
Caribbean spiny lobster – developing innovative fisheries management and aquaculture practices to sustain ecosystems and livelihoods by University of Exeter



This project will deliver a multi-disciplinary, collaborative approach to enhancing the sustainable exploitation of Caribbean spiny lobster. Focusing on the Small Island State of The Bahamas, the project will deliver three key Innovations that directly contribute to the achievement of SGDs 14.4, 14.7 and 14.b. Specifically, developing a novel genetic tool based on population genomic data for Caribbean spiny lobster. This is critical for enabling improved, science-based management of this economically and ecologically important fishery. Secondly, working directly with fishers to

transfer the latest global understanding of grow-out technology (a process whereby fishers intercept and protect early life-stages of the organism to be grown into adulthood) and management, to co-design small scale grow-out operations for spiny lobster. This innovation will be accessible, community led, and appropriate to the Bahamian and wider Caribbean context. Finally, a program of engagement activity with fishing communities and Government policy makers will raise awareness of the conservation challenges.

The project will also appraise the feasibility of, and identify the optimal route for establishing a National Caribbean spiny lobster nursery in The Bahamas, drawing on the well-established model by the National Lobster Hatchery in Cornwall, UK. Collectively, these innovations represent a holistic and revolutionary approach to addressing the increasing environmental and economic challenges associated with exploitation of the Caribbean spiny lobster, which is the most economically significant fishery in the region, with Bahamian exports generating US\$90M annually

The project started in July 2022 and is planned to be completed at end of May 2024.

Current status and achievements

- Conducted an inception workshop with all concerned stakeholders to present the project main objectives and work plan
 - Working with the project partners to collect available samples for spiny lobster from other areas for genetic work.
 - Successfully secured 164 *P. argus* DNA samples from a sample library, with historic samples from one site in The Bahamas, plus samples from Grand Cayman, Panama and Puerto Rico
 - Secured 12 DNA samples from sample library, of closely related, and co-ranging, but distinct species *P. gattatus*, will be used for validation and confirmation of ID.
 - Identified a further 160 *P. argus* tissue samples held in Smithsonian Marine Station and Florida Atlantic University sample libraries from Florida, Mexico, Belize, Honduras.
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Target outputs and outcomes by end of project

- Started communication with the Bahamian government authorities to get the required permits for samples collection from the Bahamian spiny lobster
- Prepared a baseline report on sample collection for genetic analysis
- Identification of archived Caribbean wide samples (excluding the Bahamas), and initiate transport of samples to Exeter
- Purchase of consumables for genetics work to be undertaken.
- Finalized the population genetic analysis of Caribbean spiny lobster populations from across the wider Caribbean.
- Developed a scientific report disseminated to scientific community and fisheries managers, presenting genetic variation across the genome of wild Caribbean spiny lobster populations in The Bahamas and the wider Caribbean.
- Delivery of a bespoke SNP array for use on the Fluidigm genotyping platform to facilitate rapid assessment of Caribbean spiny lobster population genetics at 96 genetic markers (loci).
- Co-design of small-scale grow-out operations, with at least two fishers engaged to actively ensure responsible community owned innovation.
- Conducted 3 training sessions with fishers, grow-out cages suitable for housing 600 pueruli deployed at CEI, grow-out cages suitable for housing 400 pueruli deployed by fishers elsewhere in The Bahamas
- Assessment of growth and survival of Caribbean spiny lobster pueruli and sub-adults maintained in grow-out cages as part of a 6 month grow-out field trial in The Bahamas (data both researcher and fisher collected).
- Optimization of abiotic conditions for ensuring optimal growth and survival from land-based rearing of newly settled post-larvae (pueruli) and sub-adult Caribbean spiny lobster.
- Industry targeted fact sheet and short video outlining benefits of, and best operational practices for, achieving sustainable community-led small-scale grow-out of Caribbean spiny lobster in The Bahamas.
- Developed a report on the key recommendations for enhancing sustainable exploitation of Caribbean spiny lobster through responsible innovation, and recommendations for developing a nursery facility in the region, as well as evidence of the positive impacts of grow-out methods on proposed MPAs and future fisheries management.

The project is planning to achieve the following outcomes at the end of its implementation: The innovation project will provide fisheries managers with the tools to better manage their stocks through improved understanding of population structure and connectivity of wild lobster stocks, with potential to help target illegal fishing and poaching. It will also introduce new aquaculture techniques from experienced partners in Europe to fishers and other stakeholders in the Bahamas to lay the groundwork for a novel aquaculture approach for Caribbean spiny lobster. This will diversify and help grow the country’s blue economy and break-down barriers to future innovation by complementing new techniques with traditional ecological knowledge in co-production.

The project outputs have the potential to go further: stimulating a cottage industry, producing aquaculture tools from locally sourced materials. These can be used by local producers to cultivate lobster at a commercial scale that then pays for itself. These innovations will also have direct conservation benefits beyond the life of the project since improvements in culturing techniques will facilitate restocking of wild fisheries populations, as practiced in many other parts of the world. When used in conjunction with marine protected areas, there is great



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on



potential to not only support livelihoods but restore lobster populations and ecosystems, ensuring long-term sustainability.