. Fieldwork will be conducted across multiple Western Indian Ocean sites, including Réunion Island, Mayotte, and the Scattered Islands, in collaboration with marine protected area managers and regional monitoring programs within the INTERREG NET-IT project framework. By integrating molecular ecology, epigenetics, bioinformatics, and reef monitoring approaches, the PhD will contribute to the development of transferable and non-invasive monitoring tools.

If successful, EPIREEF will demonstrate the feasibility of deriving population-level ecological indicators from water samples and provide operational tools for reef ecosystem monitoring and management. The project sits at the interface between fundamental research and evidence-based conservation, contributing to innovation in marine monitoring and capacity development in the Western Indian Ocean.

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CALL FOR PHD THESES 2026: SELECTED TOPIC

ACCRO

Using ACooustic Telemetry to inform spatial management: Connectivity of exploited fish and shark species across contrasting protection Regimes in the southwest Indian Ocean

Abstract

Many marine species, particularly highly mobile meso- and top predators, travel vast distances that cross national boundaries and static management areas such as Marine Protected Areas (MPAs). This ecological connectivity—driven by adult movements and larval dispersal—shapes population dynamics, resilience, and responses to fish exploitation. When management fails to reflect these spatial linkages, conservation and fisheries outcomes can be compromised. Although area-based management tools (ABMTs) can enhance sustainability, most MPAs are not designed to maintain connectivity, and many critical habitats for mobile species remain unprotected.

The Southwest Indian Ocean (SWIO) is a biodiversity hotspot under growing human pressure that requires improved transboundary conservation planning. Acoustic telemetry, now widely used to track aquatic animals across large spatial scales, provides a powerful tool to measure connectivity, though multi-species, multi-scale analyses remain rare.

This project integrates movement data from exploited and threatened species—including sharks, trevallies, wahoo, and marine turtles—across the SWIO. Using existing data (>300 tagged individuals; >2 million detections) and data from 250 additional animals, it will: (1) quantify connectivity across Mozambique–South Africa MPAs; (2) model future species distributions under climate and fishing scenarios to design resilient MPAs; and (3) upscale analyses regionally, incorporating the Comoros and Europa sites. By linking fine-scale large scale movement ecology to regional governance, the project aims to optimize cross-border spatial management and strengthen marine conservation in the SWIO.

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MOSAIC

Multidimensional assessment of seaweed aquaculture in Comoros: species screening, site suitability, carrying capacity, and socio-economic feasibility

Abstract

Seaweed aquaculture is a promising pathway to diversify coastal livelihoods and support food-system resilience in the Western Indian Ocean (WIO), yet in Comoros marine aquaculture has not yet been established and lacks a science-based planning framework. This PhD project (MOSAIC) aims to design an operational development roadmap for Mwali (Comoros) that is ecologically sustainable, socio-economically feasible, and directly usable by decision-makers and coastal communities. Conducted by a Comorian doctoral candidate within the BRIDGES program, the thesis combines ecological, spatial, economic, and governance dimensions in a single integrated framework.

The research is structured around five objectives: (1) screen and prioritise candidate seaweed species; (2) identify and map suitable farming areas; (3) estimate ecological carrying-capacity ranges for selected species and sites; (4) assess socio-economic feasibility and governance conditions; and (5) implement an experimental cultivation trial to generate local performance data and refine planning outputs. A staged species-screening approach will combine regional knowledge synthesis (Comoros and neighbouring WIO territories) with field verification in Mwali using standardised ecological surveys and taxonomic identification. Suitability mapping will use GIS-based multicriteria analysis (MCA/AHP), integrating environmental, socio-economic, and regulatory layers to delineate priority and exclusion/constraint zones. Carrying-capacity assessment will estimate precautionary biomass and farming-area ranges compatible with local ecological limits. Socio-economic analysis will use mixed methods (questionnaires, interviews, focus groups) to evaluate financial feasibility, adoption constraints, and enabling governance conditions. An experimental trial at one selected site (with one or two prioritised species, depending on operational feasibility) will monitor growth, survival, biomass yield, environmental conditions, and operational requirements. These empirical data will be used to refine carrying-capacity and feasibility analyses, improving the robustness of recommendations.

Expected outputs include a documented species-screening and prioritisation framework; georeferenced suitability maps; site-specific carrying-capacity ranges; trial performance datasets; socio-economic feasibility results; and an integrated decision-support package for phased, low-impact sector development. Beyond its scientific contribution, the project is designed for practical uptake through stakeholder engagement at key stages and through policy-oriented communication products. The thesis will provide the first integrated evidence base for seaweed-farming planning in Mwali and a transferable methodological reference for other small-island WIO contexts facing similar data and governance constraints.

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