
BOOK OF ABSTRACTS

OCEANS & LAKES 2026

Comparing Reef Fish Community Structure Across Protected and Non-Protected Areas of Coastal Kenya Using ROV-Based Video Surveys

BY Paula Andrea Acevedo Ramirez

MAIN SUPERVISOR: Marc Kochzius (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Filip Huyghe

Coral reefs support high biodiversity and provide essential ecosystem services for coastal communities yet increasing fishing pressure and climate-related disturbances continue to threaten reef resilience throughout the Western Indian Ocean. Marine protected areas (MPAs) are widely used to support reef conservation, but their ecological effectiveness remains variable across regions. Understanding how marine protection influences reef fish assemblages is therefore essential for evaluating coral reef conservation strategies under increasing environmental change. This study assessed differences in reef fish assemblages and benthic habitat composition between protected and adjacent non-protected reefs along the Kenyan coast using standardized video-based surveys. A total of 60 surveys were conducted across seven reef systems using remotely operated vehicle (ROV) transects, GoPro transects, and exploratory ROV free-search surveys. Across all surveys, 115 fish species belonging to 38 families were recorded. Protected reefs exhibited significantly higher fish species richness and distinct taxonomic and trophic composition relative to non-protected reefs. Herbivorous taxa, particularly Acanthuridae and Scarinae, were more strongly associated with protected reefs, whereas invertivorous assemblages dominated non-protected reefs. Benthic habitat composition also differed significantly between protection categories, with protected reefs characterized by greater representation of dead coral, rubble, and rock substrates, while non-protected reefs showed higher macroalgal and seagrass cover. Distance-based redundancy analysis indicated that benthic habitat significantly influenced reef fish community structure. Although marine protection contributed to maintaining more functionally structured fish communities, low hard coral cover across reefs suggested persistent degradation linked to regional warming and recent coral bleaching events. Comparisons between ROV and GoPro transects demonstrated comparable estimates of species richness and community composition, supporting the applicability of small ROV systems for shallow coral reef monitoring. Exploratory ROV surveys further increased biodiversity detection by recording 13 additional uncommon and cryptic species not observed during standardized transects.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Investigating the Relationship Between Selected Nest-Level Variables and Hatching Success of Green Sea Turtles (*Chelonia mydas*) at Tiwi Beach, Kenya

BY Daniel Arabu

MAIN SUPERVISOR: Karolien Van Puyvelde (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Sammy Wambua

Green sea turtles (*Chelonia mydas*) are among the most important marine turtle species nesting along the Kenyan coast. However, nest failure remains a conservation concern in several nesting areas, including Tiwi Beach. This study examined the relationship between selected nest-level variables and hatching success of green turtle nests at Tiwi Beach, Kenya. Nesting records collected between 2023 and 2024 by the Tiwi Turtle Police conservation group were used for the analysis. The records included information on clutch size, predation status, relocation status, incubation duration, nesting site, season category, and hatching success. In addition, beach slope, distance to vegetation cover, and distance to the high-water mark were measured in 2025 to describe nesting site characteristics. Satellite imagery and field photographs were also used to assess visible shoreline and habitat changes over time. A total of 181 nests were analyzed using descriptive statistics and quasibinomial generalized linear models. Overall mean hatching success during the study period was 81.19%. Predation showed a strong association with nest failure, with most predated nests recording little or no successful hatchling emergence. Inferential analysis indicated that nests recorded in 2024 had significantly lower hatching success compared to those recorded in 2023. In contrast, relocation status, clutch size, season category, nesting site, and incubation duration were not significantly associated with hatching success within the models used. Satellite imagery and field observations further revealed visible shoreline changes and reduction in beach width in some nesting sections, particularly at Amani and Sand Island. Overall, the study provides baseline information on green turtle nesting success and nesting habitat condition at Tiwi Beach and highlights the importance of continued nest monitoring, predator management, and regular assessment of shoreline changes within the nesting areas.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

GENOME SKIMMING AND REFERENCE DATABASE OPTIMIZATION FOR METAGENOMIC CLASSIFICATION OF MARINE NEMATODE COMMUNITIES

BY Bruno Ashimwe

MAIN SUPERVISOR: Sofie Derycke (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Martijn Callens, Marianne Lolivier

Marine nematode communities are widely used as indicators of ecosystem quality however DNA-based monitoring remains constrained by lack of curated genomic references for this highly diverse group. Genome skimming has emerged as an efficient, low coverage whole genome sequencing approach that resolves reference limitations by enabling mitochondrial genome recovery and assembly-free metagenomic classification yet its application in marine nematodes remains underexplored. In this study genome skimming was applied to recover mitochondrial genomes and optimize k-mer based reference databases for Nanopore metagenomic classification of nematode communities. Custom reference databases of different k-mer length ($k = 20, 25, 30, 35$) were constructed from unassembled Illumina reads of five nematodes marine species. These databases were subsequently used to classify Nanopore reads evaluating performance against Illumina baseline processed at default Kraken2 parameter ($k=35$).

Species -level classification precision exceeded 98% for Nanopore data classified at k-mer length (k) ≥ 25 . Shorter k-mers showed reduced precision due to increased false positive assignments although their genus level classification remained robust. Relative read abundance was significantly correlated with true biomass at longer k-mers. mitochondrial genome assembly yielded complete mitogenomes and new partial assemblies for previously uncharacterized Monhysteridae species.

Overall, the results indicated that $k = 30$ provides better classification performance, supporting the use of Nanopore-based approaches for biomonitoring of marine nematode communities.

Keywords: K-mer, genome skimming, Nanopore sequencing, biomonitoring

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Niche Changes Across glacier-fed Greenland fjords

BY Joshua Bloemperk

MAIN SUPERVISOR: Jan Vanaverbeke (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Hannah Gaber

The Arctic is warming much faster due to climate change than the rest of the earth. Arctic fjords are threatened by glacier retreat whereby marine-terminating glaciers (MTGs), that sustain high nutrient input from subglacial discharge, melt and become land-terminating glaciers (LTGs). Stable isotope analysis of ^{13}C and ^{15}N isotopes provide a technique to study trophic niches within and between fjords, offering insight into how trophic niches change across differing glacial influence. This study examined four fjords in West and South-West Greenland spanning two field campaigns CANOE and SANNA. Bayesian standard ellipse areas (SEAB) and pairwise niche overlaps were calculated across within-fjord gradients and between-fjord gradients. Results suggest niche size changes were largely taxon-specific within fjords, where some taxa supported optimal foraging theory and others deviated. Between fjords, results suggest fjords with MTGs had smaller niches, partially supporting the hypothesis that MTG-sustained nutrient input drives niche narrowing around a locally abundant resource. Comparing across taxonomic groups, benthic taxa displayed the strongest spatial response in niche size and overlap, consistent with their low mobility, while the sampled fish species showed a stable niche across stations and fjords. These findings indicate that vulnerability to glacier retreat varies across the food web, highlighting the need for taxon-specific rather than community-level assessments of climate change impacts on Arctic fjord ecosystems.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Isotopic niches as a measure of meiobenthos vulnerabilities to different glacial regimes: observations from Dodman Island, West Antarctic Peninsula

BY Celine Delauré

MAIN SUPERVISOR: Ulrike Braeckman (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Francesca Pasotti

Due to increasing climate change, glacial discharge along the West Antarctic Peninsula (WAP) has increased significantly across the past decades, driving substantial environmental changes with cascading consequences for benthic communities. In 2023, the TANGO I expedition collected sediment samples from three stations in the southernmost embayment of Dodman Island (66°S on the WAP), along a distance gradient from an actively retreating land-terminating glacier. These samples were used to determine meiofaunal community assemblage and their trophic niche based on stable isotope signatures ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$). Glacial influence was found to shape meiofaunal trophic structure and community assemblages. Results showed that community assemblage composition differed along the distance gradient from the glacier. Contrary to predictions, taxon richness was highest at the glacier front, suggesting that glacial proximity favours meiofaunal diversity instead of hindering it. Copepoda at Station 1, closest to the glacier front, showed the widest isotopic niche and highest $\delta^{13}\text{C}$ variability, likely reflecting the presence of diverse and unconventional food sources including glacially derived cyanobacteria and methane-derived carbon, while Copepoda further from the glacier exploited more conventional food sources. Isotopic niche width was further taxon-dependent. Nematoda showed the narrowest isotopic niche nearest the glacier, reflecting their tight coupling to sediment organic matter and limited trophic flexibility compared to Copepoda. Further research is necessary to confirm and expand on the patterns observed at Dodman Island geographically and to broaden the knowledge of meiofaunal community assemblages along a latitudinal gradient of the WAP.

Keywords: Meiofauna; Shallow water systems; Dodman Island; West Antarctic Peninsula; Stable isotope analysis; Community assemblage

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Investigating the ecosystem functioning of natural hard substrates using stable isotopes

BY Théo Dendievel

MAIN SUPERVISOR: Ulrike Braeckman (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Abril Reynés Cardona

The Belgian part of the North Sea (BPNS) hosts subtidal natural hard substrates (gravel beds) that support high biodiversity and important ecosystem functions, yet their trophic functioning remains poorly characterized. This study investigated the isotopic niche structure, seasonal variability, and substrate-associated niche partitioning of BPNS gravel bed communities using carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) stable isotope analysis. Benthic macrofauna and epifauna were sampled in April and July 2025, yielding 322 samples across 88 consumer species. Isotopic niches were quantified using SIBER, and diet proportions were estimated using MixSIAR with literature-derived consumer-prey priors. Seasonal isotopic shifts were detected in three of eight taxa, suggesting trophic variability is species-specific rather than communitywide. Substrate-associated niche partitioning was most pronounced in Bivalvia species, while mobile predators showed substantial isotopic overlap across substrates. Diet reconstructions revealed cross-substrate feeding links, indicating that hard and soft substrates are functionally connected. These findings contribute to the ecological baseline needed to assess the recovery potential of BPNS gravel beds under the new management zones proposed in the Marine Spatial Plan 2026-2034.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

INVESTIGATING SUSPENDED PARTICULATE MATTER DYNAMICS ALONG THE SCHELDT–NORTH SEA CONTINUUM

BY Naffisa Adyan Fekranie

MAIN SUPERVISOR: Jean-Philippe Belliard (Universiteit Antwerpen)

CO-SUPERVISORS/TUTORS: Michael Fettweis, Saumya Silori

Estuaries regulate the transfer of suspended particulate matter (SPM) from land to sea, yet how SPM concentration and particulate organic carbon (POC) content, expressed as the POC:SPM ratio, vary across the full estuarine–coastal continuum remains incompletely understood. In the Scheldt estuary, recent findings indicate that the POC:SPM ratio is higher in the freshwater reach than in the adjacent southern North Sea, which contrasts with expectations derived from simple nearshore–offshore dilution gradients. This motivated an integrated assessment of SPM dynamics across the full Scheldt–North Sea continuum using long-term monitoring data spanning 1983 to 2023. SPM concentration does not decrease gradually from river to sea. It follows a non-linear pattern structured by physically and biologically distinct retention zones, including a freshwater estuarine turbidity maximum (ETM), a secondary maximum that shifts between the mesohaline and polyhaline zones depending on season and period, and an inner coastal turbidity zone (CTZ) maintained by shoreward transport of bed material whose ultimate origin is the English Channel and local Holocene mud erosion, rather than by estuarine export. The estuarine and coastal turbidity systems are therefore structurally independent, with dissolved biogeochemical signals crossing the estuarine–coastal boundary. SPM composition along the continuum reflects the interplay of physical retention, salinity-induced flocculation, and biological processes including diatom silica uptake and the production of transparent exopolymer particles (TEP) and associated extracellular polymeric substances (EPS). In the freshwater ETM, TEP enhances trapping efficiency, while in the coastal zone TEP biostabilizes the deposited bed against tidal resuspension. From 2007 onward, improved wastewater treatment and morphological interventions reorganized both SPM concentration and POC:SPM. The freshwater zone shifted toward lower POC:SPM because reduced sewage loading lowered POC while morphological intervention raised SPM, most strongly in autumn; the mesohaline zone showed a small opposite shift consistent with a modest reduction in mineral SPM rather than a strong biological recovery, since chlorophyll-a did not increase in this zone after 2007. Together, these results highlight the importance of integrated, long-term analyses across the full land–ocean continuum.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Microplastics Ingestion by *Neotrygon Indica* in Eastern Sri Lanka
Baseline assessment and development of a practical methodology for microplastic analysis in elasmobranchs
BY Lize Gijs

MAIN SUPERVISOR: Jana Asselman (Universiteit Gent)

Microplastic (MP) pollution is an increasing threat to marine ecosystems, yet information on elasmobranch exposure remains limited. This study evaluated a practical and contamination-controlled methodology for the extraction of MPs from elasmobranch gastrointestinal tracts (GITs). The protocol was designed to be cost-efficient, safe and applicable for sample processing in laboratories with limited access to specialized infrastructure, while incorporating polymer validation through advanced analytical techniques when available. To evaluate the methodology, GITs from *Neotrygon indica* specimens (n = 24) from the East Coast of Sri Lanka were processed using potassium hydroxide digestion, density separation, filtration and micro-Fourier transform infrared spectroscopy (μ FTIR). MPs were detected with a frequency of occurrence (FO) of 66.7% in *N. indica*. Polyethylene terephthalate (PET) was the dominant polymer type (77.4%), and most detected particles measured below 100 μ m (64.0%). No significant relationship was observed between body size and MP abundance. Procedural blanks showed no confirmed contamination, while recovery experiments demonstrated a retrieval efficiency of 96%. Overall, this study demonstrates that reliable MP datasets can be generated through accessible sample-processing approaches when strict contamination control measures are applied. However, specialized equipment and laboratory infrastructure are required for polymer confirmation and the generation of high-quality, comparable data, which can be accessed through collaboration with specialized laboratories. The methodology provides a transferable framework for future MP research in elasmobranch species, particularly in regions where laboratory infrastructure may be limited.

Keywords: Gastrointestinal tract, μ FTIR, contamination control, marine pollution, polymer identification

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Reconstructing The Holocene climate and landscape evolution of East Antarctic lakes through cyanobacterial communities: Evidence from sedimentary ancient DNA

BY Célestin Goubau

MAIN SUPERVISOR: Elie Verleyen (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Rune Lagaisse

Cyanobacteria are key primary producers in Antarctic freshwater ecosystems and play a major role in carbon and nutrient cycling. Their community composition, sensitive to environmental conditions, makes them promising indicators of past climate change. This study used sedimentary ancient DNA (sedaDNA) to track changes in cyanobacterial communities and their responses to deglaciation and Holocene environmental shifts in East Antarctica. Additionally, ancient communities were compared with modern Antarctic Conservation Biogeographic Regions (ACBRs).

Sediment cores from three East Antarctic lakes: Lake Nella and Progress Lake in the Larsemann Hills, and Lake Zub in the Schirmacher Oasis, were analysed using cyanobacteria-specific 16S rRNA metabarcoding. Community composition was studied through stratigraphic analyses, Constrained Incremental Sum of Squares analysis (CONISS), principal component analysis (PCA), and nonmetric multidimensional scaling (NMDS). The ancient cyanobacterial communities were then compared to modern ones from the CCAMBIO dataset, which covers eight ACBRs.

The three lakes showed contrasting ecological histories. Lake Nella and Lake Zub experienced notable shifts in cyanobacterial communities linked to deglaciation, meltwater increases, and stable freshwater conditions. In contrast, Progress Lake's cyanobacterial community remained mostly stable despite sediment disturbances, indicating resilience and recolonisation from microbial mats. Overall, community changes were more influenced by catchment evolution, deglaciation, and lake development than by climate warming.

Comparison with modern Antarctic cyanobacterial communities revealed that ancient DNA samples had notably lower diversity, primarily due to methodological issues such as DNA degradation and limited sequencing depth. Consequently, reliably assessing the biogeographic links between ancient and current ACBRs was challenging. Nonetheless, this study emphasises the value of sedimentary ancient DNA in piecing together the long-term ecological history of Antarctic biota and provides new insights into how landscape evolution has shaped cyanobacterial communities in East Antarctic lakes.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Genome size variation in giant clams

BY Maud Januarius

MAIN SUPERVISOR: Marc Kochzius (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Filip Huyghe

Giant clams (subfamily Tridacninae, family Cardiidae) are the largest existing bivalves. They are important organisms influencing biodiversity of coral reefs in the Indo-Pacific. Despite their ecological and cultural importance, several species are threatened with extinction or are endangered. Giant clams are characterised by high cryptic diversity, hindering species identification based on morphology and hence conservation efforts. Genome size (GS) is a fundamental genomic characteristic with high variation among taxa. It is influenced by the accumulation of repetitive DNA, particularly transposable elements, inducing changes in the genome. This study evaluates the potential of Feulgen Image Analysis Densitometry (FIAD) as a rapid and cost-effective method for identifying giant clam species based on GS. Specifically, it investigates whether GS can be used to distinguish morphologically similar giant clam species and whether a trend in GS variation is detectable across their evolutionary history. This study provides currently the first account of the application of FIAD in giant clams. Significant interspecific variation in GS was detected, indicating the potential of GS as a marker for species identification. Significant intraspecific variation was not observed, suggesting that interspecific variation plays a more important role in giant clams. The GS values did not exhibit a directional trend across the phylogeny, denoting that shared ancestry does not seem to drive GS evolution in giant clam species. These findings demonstrate the potential of GS estimates as a tool for species identification, with important implications for management and conservation.

Keywords: C-value, Conservation genetics, Indo-West Pacific, Mollusca, Nuclear DNA quantification

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Genomic diversity and connectivity of *Laminaria digitata* across the European latitudinal gradient

BY Elli Kiourani

MAIN SUPERVISOR: Olivier De Clerck (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Sofie Vranken, Lauren Elisa Vapillon

Climate change has increasingly been impacting marine ecosystem globally. Understanding the genetic structure of the most vulnerable species constituting these marine environments, is necessary to assess their vulnerability in a changing ocean. Kelp forests are the foundation of cold and temperate coastal environments, acting as ecosystem engineers and providing valuable ecosystem services to both humans and the environment. Under climate change, they have faced tremendous stress that has caused decline and distributional shifts worldwide. The lack of knowledge on their genetic diversity and population connectivity impedes efforts to assess their vulnerability under climate change and implement proactive conservation measures. In this study, we use low-coverage Whole Genome Sequencing (lcWGS) data to determine the neutral genetic structure and demographic history of the kelp *Laminaria digitata* in the European continent. The latitudinal gradient, spanning from the Norwegian Coastline to Brittany, France reveal 4 distinct genetic clusters, which exhibit strong neutral population structure, isolation by distance and restricted gene flow. Genome-wide diversity statistics revealed a “central-peripheral” diversity distribution and highlight a regional bottle-neck event that has hindered the genetic diversity of the rear-edge populations, potentially stemming from climate change and human-induced stress on the rear-edge populations. Our findings highlight the importance of considering population structure and connectivity in the design of effective management strategies as a way to preserve these vulnerable ecosystems.

Keywords: kelp forests, climate change, genetic connectivity, geographical ranges, range limits

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Evaluating artificial LED lighting as a bycatch mitigation tool for elasmobranchs in Belgian beam-trawl fisheries

BY Enya Kvarantan

MAIN SUPERVISOR: Sven Sebastian Uhlmann (Vrije Universiteit Brussel)

Elasmobranchs are one of the most threatened vertebrate groups globally, with overfishing and bycatch being the primary drivers of their decline. Bottom trawling is a major contributor to elasmobranch bycatch, yet mitigation techniques for this gear remain limited. Light is a promising bycatch reduction tool, but it has been tested almost exclusively on static gear such as gillnets, leaving its effectiveness on mobile gear largely unexplored. This study is the first to test LED lights as a bycatch mitigation tool for elasmobranchs on a bottom trawl, using data from a beam-trawl survey in the Eastern English Channel and Southern North Sea. We assessed the LED treatment effect on elasmobranch catch using generalized linear (mixed) models across multiple taxonomic resolutions, as a function of depth, time of day, and body length. We found no evidence that LED lights reduced overall elasmobranch catch at any taxonomic level. However, LED response differed significantly between sharks and skates: sharks showed a lower and skates a higher probability of capture in the illuminated net, though neither deviated significantly from equal capture probability. Depth significantly influenced shark capture probability in the LED net, while time of day had no significant effect at any level. In contrast, LED lights significantly reduced flatfish catch—the fishery's primary commercial target—by approximately 9.7%. Body length significantly predicted capture probability in the small-spotted catshark, with larger individuals more likely to be caught in the illuminated net. These results indicate that LED-based bycatch reduction does not affect elasmobranchs uniformly, with meaningful heterogeneity between and within taxonomic groups that a pooled analysis alone would miss. Differences in morphology, behaviour, and visual ecology likely contribute to this variation, though our findings suggest these factors alone cannot fully explain the observed patterns. Given the treatment affected flatfish catches, while showing no significant effect on elasmobranchs, further research, specifically tailored to towed-gear conditions and accounting for species-specific behavioural responses, is needed before LED lights can be recommended as a bycatch mitigation tool in this fishery.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

THE EFFECTS OF PROBIOTIC TREATMENT ON *LAMINARIA OCHROLEUCA*

A case study on *Cobetia amphilecti*

BY Flore Lamond

MAIN SUPERVISOR: Olivier De Clerck (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Sofie Peeters

Kelp forests, often described as the “trees of the ocean”, are highly productive marine ecosystems that provide habitat for a wide range of organisms and contribute substantially to coastal primary production. However, these ecosystems are increasingly threatened by climate change, with rising seawater temperatures altering kelp productivity, resilience, and geographic distribution. While restoration efforts have traditionally focused on the kelp itself, increasing attention is being given to the kelp holobiont - the host and its associated microbiome – as a means of improving restoration success. Beneficial bacteria have the potential to enhance host growth, reproduction, and tolerance to environmental stress.

This thesis builds upon previous work identifying *Cobetia amphilecti* as a promising probiotic candidate for the kelp *Laminaria ochroleuca*. The objective was to further investigate the mechanisms underlying this symbiosis and assess whether *C. amphilecti* could enhance kelp reproductive success, growth, and resilience to thermal stress. To address this, the bacterium was genomically characterized and its effects were assessed in a series of inoculation experiments with different *L. ochroleuca* populations, including a developmental morphology characterisation, a long-term and physical contact experiment, and microbiome analyses.

Genomic analyses and physical contact experiments suggested that the beneficial effects of *C. amphilecti* are likely mediated through metabolite provisioning, including vitamin biosynthesis, ammonium production, and protection against oxidative stress, primarily supporting early sporophyte development. In addition, inoculation altered the kelp-associated bacterial community in a population-dependent manner. The French population exhibited stronger shifts in microbiome composition accompanied with a decline *C. amphilecti*, whereas the Moroccan population maintained a more stable microbial community. Although *C. amphilecti* consistently promoted reproductive development, its effects depended on host population and environmental conditions, and could become neutral or even negative under elevated temperatures.

These findings demonstrate the potential of microbiome-based restoration strategies while emphasising that candidate probiotics should be evaluated across multiple host populations and environmental conditions before their implementation in kelp restoration programmes.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Filling the gap: Revealing the predator-prey linkages of sympatric top predators in Peru

BY Julianna Consuelo López Flores

MAIN SUPERVISOR: Anna-Maria Vafeiadou (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Susana Cárdenas-Alayza, Marleen De Troch

Eastern Boundary Upwelling Systems (EBUS) are among the most productive marine ecosystems worldwide, supporting highly complex food webs dominated by small pelagic fishes. The Humboldt Current System (HCS) is one of the most productive EBUS in terms of fish biomass, with Peruvian anchoveta (*Engraulis ringens*) representing a key resource for both commercial fisheries and higher trophic-level predators. However, strong fishing pressure and environmental variability, particularly associated with El Niño–Southern Oscillation (ENSO), can alter prey availability and distribution, potentially affecting top predators. Punta San Juan (PSJ), a peninsula on the southern coast of Peru, hosts three key top predators of the HCS: the South American fur seal (*Arctocephalus australis*, SAFS), the South American sea lion (*Otaria byronia*, SASL), and the Humboldt penguin (*Spheniscus humboldti*, HUPE), all of which have experienced population declines in recent decades that have been associated with changes in prey availability, environmental variability, and ongoing anthropogenic pressures.

In this study, we used stable isotopes of carbon ($\delta^{13}\text{C}$) and nitrogen ($\delta^{15}\text{N}$) obtained from inert keratinised tissues, combined with Bayesian mixing models to investigate the diet composition and feeding ecology of these sympatric wild key top predators, and quantify the relative contribution of different prey groups to their diets. Our results indicated that these predators share broadly similar food resources, but due to differences in foraging strategies and other ecological factors, these are used differently. Despite environmental variability and temporal differences among sampling periods, Peruvian anchoveta remained as a major diet component, particularly for HUPE and female SAFS. However, other important resources such as pelagic and benthic fish species also contributed substantially to their diets, suggesting that they do have alternative prey when the availability of key resources fluctuates. Overall, our findings highlight the importance of accounting for environmental variability and alternative prey resources when assessing trophic relationships in the HCS. This framework provides a complementary approach for evaluating predator-prey relationships and offers insights into how changes in prey availability associated with environmental variability and anthropogenic pressures may affect key top predators in the HCS.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Macrobenthos as indicators of seabed change from early construction of the Princess Elisabeth Island in the Belgian Part of the North Sea

BY Irina Lung

MAIN SUPERVISOR: Ulrike Braeckman (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Christelle Jammart

This study investigates the characteristics of macrobenthic invertebrate communities and assesses potential effects of the incipient construction phase of the Princess Elisabeth Island, the first artificial energy island, located on the Noordhinder sandbank in the Belgian Part of the North Sea. Changes in environmental variables and community composition were analysed at both temporal and spatial scales between the 2024 pre-construction baseline and the first year of construction works in 2025. Community composition exhibited a clear shift between the years, detectable at multivariate level. No significant differences in individual sediment characteristics were observed between the years, but the 2025 samples showed increased spatial heterogeneity, potentially as a result of construction disturbance. Both community composition and sediment characteristics exhibited weak spatial structure, partially consistent with sandbank morphology. However, due to sampling limitations such as capturing different seasons between the years, and safety restrictions limiting access to areas closest to the construction impact, these results might be confounded. To conclude, macrobenthic communities shifted between the baseline and the first construction year, but the underlying drivers remain uncertain. Continued long-term monitoring is needed to properly assess the impacts of the Princess Elisabeth Island.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Seasonal *Furcellaria lumbricalis* extracts as biostimulants: high-throughput phenotyping of drought and salinity responses in *A. thaliana* and *S. oleracea*

BY Tanjona Rovanirina Manganiainarivony

MAIN SUPERVISOR: Olivier De Clerck (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Kris Audenaert, Noémie de Zutter, Louka Noyen

Climate-driven drought and salinity are projected to affect an increasing fraction of European cropland, creating an urgent need for sustainable, evidence-based stress mitigation strategies. Marine macroalgae offer a promising source of plant biostimulants, yet the influence of harvest season on extract efficacy and whether batch-dependent variation represents a regulatory obstacle or an exploitable resource remains unresolved. This thesis evaluated four seasonal extracts of the red alga *Furcellaria lumbricalis* (Spring 2023, Summer 2023, Spring 2024, Summer 2024) across three complementary experiments: two in vitro systems on *Arabidopsis thaliana* and one controlled environment experiment on *Spinacia oleracea*, using a validated multispectral high-throughput phenotyping pipeline.

Under optimal conditions, all four extracts consistently triggered anthocyanin accumulation without biomass gain, confirming a priming rather than fertilising mode of action. Under drought, extracts maintained shoot area above untreated stressed plants, with one batch producing a measurable dry-biomass advantage. Under salinity, extracts broadly sustained photosynthetic efficiency, but a striking stress-type reversal emerged: the batch ranked weakest under drought became the strongest protector under chronic salinity in spinach, a pattern consistent with selective modulation of ionic stress pathways by seasonal compositional variation. The phenotyping pipeline was validated against destructive measurements, with chlorophyll fluorescence explaining 98% of the variance in tissue water content ($r = 0.988$), confirming that non-destructive imaging can substitute for destructive assays at this scale. These results establish *F. lumbricalis* as a real, batch-dependent, stress-specific biostimulant and reframe seasonal variability as a formulation opportunity rather than a standardisation obstacle, with direct implications for claim documentation under EU Regulation 2019/1009.

Keywords: *Furcellaria lumbricalis*; seaweed extract; red macroalgae; plant biostimulant; seasonal variability; drought; salinity; high-throughput phenotyping; chlorophyll fluorescence, *Arabidopsis thaliana*; *Spinacia oleracea*.

Remote sensing analysis of coccolithophore blooms in the North Sea using Sentinel-3 Ocean and Land Colour Instrument (2016 – 2025)

BY Dia Marganita

MAIN SUPERVISOR: Griet Neukermans (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Alexandre Castagna

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:



Dynamic Growth Modelling of *Palmaria palmata* Across Western European Waters: Predicting Potential Growth and Yield Using Environmental Forcings

BY Amr Moustafa

MAIN SUPERVISOR: Olivier De Clerck (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Lauren Elisa Vapillon

Over the past decades, marine macroalgae have attracted increasing interest as sustainable resources by offering various solutions for sustainable aquaculture, carbon sequestration, nutrient bioremediation in coastal ecosystems and the development of the blue economy. Among these promising species, *P. palmata* is an ecologically and commercially valuable red macroalga distributed throughout the northeastern Atlantic. Despite the growing demand for *P. palmata* biomass, large-scale offshore cultivation systems remain largely limited in Europe, because environmental variability strongly influences its growth and biomass production, and consequently, cultivation opportunities. This study investigates the expected growth dynamics of *P. palmata* along western European coasts using a mechanistic modelling approach adapted from an existing multi-species macroalgal growth model (Johnson et al., 2024). Species-specific parameters were collected from published literature, while the model was driven by daily environmental forcings for 2025 to simulate the potential growth and yields of *P. palmata* across western European waters. The model combines key environmental drivers, including temperature, light and nutrients, with internal nitrogen dynamics under simplified farming conditions. Initial model simulations successfully reproduced the general seasonal growth dynamics reported in field observations, with rapid biomass accumulation during spring followed by reduced growth during summer. Across western European coastal waters, the highest predicted growth rates and biomass yields were concentrated along western Scotland, parts of western Ireland and localized areas of southern Norway, whereas lower productivity was predicted along many spots of the Atlantic coasts of France, northern Spain and Portugal. The model indicates that internal nitrogen quota, uptake rates and temperature-related parameters have a strong influence on predicted growth and potential biomass production, reinforcing the importance of using accurate physiological parameterisation and environmental data in determining ideal cultivation conditions. The model further identifies an optimal cultivation window and harvesting schedules, suggesting deployment between January and April, followed by harvesting between May and July, when biomass accumulation was predicted to be the highest across most favourable regions. Beyond estimating potential yield production, the model provides a data-driven framework to support management decisions through the identification of suitable cultivation areas and harvesting periods.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Mapping mangrove use to inform sustainable management in western Benin

BY Biringanine David Mugisho

MAIN SUPERVISOR: Jean Hugé (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Séverin Tchiboza

Guézin, a fishing district on the eastern shore of Lake Ahémé in western Benin, is surrounded by fragmented mangrove patches that play vital role in providing essential provisioning services but overexploited in some villages. This study assessed how mangrove resources are used in three villages (Dohi, Degbo-Codji, and Guézin) of Guézin district by identifying the range of livelihood and subsistence activities through which resident communities interact with and utilise the mangrove ecosystem. The study further identifies current management practices by analysing the local and institutional arrangements currently governing mangrove use in Guézin, and maps the land use of Guézin's mangrove patches and land cover change across different years (2015, 2020, and 2024). A mixed methods approach was used, combining in-depth expert interviews (n=5), household surveys (n=120), focus group discussion (n=4) and remote sensing for data collection. Results show high community dependency on mangrove resources, with 84.5% of respondents reporting direct dependence, provisioning service dominance anchored in fisheries, and a culturally significant spiritual dimension expressed through sacred mangrove zones identified by 70.4% of respondents. Three distinct governance configurations were identified, ranging from embedded traditional authority to institutional fragmentation and national delegation. Sacralisation emerged as the most consistently effective protection mechanism despite receiving no formal policy recognition. Land cover analysis revealed that between 2015 and 2020, built-up areas increased over near nine-fold, mostly at the expense of bare soil and degraded forest, rather than mangroves, which showed a slight overall net gain of +2.3% over the full study period. Dohi gained +20.8% under strong traditional governance, while Degbo-Codji lost -48.8% in the absence of institutional oversight, yet its small sacred Wedo patch grew by +11.2% over the same period. These findings demonstrate that governance type seems to be the primary mediating variable between anthropogenic pressure and mangrove conservation.

Keywords: mangrove, patches, conservation, management, sacralisation, land, Guézin, Degbo-Codji, Dohi, Wedo, Mitogbodji, Benin.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Evaluating COI eDNA metabarcoding as a monitoring tool for zooplankton in the Western Antarctic Peninsula

BY Alexa Narciso Mezones

MAIN SUPERVISOR: Marc Kochzius (Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Filip Huyghe

Zooplankton is a crucial group of organisms that, along with phytoplankton, plays a key role in the carbon cycle. Both groups are considered plankton, inhabiting the water column and their spatial distribution is influenced by water movements, light, temperature, salinity and nutrients. Since they are interconnected at different levels in the food web, changes in plankton species composition or biomass can cascade up to higher trophic levels. In Bransfield Strait and Elephant Island, zooplankton communities are shifting due to regional warming. In this study, we assess whether eDNA can be used to characterise the plankton communities in this area using water collected from Niskin bottles. Additionally, we evaluated whether environmental conditions differed among nine stations through a Principal Component Analysis. DNA was filtered using Sylphium filters, extracted from the filters, and amplified using the universal Folmer COI primers. Sequencing was done using a MinION sequencing device (Oxford Nanopore Technologies). We obtained 279 curated molecular operational taxonomic units (MOTUs) that were assigned to taxonomic ranks based on two different reference databases, COInr and the Southern Ocean MetaZooGene (MZG_SO). Fifty (18 %) and 29 (10 %) MOTUs were assigned using COInr and MZG_SO, respectively, with an overlap of 5 to 7 MOTUs at species and phylum level. Unassigned reads using the databases were verified using the online BLAST tool in NCBI. Most of the taxa assigned corresponded to phytoplankton rather than zooplankton, while the dominant unassigned reads corresponded to bacterioplankton. Ordination showed an apparent distinct MOTU composition among stations, but was not confirmed statistically since a PERMANOVA was not performed. Although quite a high number of sequences were retrieved, we could not detect common zooplankton or invertebrate taxa like *Oithona similis*, *Euphausia superba* and *Salpa thompsoni*, which are reported by morphological surveys. Results can be improved by building more performant reference databases, using a mix of universal and more taxa-specific primers, and sampling at different depths.

Keywords: Long-read sequencing, Lowest Common Ancestor, Primer bias, Southern Ocean.

PERCEPTIONS OF ECOSYSTEM SERVICES IN RELATION TO CLIMATE CHANGE AND LIVELIHOOD ADAPTATION AMONG LOCAL COMMUNITIES IN THE NUI CHUA BIOSPHERE RESERVE, VIETNAM

BY Gitte Neyns

MAIN SUPERVISOR: Jean Hugé (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Karolien Van Puyvelde

Climate change and mounting human pressures are intensifying stress on ecosystems worldwide, leading to consequences such as prolonged droughts and coastal degradation. These impacts are especially significant for communities that depend directly on local natural resources for their livelihoods. Understanding how local communities perceive ecosystem services on which they depend, how these services relate to their livelihood strategies, and how the communities respond to climate change is therefore essential for effective conservation and resource management. The Núi Chúa Biosphere Reserve in south-central Vietnam provides a particularly relevant case study, as its exceptional biodiversity coincides with severe climate stress and increasing environmental degradation. This study investigates how local communities in the Núi Chúa Biosphere Reserve perceive and value ecosystem services, explores differences in these valuations across livelihood groups and socio-demographic backgrounds, and examines how environmental changes and climate pressures shape local adaptation strategies. Structured household surveys were conducted in five coastal sites within the Reserve's buffer zone (N = 107). Results show that all ecosystem service categories were considered highly important, with provisioning and regulating services valued slightly higher than cultural services. Among households for which the natural resource dependence index (NRDI) could be calculated (N = 44), reliance on natural resources was high and significantly greater among older respondents. However, no significant relationship was found between NRDI scores and ecosystem service valuation. Households engaged in agriculture and forestry showed a somewhat stronger preference for terrestrial ecosystem services, whereas those involved in fisheries placed more emphasis on marine ecosystem services. Widely recognised environmental issues such as poor waste management, water pollution, and declining fish stocks were associated with lower ecosystem service valuations, suggesting that ongoing ecological decline may gradually reduce the perceived value of the very resources communities depend on. Most respondents also reported noticeable changes in weather patterns, particularly increasing drought frequency and severity. Despite this widespread climate awareness, relatively few respondents had received climate adaptation training, and adaptation strategies remained largely reactive rather than preventive. These findings suggest that although ecosystem service awareness is high, there is still a gap between climate awareness and access to practical adaptation support. Effective management of UNESCO Biosphere Reserves therefore, requires integrating ecosystem protection with targeted livelihood support and climate adaptation training.

Keywords: Ecosystem services, Local perceptions, Livelihood dependence, Environmental pressures, Núi Chúa Biosphere Reserve.

Comparing electromagnetic sensory deterrents as a bycatch reduction method for *Raja clavata*: a behavioural analysis

BY Kaat Paepen

MAIN SUPERVISOR: Sven Sebastian Uhlmann (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Daniel Stepputtis, Ignacio Ruiz-Jarabo

Elasmobranchs are negatively impacted by the fishing industry, as they are often caught incidentally as bycatch. In Belgium, the most economically valuable species are sole (*Solea solea*) and plaice (*Pleuronectes platessa*) and are caught through beam trawling. This is a non-selective fishing method leading to high numbers of bycatch. Several bycatch reduction methods have been tested, but due to the similar size and shape of elasmobranchs, specifically rays, to the target species it is difficult to mitigate without economic losses. Researchers have therefore started to investigate sensory deterrent devices as elasmobranchs have the ability to detect weak electromagnetic fields through specialized pores called Ampulla of Lorenzini (AoL). These pores are not found in teleost fish, therefore electrosensory deterrent devices would not affect the landings of valuable target species.

This study compared the repellent capacity of two commercially available deterrent devices Sharkbanz® Zeppelin, a rare-earth magnet and Fishtek Marine Sport® Sharkguard, a device working with electrical stimuli, on juvenile thornback rays (*Raja clavata*). For both devices a reduction in passage rate was found indicating the possibility of a repellent effect. No significant difference in deterring capacity was seen between the two devices. However, estimations on behavioural duration and probability of occurrence might suggest that the electrical deterrence is slightly more suited for repelling *R. clavata* compared to the magnetic counterpart.

Keywords: electroreception, bycatch reduction, electromagnetic field, North Sea

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Using the fossil remains of aquatic insect larvae, ostracods, and water fleas to reconstruct changes in salinity and associated aquatic habitats in a crater lake near Lake Victoria (East Africa) over the past 8300 years

BY Zanura Jumanne Salimu

MAIN SUPERVISOR: Dirk Verschuren (Universiteit Gent)

Crater lakes in the East African Rift Valley provide valuable archives for reconstructing long-term changes in aquatic ecosystems and regional environmental conditions, as their water volume is controlled by precipitation and evaporation. High evaporation decreases lake volume and increases solute concentration. However, the ecological responses of aquatic communities to changes in salinity and hydrological conditions during the Holocene remain poorly understood in many small crater lakes near Lake Victoria. This study used taxonomic identification to reconstruct changes in salinity and associated aquatic habitats over the past 8300 years using fossil remains of aquatic insect larvae, ostracods, and cladocerans (water fleas), preserved in sediment cores from a crater lake (Simbi) near Lake Victoria, Kenya, East Africa. The 8300-year sediment record of Lake Simbi (SIM 20) studied here was collected in January 2020 using a hammer-driven UWITEC piston corer and gravity corer, both suspended from a wire on a carefully anchored UWITEC platform. The sediments were then transported to the Limnology Laboratory at Ghent University, where they were stored in the cold room for preservation. In SIM 20 core sections, 39 mud samples of 2 cm each, weighing an average of 13.8 g (ranging from 5.51 to 24.04 g), were extracted from seven (7) core sections covering five periods of the Holocene (African Humid Period, Late-Holocene Drying Trend, Medieval Climate Anomaly, Little Ice Age and Recent Wet Period) for assessment of the fossil assemblages. The fossil assemblages recovered comprise three chironomid taxa (*Kiefferulus disparilis* (92.59 %), *Microchironomus deribae* (4.71 %), and *Cladotanytarsus pseudomancus* (2.69 %), four ostracod taxa (*Limnocythere notodonta* (64.51 %), *Limnocythere africana* (28.46 %), *Hemicypris* sp. (6.81 %) and *Candonopsis africana* (0.84 %), *Moina belli* as only representative of water fleas (cladocerans), and fish remains (bones and scales). The composition and abundance of these aquatic organisms varied through the sediment sequence, with highest abundance and diversity observed during the Little Ice Age, indicating temporal changes in aquatic habitat conditions. During the Medieval Climate Anomaly (MCA), no fossils were recovered, indicating that the lake might have been too saline for organisms to survive. The chironomid and ostracod assemblages provided information on changes in habitat conditions due to salinity preference, water depth and aquatic vegetation of the lake. Occurrence of *K. disparilis* and *Limnocythere* spp. at high abundances suggests predominantly saline conditions, while occurrence of *C. pseudomancus* and *C. africana* is consistent with relatively fresh aquatic conditions. The low percentages of these freshwater species indicate that the lake was saline in many phases. In addition, *Moina belli* provides complementary information on the high salinity of the lake, and fish remains provide evidence for the persistence of aquatic habitats capable of supporting higher trophic levels. Chironomids, alongside ostracods and *Moina belli*, demonstrate their value as sensitive indicators of past hydroclimatic change in East African lakes. Overall, the intermittent presence and absence of microfossils and the presence of salt-tolerant species and freshwater species across the sediment core indicate that East African climate conditions alternated between drier and wetter phases during the Holocene.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Developing eDNA as a tool for assessing fish diversity on East African coral reefs

BY Tara Sarwar

MAIN SUPERVISOR: Marc Kochzius (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Filip Huyghe

Coral reefs support some of the highest levels of biodiversity in the world but are increasingly threatened by a range of anthropogenic pressures, underlining the need for effective biodiversity monitoring. Environmental DNA (eDNA) metabarcoding has emerged over the last decade as a promising non-invasive technique for detecting aquatic organisms from water samples and has the potential to complement traditional underwater visual census (UVC) surveys. This study evaluated the performance of the 12S mitochondrial marker using Oxford Nanopore sequencing to characterise shallow coral reef fish communities along the southern Kenyan coast from filtered water samples. More specifically, it examined marker performance, the influence of protection status and geographic location on fish communities, and differences in species detection between eDNA and UVC surveys.

Sampling sites included both no-take and multiple-use areas in Diani, Mombasa, Shimoni, and Watamu. Amplification of fish DNA using the MiFish-U primers and subsequent sequencing across two independent runs successfully identified reef fish diversity at the family, genus, and species level. Overall, 41 families, 61 genera, and 71 species were identified across all reefs. We detected most expected reef-associated families, as well as the cryptic Gobiidae, which further illustrates one of the main advantages of eDNA metabarcoding, namely its ability to detect taxa that are commonly missed by UVC surveys. Geographic location had an influence on fish communities but not protection status. The Watamu Marine National Park showed greater taxonomic richness, while unprotected reefs in Shimoni showed comparable species compositions. Functional trophic composition was dominated by grazers and detritivores, while corallivores were absent, suggesting a shift towards ecological conditions commonly associated with coral reef degradation. While eDNA and UVC surveys recovered comparable taxonomic richness, overlap in detected species was limited.

Despite technical limitations associated with incomplete reference databases and sequencing performance, this study demonstrates that eDNA metabarcoding using Oxford Nanopore Technology can provide reliable ecological insights into Kenyan coral reef ecosystems.

Keywords: MPA, bioinformatics, Western Indian Ocean, next generation sequencing, high throughput sequencing, reef monitoring

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Monitoring the impact of mussel aquaculture on macrobenthos in the Belgian part of the North Sea.

BY Luka Serbruyns

MAIN SUPERVISOR: Ulrike Braeckman (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Christelle Jammart

The aim of this study was to provide insights into the spatio-temporal variability of macrobenthic communities near the Westdiep seafarm, an offshore longline mussel farm in the Belgian part of the North Sea. Van Veen grab samples and sediment samples were collected in triplicate along a north-east gradient away from the farm over a four year period (2021–2025). Data on macrobenthic abundance (N), species richness (S) and Shannon diversity (H') as well as sediment characteristics were assessed using univariate and multivariate analyses, including generalised additive models (GAMs), Principal Coordinates Analysis (PCoA), PERMANOVA and SIMPER.

Significant spatial and temporal patterns were observed in the three biotic response variables. A transition zone between the *Abra alba* and *Nephtys cirrosa* communities was identified approximately 3–5 km from the farm, characterised with an increase in fine sediment over time. Changes in the abundance of several opportunistic species were also observed, although these may reflect the natural temporal variation in species composition rather than a direct response to the mussel farm. Due to the high hydrodynamic regime of the region, the influence of sediment plumes from a nearby river, and the closest sampling location being almost one kilometre from the farm, distinguishing the direct effects of the farm on the macrobenthic community remains challenging. The present study therefore provides a baseline of multi-year variation in macrobenthic communities north-eastwards of the farm and can serve as a reference for future monitoring of the potential effects of the Westdiep seafarm.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Governance of the Nui Chua Biosphere Reserve, Vietnam: an assessment of local community perceptions

BY Lea Rosa Tanzer

MAIN SUPERVISOR: Jean Hugé (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Karolien Van Puyvelde

As global sustainability challenges intensify, biodiversity loss due to deforestation, land-use changes, urbanization and pollution continues to increase. These processes are closely linked to human dependence on natural resources. UNESCO Biosphere Reserves have been established as a governance approach that aims to combine ecosystem conservation and socio-economic development.

Stakeholder trust and participation within Biosphere Reserve governance are key to guarantee the sustainable development of these areas. Understanding how livelihood dependence, geographic location, and institutional interactions influence trust is thus important to evaluate governance outcomes.

This thesis provides a baseline assessment of the recently designated Nui Chua Biosphere Reserve in Vietnam, building on questionnaires data from local communities across different Biosphere Reserve zones. The thesis examines how households interact with governmental institutions, which factors influence trust in the Nui Chua National Park Management Board, how zonation relates to these dynamics, and which improvements are suggested by local communities to strengthen cooperation.

A total of 109 responses were analysed using R. Statistical methods included Kruskal-Wallis rank sum tests, Spearman's rank correlation tests, thematic frequency analysis, and a simplified binomial logistic regression.

Results show that the reported frequency of interactions between households and institutions is generally low to moderate and vary little across zones. Trust in the National Park Management Board is generally high, although forestry-dependent households exhibit significantly lower trust compared to other livelihood groups. Additionally, interactions with extension services show a positive association with trust in the Nui Chua National Park Management Board. Interaction levels are also associated with the type of improvement requests expressed by respondents, where higher interaction is linked to more specific and structured suggestions.

Overall, the findings suggest that trust is associated with livelihood characteristics and specific forms of institutional engagement rather than with the frequency of institutional interaction or spatial zonation alone. Strengthening communication, participation, and livelihood-oriented support may improve the long-term socio-economic sustainability of the region and support conservation efforts and governance of the Nui Chua Biosphere Reserve.

Can offshore wind farms serve as marine protected areas for flatfish?

BY Madeline Thomson

MAIN SUPERVISOR: Sofie Derycke (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Annelies De Backer, Jolien Buyse

Offshore wind farms (OWFs) introduce hard substrates into a predominantly sandy seafloor, with several studies demonstrating that this can create an artificial reef effect, with increased biomass around turbines attracting demersal mobile species. Because fishing activities are typically restricted within this area, OWFs may also function as no-take zones. Numerous studies on OWFs have therefore focused on whether these areas have increased density of commercially fished species; similar analyses are carried out in marine protected area (MPA) research. However, assessment of these metrics alone may not capture the full biological response. In this study, two species of flatfish, plaice (*Pleuronectes platessa*), a commercially targeted species, and dab (*Limanda limanda*), a bycatch species, are investigated to assess their biological responses in two OWFs off the coast of Belgium and to evaluate whether any observed benefits suggest that OWFs can serve as MPAs. Trawl sampling data were analyzed to compare impact sites within the wind farms and their paired reference sites. For plaice, samples collected after construction showed an initial increase in length of large individuals at one wind farm followed by a decline to reference site levels, while the condition index increased closer to the turbines at both OWFs. Overall, there was some indication of more balanced sex ratios inside the OWF concession area for both species, but no clear increases in growth or age were detected for plaice. Dab, generally, showed weaker evidence of a response to the OWF. These results suggest the magnitude of responses was species-specific and was generally not consistent between the two OWFs studied. Although some benefits are described in this study, comparisons between OWF and MPAs should also consider the negative impacts of OWF on the surrounding environment. Future research should refine sampling methods to better detect large plaice that may aggregate close to the turbines and investigate whether female plaice may benefit disproportionately from the no-take effect, potentially influencing their reproductive contribution.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

COASTLINE AND MANGROVE DYNAMICS IN THE HURRICANE-PRONE ISLANDS: SAN ANDRÉS AND PROVIDENCIA, COLOMBIA

BY Krisly Marcela Toro Barragan

MAIN SUPERVISOR: Tom Van der Stocken (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Diana Di Nitto

Mangrove ecosystems on isolated islands provide coastal protection and store substantial amounts of carbon, but they are increasingly vulnerable to extreme weather events. This study evaluates long-term mangrove vegetation dynamics and coastline change in the Seaflower Biosphere Reserve of San Andrés and Providencia archipelago in relation to hurricane activity between 2000 and 2024. Multi-decadal Landsat 5, 7, and 8 imagery, combined with higher-resolution Sentinel-2 data, was used to assess vegetation response to four major hurricanes and to analyze shoreline change using annual median composites, vegetation indices (NDVI, NDWI, CMRI, MVI, and MFI), and shoreline change analysis with QSCAT. The results show difference between islands and storm events. Hurricane Iota (2020) reduced median NDVI in Providencia by 41%, whereas San Andrés showed only limited change; in contrast, Hurricane Julia (2022) produced a 32.5% decline in San Andrés. Although NDVI indicated partial recovery by 2024, the multi-index analysis showed more persistent structural and hydrological degradation, particularly in Providencia, where MVI remained 31% below its pre-Iota baseline. Shoreline analysis further showed that most transects across the archipelago were stable over the five-year interval, but change was spatially heterogeneous: McBean Lagoon in Providencia was dominated by erosion, with 85.2% of transects classified as eroding whereas Old Point and Cocoplum Bay in San Andrés were predominantly stable. Smaller, fragmented, and urban-proximate mangrove sites also showed weaker recovery trajectories than larger and less disturbed stands. Together, these findings indicate that mangrove resilience and shoreline dynamics in the archipelago are shaped not only by hurricane intensity, but also by storm-track geometry, island geomorphology, site configuration, and cumulative disturbance history. This study provides a remote-sensing framework to support Colombia's national mangrove monitoring network in distinguishing sites that may recover through continued observation from those that should be prioritized for active restoration.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Using eDNA as a tool to assess marine eukaryotic diversity in East African coral reefs

BY Amélie Trigallez

MAIN SUPERVISOR: Marc Kochzius (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Filip Huyghe

Environmental DNA (eDNA) metabarcoding is increasingly used to study biodiversity, especially in marine environments where conventional surveys can be logistically challenging and might overlook small and cryptic organisms. The mitochondrial cytochrome c oxidase subunit I (COI) gene is widely used for broad eukaryotic metabarcoding due to its extensive coverage in reference databases. However, the biodiversity recovered through metabarcoding heavily depends on marker and primer choice, sequencing accuracy, and reference database completeness. In this study, we assessed a single marker assay, the Folmer universal COI marker, to characterise eukaryotic diversity across seven coral reef sites along the southern Kenyan coast and analysed the taxonomic composition and resolution of the recovered molecular operational taxonomic units (MOTUs).

Nanopore sequencing generated 469,110 raw reads, with 188,588 reads (40.2 %) successfully assigned to individual sample barcodes after demultiplexing. Of these, 70,514 passed quality and length filtering. Sequence processing and curation resulted in 4,504 MOTUs, of which 682 were confidently assigned to phylum level. The recovered community was strongly dominated by the phylum Chlorophyta, followed by Arthropoda and Bacillariophyta, which together represented 90.47 % of phylum-assigned MOTUs. Observed MOTU richness and Shannon diversity showed no significant differences between protected and unprotected reefs. Richness of MOTUs increased significantly with read abundance in individual samples. Although planktonic micro-eukaryotes dominated, the dataset included a broad range of eukaryotic diversity, such as zooplankton and benthic invertebrates. Eleven taxa were confidently identified to species level, including widespread phytoplankton and zooplankton, as well as benthic species like the sponge *Fasciospongia cavernosa*, gastropod *Jujubinus suarezensis*, ascidian *Ascidia ahodori*, and the pleurobranch sea slug *Berthellina delicata*.

The strong taxonomic imbalance and limited species-level resolution highlight some of the limitations of broad-range COI metabarcoding using environmental samples. These findings emphasise the importance of selecting markers and primers aligned with each study's goals for biodiversity assessments. Improving reference-database coverage remains crucial for understudied regions such as the Western Indian Ocean. A combination of broad-range metabarcoding, taxon-specific markers, and conventional survey techniques is therefore recommended to provide a more comprehensive understanding of marine eukaryotic biodiversity.

Keywords: East Africa, Coastal ecosystems, Bioinformatics, Next Generation Sequencing, Oxford Nanopore MinION, biodiversity assessment

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

Investigating eDNA as a Tool to Map Coral Reef Fish Biodiversity in Tanzania

BY Lynn Vervenne

MAIN SUPERVISOR: Marc Kochzius (Vrije Universiteit Brussel)

CO-SUPERVISORS/TUTORS: Filip Huyghe

Coral reefs, which are among Earth's most biodiverse ecosystems, have been declining globally, affecting not only the corals but also reef-associated fish communities. Reef fish communities can reflect the reef's condition, as their composition and diversity respond to habitat degradation and anthropogenic stressors. The ability to capture these changes is valuable. The Western Indian Ocean (WIO) contains a biodiversity hotspot. However, despite its ecological importance, several regions within the WIO remain understudied. To inform effective monitoring and management, accurate and efficient biodiversity assessment methods are needed. This study explores the use of environmental DNA (eDNA) metabarcoding as a tool to assess reef-associated fish biodiversity in Tanzania. eDNA metabarcoding is a cost-effective, non-invasive approach that has gained increasing attention in marine biodiversity research, but its performance remains variable. Our study compares the eDNA metabarcoding data to a parallel underwater video census (UVC) survey conducted at reef sites in Chumbe and Nungwi. Understanding the advantages and limitations of eDNA will help inform future marine biodiversity surveys in the region. We found that both methods captured distinct components of the reef fish community, with taxa present at higher abundances more likely to be detected by both approaches. eDNA metabarcoding successfully identified multiple taxa to species level, with most detected species displaying cryptic or low-visibility behaviour. In contrast, UVC detected a greater number of families overall and provided abundance data, but failed to record several inconspicuous taxa that were successfully detected through eDNA. These findings highlight the complementary nature of eDNA metabarcoding and UVC, while also demonstrating the methodological and ecological factors that influence eDNA-based community assessments in reef systems. Despite current limitations, this study demonstrates the potential of eDNA metabarcoding as a tool for biodiversity monitoring when used alongside established visual survey methods.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by:

IMPACTS OF GLACIER RETREAT ON THE TROPHIC NICHES OF GREENLANDIC FJORD COMMUNITIES

BY Una Vēvere

MAIN SUPERVISOR: Jan Vanaverbeke (Universiteit Gent)

CO-SUPERVISORS/TUTORS: Hannah Gaber

The Arctic is undergoing significant ecological changes, largely driven by global warming, with the widespread retreat of the Greenland Ice Sheet having accelerated dramatically over the past decade. Fjords, as ecosystems at the land-ocean interface, are highly vulnerable to these changes. Marine-terminating glaciers (MTGs) release meltwater through subglacial discharge that ascends as a buoyant plume, drawing up deeper fjord water and supporting a surge in primary production, whereas land-terminating glaciers (LTGs) instead lack this mechanism and enhance stratification through surface runoff, limiting primary production. While this contrast has been documented in pelagic systems, benthic systems remain comparatively understudied despite growing interest.

This study addressed this gap by comparing benthic communities and their isotopic niches across four Greenlandic fjords in two regions, South-western Greenland (Igaliku and Tunulliarfik fjords) and Disko Bay (Disko and Eqi fjords). The research questions were (1) do benthic communities and their isotopic niches differ within fjords, with particular focus on patterns related to glacier proximity, and (2) do they differ between fjords, with particular focus on MTG- versus LTG-influenced systems?

Macrobenthic community structure showed no consistent relationship with glacier proximity, nor distinct differences between MTG- and LTG-influenced fjords. Isotopic niche metrics, in contrast, revealed clear patterns at both scales. Within-fjords, decline in trophic diversity (SEAB, TA, C Range, N Range, CD, number of trophic clusters) towards the inner regions of the fjord was present within South-western Greenland fjords, while Disko Bay fjords showed little variation in isotopic niches. Between fjords, higher trophic diversity (a higher number of clusters, TA, C Range, and CD) was found in the outer part of MTG-influenced fjords, and in fjords with (partial) MTG influence trophic diversity (CD) decreased towards the inner part of the fjord, both of which were absent in LTG-influenced systems.

These findings suggest that isotopic niche analysis captures aspects of benthic functioning not reflected in community structure alone. As marine-terminating glaciers retreat, the heterogeneous and diverse trophic functioning currently observed within MTG-influenced fjords may be altered, with potentially important consequences for fjord ecosystem functioning.

MSc Marine and Lacustrine Science and Management in an interuniversity programme offered by: