

Darwin Initiative: Half Year Report

(due 31 October 2016)

Project Ref No	21-013
Project Title	Alternative livelihood opportunities for marine protected areas fisherwomen
Country(ies)	Sierra-Leone, UK
Lead Organisation	University of Stirling (UoS)
Collaborator(s)	Fourth Bay College, University of Sierra Leone Institute of Marine Biology and Oceanography (IMBO), Njala University (NJU), Macalister Elliot and Partners Ltd. (MEP).
Project Leader	<i>Dr Francis Murray (UK) – Dr Saliue Sankoh (Sierra Leone)</i>
Report date and number (eg HYR3)	12 Jan 2017 – HYR2
Project website	http://www.stir.ac.uk/aquaculture-mangrove-oyster/
1. Outline progress over the last 6 months (April – Sept) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up to end September).	
<p>Following a successful post-Ebola joint scoping mission by all project partners to research sites in Sierra Leone (Jan 16), a permanent research presence was established in the Bonthe Town at the heart of the Sherbro MPA. Mr Richard Kapindi (IMBO), a community outreach and survey specialist is coordinating collaboration with the local office of Environmental Justice Foundation (EJF: http://ejfoundation.org/gallery/ejf-sierra-leone). EJF staff (Amara Kalone and Ali Kumara) have been trained to conduct longitudinal water quality monitoring (with equipment provided by the project) and survey of mangrove oyster gathering, processing and marketing effort in eight satellite communities around Bonthe. The team were also responsible for maintaining and monitoring performance of two suspended and submerged (bottom) culture pilots near the research office in Bonthe, installed under guidance of Mr James Green proprietor of the Whitstable Oyster Company, UK (WoC) in Sep-Oct 2015, (see annual report). From April to July, the field team was further augmented by UoS MSc aquaculture student Mr Nick Shell who went on to successfully submit a theses titled; '<i>Evaluating the role of mangrove oyster (Crassostrea tulipia) production and marketing on livelihoods of fisherwomen in the Sherbro River Delta, Sierra Leone; a mixed methods study</i>' Local supervisory support was provided by Dr Richard Wadsworth (NJU). A second-joint progress and data-gathering mission by UoS staff (Francis Murray, Richard Quilliam) local PI's (Saliue Sankoh, Richard Wadsworth) and Mr James Green (WoC) followed over eight days during the peak oyster harvesting season in June 2016.</p> <p>In-depth semi-structured qualitative interviews across ten communities, gave further insight into harvesting patterns and gender-based access rights. Mangrove oysters effectively remain beyond the purview of local authorities (Chieftaincies, Municipality and MPA authority). Exploitation of this open-access resource then depends on gendered-mobility attributes together with endowments and negotiation of shared access to canoes with male family members (who prioritise fishing and transport uses). Consequently, female dominated-harvesting is generally concentrated within a 2-3km paddling range of micro-settlements often consisting of just small extended family groups. Salinity, tidal and safety factors linked to channel characteristics and weather exposure are other key interacting determinants of seasonal and spatial variability in effort and ability of different groups to participate in oyster harvesting.</p>	

Supervised classification of satellite image series (2004 and preliminary 2015 census results), indicates settlement is becoming more common in mangrove areas whilst the population in Bonthe Town remains relatively static due to lack of formal employment opportunities. Census results also show that though slowly correcting following Sierra Leone's brutal civil-war, Bonthe district retains a significantly skewed gender-ratio (97 males to 100 females in 2015). In a predominantly Muslim hinterland around Bonthe Town, it is common for males to take multiple-wives. Preliminary findings suggest relatively high degrees of autonomy around reproductive tasks by such family sub-units which will be considered in selection of beneficiaries for project interventions. Prevailing male attitudes towards oyster gathering as 'a less-serious' activity serve to conserve traditional female-roles, however we also found as yet limited numbers of unemployed male youth from Bonthe turning to oyster harvesting; attracted by low-entry costs relative to fishing. Such youth are also likely to make longer multi-day trips to remoter and hitherto less exploited harvest-sites.

Despite evidence of growing harvest effort, the project team found reason to question a native oyster depletion assumption on which the project was predicated. Ecological 'r-selection' traits; fecundity and rapid maturation are a response to high natural mortality rates in narrow seasonal salinity windows. These are characteristics which are more redolent of euryhaline cockle and clam fisheries than oceanic oyster fisheries also make mangrove oysters relatively resilient to increasing fishing pressure. This hypothesis was supported by outcomes of pilot culture trials. Although the suspended culture systems constructed of locally available mangrove wood, string & oyster cultch (3.5x12m frame, supporting 80 strings of spat collectors at sub and intertidal levels with 15 shells per string) achieved excellent yields, this was still only equivalent to 2-3 days wild-harvesting of oysters from mangrove roots typical of the peak season. Although experimental yields from the oyster trial on mud banks were much lower, low investment needs and opportunity cost for such interventions make this the preferred 'environmental-enhancement' strategy under prevailing resource and economic conditions. Although shucked oyster shells have commercial value as a construction material in Bonthe, large-spoil heaps are the norm in most mangrove communities as the low market price only justifies highly local (canoe) transport. Equipment challenges complicated efforts to assess mangrove oyster carrying capacity based on assessment of primary productivity (using Secchi depth and chlorophyll-A measurements and evaluation of mangrove oyster clearance rates).

The taxonomic status of the mangrove oyster (*Crassostrea tulipa*) remains contested. Furthermore, fishing pressure based on simple-hand gathering is highly unevenly distributed across three different phenotypes associated with different culture substrates; mangrove, mud and rock. Most effort is concentrated on the most accessible oysters colonising mangrove roots in inter-tidal zones, whilst sub-tidal mud and rock oysters that are refractory to hand-gathering may constitute more resilient multi-year class breeding pools. Management of biodiversity is therefore contingent on clearer determination of the extent of genotypic differences, if any, between these morphotypes which may, or may not, also be geographically restricted to different coastal mangrove areas (in turn contingent on the natural ability of spat to disperse on oceanic currents). To address this question we plan to collect samples for double-digest restriction site associated DNA (dd-RAD) marker analysis at UoS linked to a potential MSc project in 2017.

Hand-gathering involving cutting of mangrove roots, along with use of mangrove wood for steaming and smoking contributes to what appears to be a more serious mangrove degradation problem. The severity of this problem will be assessed more systematically as part of longitudinal community surveys linked to potential intervention (e.g. fuel efficient stoves) and training outcomes. Two additional MSc projects have been offered on these aspects.

Inter-disciplinary findings have been used to adapt the proposed range of post-harvest value-addition options with respect to their ability to (i) sustainably enhance incomes and livelihoods of the primary female project beneficiaries whilst (ii) mitigating environmental damage. Recognising open-access and free-market conditions within a weak regulatory context, we also adopt an explicit 'do-no-harm' ethos around solar cold chain implementation for live oyster sales around Freetown e.g. in accelerating resource extraction of oysters as a low-value bulk-commodity for export to regional markets.

In June, Dr Richard Quilliam repeated and extended an earlier assessment (Jan 2016) of faecal organisms indicative of human pathogen contamination in oyster flesh. A portable field laboratory was set up in Bonthe for this purpose. On this occasion samples of live mangrove and rock oysters were collected respectively from the Sherbro estuary and a Freetown tourist beach, along with freshly steamed mangrove oysters from Bonthe. Bacterial concentrations beyond EU food safety classification limits were confirmed in live Sherbro mangrove oysters, whilst negligible or no contamination was detected in live rock and steamed mangrove oysters. In contrast to the rock oyster samples collected from a coastal area experiencing full oceanic dilution, hydrographic assessments of tidal currents (using drogues) within the Sherbro delta indicated low residual currents and hence flushing rates of human excreta from the micro-dispersed population described above. Further assessment is required to assess whether effective and reliable depuration attuned to local development constraints, could be achieved (e.g. using simple solar tilt-tray methods). However, availability of 'clean' rock oysters near Freetown and absence of any effective food safety regulatory regime limits prospects for sales of live Sherbro oysters on tourist beaches (& requirement for the marketing international sustainability "green tick" for potential export opportunities - as described in the grant proposal)

This finding also limits potential for the proposed micro cold-chain intervention predicated on value-added live oyster sales in Freetown. A review of a comparable intervention (for fish products) implemented by local NGO Green Scenery also demonstrated the enormous challenge of maintaining refrigeration plant without reliable access to repair training and spares-inventory in this remote area. In a further illustration, a large-scale refrigeration plant installed as part of a Government fisheries landing and processing complex in Bonthe has rarely functioned since its installation some 4-5 years ago. Green Scenery experiences also underscore the importance of designing production and processing interventions that can, as far as possible be decentralised to female groups within their satellite communities.

An assessment of economic margins associated with primary (steaming) and secondary (smoking) processing losses confirmed that smoking serves a preservation rather than value-addition function (considering processing, additional labour costs and a universal volumetric marketing practice). However, only those in a short-range paddling range (1-2km) of Bonthe town can undertake the same day processing and marketing required to sell fresh oysters without risk of spoilage. Thus most production in the delta is steamed, smoke-processed and stockpiled for retail at a weekly mainland market (*lumi*). Market assessments at this bottleneck offer one means of estimating seasonal harvesting effort over much of the delta. IMBO is recruiting a local MSc student to conduct longitudinal market assessments. Samples of steamed and smoked oysters have also been subjected to proximate analysis to assess effects of smoking on nutritional quality.

With these development challenges in mind, interventions will focus on value-added marketing of steamed and smoked oysters as ingredients in ready-meals. Marketing will be promoted through development of a Sherbro brand for positioning of packaged product(s) in local and regional sales channels. Simple measures to extend shelf life will be developed incorporating fuel-efficient and sanitary processing methods, selection of locally available bulking ingredients with preservative qualities under ambient conditions, combined with fermentation and vacuum packaging. The oyster recipe competition described in the proposal will be a central activities in the first Sherbro Oyster festival being scheduled for June 2017. This will be implemented with support of the Whitstable oyster Company (James Green) organisers of the annual Whitstable Oyster Festival and the local council. Best-practice training on sustainable production practices will also be combined with cultural events. Members of the Try Oyster women's association, Gambia (Equator Prize winners 2012: http://www.crc.uri.edu/stories_page/try-oyster-womens-association-of-the-gambia-wins-equator-prize/) and organisers of the Tri-Oyster Festival will also be invited to attend and share their experience of institutional capacity building around processing and marketing activities. Supporting advice is also be sought from Rhode Island University, USA (Dr Mike Rice) one of the sponsors of the Gambian program. Attendees will also be invited from other regional initiatives including Senegal. The Darwin initiative was discussed and endorsed in follow-up meeting during the June mission with Layemin Joe Sandi, Mayor of Bonthe Municipal Council. This resulted in the Municipality communications officer, Dr Francis Murray and James Green (WoC) being invited to promote the event and participate in a Q&A on the weekly local radio station (Bontico) 'Council Hour' show hosted by Mr Samba Kuroma. Radio is the main means of communication with outlying communities using solar

powered radios.

2a. Give details of any notable problems or unexpected developments that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

Despite growing exploitation pressure, the research-team has collated evidence to challenge a native oyster depletion problem and linked market interventions on which the project was predicated (see above). This learning which has been carefully documented in annual reports constitutes a responsive inter-disciplinary problem-(re)framing approach with lessons for data-deficient and production-oriented aquaculture development interventions with a history of failure across sub-Saharan Africa (an abstract has been submitted for oral presentation in the social impact of fisheries & rural development: role of women in seafood session in the World Seafood Congress, Reykjavik 2014).

The need for the proposed changes outlined in section 1 were high-lighted in the last annual report and are the subject of a separate change request

2b. Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?

Discussed with LTS: Yes (details in second yearly report)

Formal change request submitted: Yes (details in second yearly report)

Received confirmation of change acceptance Yes (details in second yearly report)

3a. Do you currently expect to have any significant (eg more than £5,000) underspend in your budget for this year?

Yes No Estimated underspend: £ ??

3b. If yes, then you need to consider your project budget needs carefully as it is unlikely that any requests to carry forward funds will be approved this year. Please remember that any funds agreed for this financial year are only available to the project in this financial year.

If you anticipate a significant underspend because of justifiable changes within the project and would like to talk to someone about the options available this year, please indicate below when you think you might be in a position to do this and what the reasons might be:

We anticipate an underspend of....

4. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?

NA

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

Please note: Any planned modifications to your project schedule/workplan can be discussed in this report but **should also** be raised with LTS International through a Change Request.

Please send your **completed report by email** to Eilidh Young at Darwin-Projects@ltsi.co.uk . The report should be between 2-3 pages maximum. **Please state your project reference number in the header of your email message eg Subject: 20-035 Darwin Half Year Report**