

## Darwin Initiative Main Project Annual Report

**Important note:** *To be completed with reference to the Reporting Guidance Notes for Project Leaders:  
it is expected that this report will be about 10 pages in length, excluding annexes*

**Submission Deadline: 30 April**

### Darwin Project Information

Project Reference	21-013
Project Title	Alternative livelihood opportunities for marine protected areas fisherwomen
Host Country/ies	Sierra-Leone, UK
Contract Holder Institution	University of Stirling (UoS)
Partner institutions	Fourth Bay College, University of Sierra Leone Institute of Marine Biology and Oceanography (IMBO), Njala University (NJU), Macalister Elliot and Partners Ltd. (MEP).
Darwin Grant Value	£247,264
Funder (DFID/Defra)	DFID
Start/end dates of project	1 Apr 2014 to 31 Mar 18
Reporting period (e.g., Apr 2015 – Mar 2016) and number (e.g., Annual Report 1, 2, 3)	Annual Report 1: Apr 2014 to Mar 2015
Project Leader name	Francis Murray
Project website/blog/Twitter	<a href="http://www.stir.ac.uk/aquaculture-mangrove-oyster/">http://www.stir.ac.uk/aquaculture-mangrove-oyster/</a>
Report author(s) and date	Francis Murray, William Leschen, Salieu Sankoh, Richard Wadsworth.

### 1. Project Rationale

Many Sierra Leonean fisherwomen living in coastal mangrove areas are trapped in a vicious downward spiral of environmental destruction and resource depletion. Because they are poor, lacking capital and alternative sources of income, they are compelled to harvest local oysters throughout the year in what is now a widespread and unregulated activity. Consequently the harvested oysters become smaller and less valuable, so they have to harvest more exacerbating the problem. It is a hard and dangerous life, injuries such as infected cuts from roots and shells are common. Mangrove trees are damaged by the harvesting and habitat for other species is disturbed. If the oysters are exterminated from an area one of the few options left for the women will be to cut the trees for firewood. The government are making efforts to regulate the fishing effort of artisanal fishermen with from the start of 2014, only 11,000 boats being registered /licensed to fish throughout the country. Alternative livelihoods will need to be found by those excluded from fishing. Most of the commercial fish species in Sierra Leone also depend on the mangroves as spawning and nursery areas. This project aims to support the work of the Marine Protected Area by providing alternative livelihoods based on carefully managed extensive culture and value-added marketing of native mangrove oysters in order to make it a financially viable income earning activity for local women whilst also protecting its sustainability for the future. This native oyster depletion and degradation problem was first identified during 2006/7 by a previous Darwin Initiative project under which two reconnaissance surveys (Wadsworth

2009a & 2009b) were undertaken to consider the possibility of including the mangrove forests as a “biodiversity offset” to a commercial Rutile-mineral mining concession (NACE 2009).

The research area is located in Bonthe District, Southern Province around the Sherbro River estuary, an area which includes the settlement of Bonthe Town on Sherbro Island (Figs 1a-c).

Sherbro Island borders the Atlantic Ocean to the west, and is separated from the African mainland by the Sherbro River in the north and by the Sherbro Strait to the east. The Sherbro Estuary is 32 miles (51 km) long and up to 15 miles (24 km) wide, covering a total area of approximately 230 square miles (600 km<sup>2</sup>). At the western extremity is Cape St Ann, and on the eastern end, is the chief port and commercial centre of Bonthe.



**Figure 1a-c: Location of project area in the Sherbro estuary and Bonthe town. The map bottom right (Fig 1c) indicates the locations of communities visited during preliminary scoping work.**

## 2. Project Partnerships

Planned year 1 activities have been severely disrupted by the on-going Ebola outbreak in Sierra Leone, delaying the development effective working relationships between the project partners and its affiliates and intended beneficiaries. As this report is being written, erratic numbers of new Ebola cases are still being reported still recommends UK citizens against non-essential travel to Sierra Leone.

During this time Stirling University has maintained regular contact with local partners, IMBO and NJU to review weekly UK-FCO and WHO Ebola situation reports (<http://apps.who.int/ebola/ebola-situation-reports>) and to discuss planning options. Within this context, IMBO the local coordinator has taken lead responsibility for primary scoping field work (Section 3.1) consistent with their local knowledge of Ebola conditions. As part of this effort IMBO have had limited liaison with the following project affiliates: the West African Regional Fisheries Project, the Ministry of Fisheries and Marine Resources (MFMR) and with the MPA

management and devolved Local Management Committees (LMCs). Once travel restrictions and delays throughout the country are rescinded Dr Sankoh will also liaise with oyster fisherwomen groups – the principle intended beneficiaries of the project. Since the project is yet to start supporting and developing the sales and marketing channels for the female oyster growers the MaCallister Elliot partner is yet to engage in activities as laid out in the proposal.

### **3. Project Progress**

#### **3.1 Progress in carrying out project activities**

Due to restricted access to our research-areas arising from the on-going Ebola outbreak, the project partners were granted a 12 months no-cost project extension (to 31 mar 2018). Since April 2014, the ability of the Sierra Leonean partners to travel and conduct field-work within country has also been severely restricted. Within this context, a local partner report summarising Year 1 field work outcomes is presented in Annex 6 and activity progress described under logframe outputs below:

#### **Inception Meeting**

Whilst not listed as an activity/ output it was our intention to initiate the project with an Inception meeting for project partners and local stakeholders in Freetown. Instead, consortium members, Dr Francis Murray and Mr William Leschen (UoS), Dr Richard Wadsworth NJU, held an inception meeting at the University of Stirling on the 26<sup>th</sup> August 2014 to discuss project planning. Dr Sankoh (IMBO) also joined by Skype. With the Ebola outbreak at its height it was decided to request the no-cost extension (Annex 4). Contingency planning was discussed and a new time plan was formulated based on at least a six month delay before the country would be clear of the virus. Ultimately this was extended to 12 months as despite significant improvement the outbreak still shows no definitive sign of abating.

#### **Output 1**

##### **Activity1.1 Multi-stage sample design for selection of 6-8 intervention communities according to social and environmental criteria (e.g. harvesting mangrove oysters along salinity and primary productivity gradients)**

This was to be a key collaborative post-inception meeting office and field scoping activity. Central to the design was collection or development of appropriate sample-frames auditing all existing mangrove gathering activity and community and household involvement in the project area. This comprehensive frame would then provide the basis for selection of communities for more in-depth research, stratified on key ecosystem and livelihood characteristics in order to enhance the generalizability of our findings. Suitable primary data sources are very limited in the Sherbro Estuary context such that greater reliance has to be placed on interview of knowledgeable key informants in the project area. Dr Sankoh initiated this process, consulting with local Chiefs and others during Activity 1.2 (below) identifying 15 communities in the research area. Further delineation/ GPS and GoogleEarth mapping of the oyster zones, their dependent communities and households will be undertaken during subsequent visits once greater rapport and trust has been established. Further details of selection considerations, constraints following field visits are presented in Annex 5.

##### **Activity 1.2. Baseline livelihood surveys & selection of target-households:**

#### **Preliminary Scoping visit**

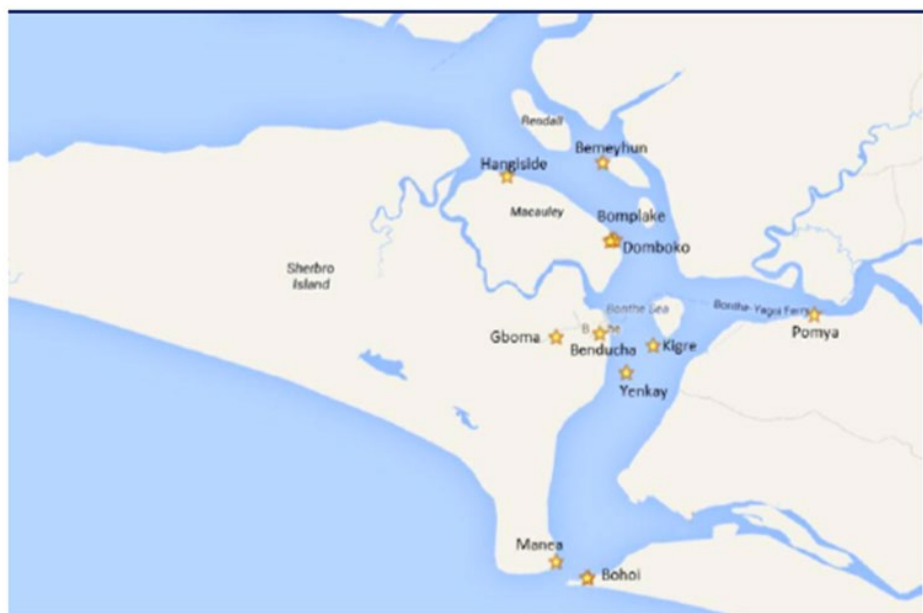
Whilst it hasn't yet been possible to carry out the full surveys due to the countrywide situation, just before local travel restrictions were enforced, Drs Sankoh and Wadsworth (IMBO and NJU) carried out an initial **Scoping Visit** to the Bonthe area between 17<sup>th</sup> – 21<sup>st</sup> April 2014 as an extended follow-up to the initial field work undertaken by the Sierra Leonean partners between the first and second stages of writing the proposal. The team consisted of:

- Dr Saliue Sankoh (National Coordinator of the West African Fisheries Development Project)
- Dr Richard Wadsworth (Department of Biological Sciences, Njala University)
- Mz Caroline Kennedy (an MSc student from Bath University, UK, completing her thesis on solar powered desalination for rural communities)

The main purpose of the field work was to:

- make contact with the local elected officials (the Mayor) and traditional authorities (the Paramount Chief),
- make contact with organisations with compatible objectives (such as the Environmental Justice Foundation EJF),
- make contact with community management committees (of the newly established co-management zones in the Marine Protected Area),
- make contact with fourteen communities along a north-south (freshwater-sea water) transect
- to start to understand the economic and technological constraints faced by oyster fisherwomen and their families
- to raise awareness of the project.

A total of 15 communities (villages) were identified; the figure below shows the locations of ten communities visited over 3 days (several of the target villages could not be reached because of tidal conditions).



**Figure 2. Location of sample-frame communities**

, Main findings from Scoping Visit:

- All the indications are that the fishing communities are among the poorest segment of a poor country, they are eager for change but for the most part function on a very hand-to-mouth existence. They are often in debt for loans used to purchase boats and nets and as such are unable to switch to other occupations as easily as they might otherwise do.
- While education is valued by the communities only one of the 10 outlying villages (those with no land connection with Bonthe Town) had a functioning school (a second village had a school but the single teacher was on-strike until the community patched the thatch roof of his one room school). Levels of literacy are therefore likely to be lower here than in the general mainland population.

- The distribution of oysters is predictable at the broadest spatial scale, where sites that are too riverine or too marine have few oysters (but other shellfish take their place). The main oyster production zone is in the north-west; the Pomya community has too much freshwater, while Monca and Bohoi are too saline (Fig 2).
- Only one community at Bemeyhun reported “rock oysters” (that is oysters growing permanently submerged on rocks or gravel), but they were reluctant to show the sites, claiming the beds were “too far off”. Discarded shells were considerably larger (~50% longer) than shells at other communities.
- At a finer spatial scale the distribution of oysters seems very difficult to predict. It is unclear whether the patchy nature of the distribution represents past exploitation or existing environmental variables.
- More detailed mapping of bio-physical characteristics is required.
- It appears that the idea of co-management committees to oversee the exploitation of natural resources in the estuary is accepted, and perhaps, welcomed. However, there are indications that strict no-take zones may cause friction between adjacent communities where one is affected and the other is not.

### *Outputs*

Results gathered during the field work:

- were presented in Ghana at the Mangrove and climate change workshop.
- helped confirm & validate the conclusions reached by the reconnaissance survey.

### Further work required

So far we have only a qualitative understanding of the distribution of oysters in the mangrove swamps; we need to understand whether the observed patterns are predominantly driven by harvesting or abiotic and biotic factors. This will require much more time physically visiting and surveying the different locations where oysters are being harvested.

### **Activity 1.3 Development of initial oyster artificial-substrate based culture-technology and depuration options.**

Dr Francis Murray met with Prof. Mike Rice<sup>1</sup>, University of Rhode Island one of the coordinators of USAID funded project supporting community based organisation of female oyster fisherwomen in the Gambia<sup>2</sup>. The project included a cost-benefit analysis of a simple home-made floating ‘oyster gardening system’<sup>3</sup>. Results indicated the system was unlikely to be profitable under local Gambian production and marketing conditions – however the development approach did incorporate any value-addition strategy. Potentials will be explored for adapting the system to conditions in Sierra Leone using low-cost locally available materials.

### **Output 2**

#### **Activity 2.1 Procurement and adaptation of solar powered freezers**

Drs Sankoh (IMBO) and Wadsworth (NJU) have reviewed solar powered freezer technological options appropriate to field conditions in Sierra Leone (Annex 8) and obtained quotes for a series of different product options in country. Field research by Bath University MSc student Caroline Kennedy researching solar power and desalination contributed to the analysis. Further progress is contingent on lifting of travel restrictions.

<sup>1</sup> [https://en.wikipedia.org/wiki/Michael\\_A.\\_Rice](https://en.wikipedia.org/wiki/Michael_A._Rice)

<sup>2</sup> [http://www.gm.undp.org/content/dam/gambia/docs/GMB\\_UNDP%20Global\\_Case%20Study%20on%20TRY%20Oyster.pdf](http://www.gm.undp.org/content/dam/gambia/docs/GMB_UNDP%20Global_Case%20Study%20on%20TRY%20Oyster.pdf)

<sup>3</sup> <https://www.youtube.com/watch?v=WEbT7SepU5I> <https://www.youtube.com/watch?v=RohXNGZCKPI>  
 ``<https://www.youtube.com/watch?v=Wxs9kJWMclI>

## Output 3

### Activity 3.1 Analysis of markets for oyster-based products and their substitutes

In January 2015, two value-chain market surveys were undertaken as a preliminary assessment of the trade in traditional oyster products, building on an understanding of producer (oyster fisherwomen) perspectives gained from the earlier scoping visit.

#### 1. Sherbro Estuary Processors:

Fourteen respondents in 9 communities close to Bonthe town were interviewed. The average price of a cup of oysters was very similar for all merchants except for two (Le 1,000 / cup fresh and Le 1,500 or Le 2,000 cup dried / smoked)

#### 2. Freetown Area

A transect of nine markets from the very centre of Freetown through to a satellite town were visited. All markets in this survey operate at least 6 days per week and most operate 7 days per week. (Weekly markets such as Yagoi and Gbangatok are much more a feature of rural areas).

### Main findings

- Processing and harvesting chains are more complex than originally thought but selling in the market is predominantly a female occupation (24 of the 26 respondent).
- Oysters for sale in Freetown were mainly sourced from the Sierra Leone River Estuary; however, three respondents (out of 18) sourced their oysters from either Gbangatok or Bonthe.
- Prices were remarkably static along this gradient, everyone charging Le 2,000 or Le 2,500 except for one respondent in Dove Cut, selling for Le 3,500 (these were sourced from Bonthe); therefore the ability of the respondent in Bonthe to sell processed oysters for Le 5,000 / cup might be optimistic – without further ‘value-added’ (e.g. through product differentiation, promotion through recipe competitions etc.).
- The supply chain between mangrove and market was more complex in the Freetown markets with some traders being approached by processors and others going to processing centres.
- Markets in Freetown are open 6 or 7 days per week so traders need constant supply and are more likely to think of the market as their main occupation.
- The consistency in price across all markets is surprising and possibly indicates commoditisation an efficient transmission of price data contributing to perfect competition – or alternatively price fixing collusion (further research required).
- Although smoked oysters command a higher price per cup in all markets the increase in value does not adequately cover the increased number of oysters needed to fill a cup, nor would it cover the extra time and effort needed to smoke the oysters. However, the advantage of the smoked oysters is that they are much easier to transport i.e. it represents a quality assurance rather than a value addition strategy.
- It is impossible with the data collected so far to estimate the impact of oyster harvesting on wild stocks. Qualitative data from the village level suggests that over fishing is going on and is likely to increase (findings in agreement with the project proposal).
- Some traders in Freetown are making use of refrigerators to store surplus goods from one day to the next, but none of the traders in the Bonthe area are doing so (although they are well aware of the value of ice).
- The observation of a much higher price for oysters transported a long distance or where processed further (beyond smoking) supports the basic premise of the Darwin project.

Within the limited resources available to oyster fisherwomen they are trying to “add-value”.

### Further work required

More detailed value-chain mapping, further assessment of market failures (e.g. price collusion) and evaluation of market segmentation and consumer preference to inform potential value-addition strategies

## **Output 4**

### **Activity 4.1 Establishment of project web-site**

A project website is under development and can be accessed at <http://www.stir.ac.uk/aquaculture-mangrove-oyster/>. The site will be continually developed and populated with content as the project proceeds.

## **3.2 Progress towards project outputs**

Travel restrictions have severely delayed delivery of progress against planned project outputs. Some limited progress has been made as follows:

*Output 1. Sustainable production and collective management systems (WP2)*

Community selection and preliminary livelihoods assessment (Annex 6 & 7)

*Output 2. Supply chain enhancement (WP3)*

Review of appropriate cold-chain technology and local cost inventory (Annex 8)

*Output 3. Market promotion and value-addition (WP 4)*

Preliminary value chain market survey (Annex 6 & 7)

*Output 4. Training and dissemination (WP1)*

An initial scoping visit to Bonthe (Annex 6) informed and increased awareness of the upcoming project with key stakeholders (including some of the female oyster collectors, local oyster processors and market traders as well as the local administration, mayor, environmental services, and local armed forces - whose role it is on very low budget to monitor and prevent illegal fishing in the area).

## **3.3 Progress towards the project Outcome**

The project outcome is as follows: *“Incomes of oyster-fisherwomen in at least 40 households of the Sherbro MPA increased by 45% pa and abundance/ mean-size of adjacent wild-oyster populations increased by at-least 18% over base-line levels.”*

Due to travel restrictions we have made very limited progress towards reaching the project outcome described above. Individual beneficiaries i.e. including oyster fisher women and their associated households have yet to be fully engaged. Therefore at this stage we cannot make any reasonable evidence based judgement regarding indicator adequacy and outcome achievement.

## **3.4 Monitoring of assumptions**

Although the Ebola outbreak was not a risk we could have reasonably foreseen prior to the project – further progress is now highly contingent on lifting of travel restrictions linked to the elimination of new cases. Although the situation is much improved on 2014 peak prevalence, sporadic cases continue to occur due to fatigue and fear. We continue to regularly review the situation.

### **3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation**

(As above) we are not yet at a stage within the project where we have an evidence base to substantiate any of our original indicators regarding the higher goal/impact of biodiversity conservation and poverty alleviation.

### **4. Project support to the Conventions (CBD, CMS and/or CITES)**

(As above) we cannot yet provide an evidence base as yet to show positive outcomes towards interacting with and meeting some of the objectives of Biodiversity Conventions

Drs Sankoh and Wadsworth have had some meetings with the Environmental Justice Foundation who's effort to support extensive mangrove oyster culture in a complementary project have also been constrained by the Ebola outbreak.

### **5. Project support to poverty alleviation**

No evidence is yet available to demonstrate poverty alleviation impact

The main intended beneficiaries are the female oyster fisherwomen who will take up new more sustainable mangrove oyster culture. As volumes of oysters from these improved systems increase processors and market traders will also benefit through improved incomes. Both local consumers, mining employees, and later on into Year 3 the project Freetown consumers of the product will benefit from a nutritious more readily available source of protein.

Direct impacts - as indicated above – are expected through the improved incomes of the women producers and the improved well-being of their families.

There are no noticeable achievements yet other than a noted keenness on behalf of most interviewed in the scoping study to get on with the project and for themselves uptake of new more sustainable oyster production systems.

### **6. Project support to Gender equity issues**

The main intended beneficiaries are lower income women subsisting in the Sherbro MPA.

Gender equality impacts are anticipated in terms of providing poorer females (either already married with families or single) incomes for their households. The project will also assess barriers for these women to also become involved in up or downstream value chain activities. This could potentially increase/ secure their incomes by affording more control over their own production and sales

There have been no noticeable achievements in this respect yet.

### **7. Monitoring and evaluation**

A refined M&E plan incorporating appropriate metrics will be developed as an outcome of the scoping work and finalised once all consortium members have completed a joint field visit to gain a shared understanding of the intervention strategy. In the interim UoS has maintained regular contact with the Sierra Leonean coordinating partner Dr Sankoh and Dr Wadsworth (NJU) through email, phone calls and also skype. In terms of financial monitoring receipts and spreadsheet lists of all costs associated with the the scoping and initial markets surveys have been requested and received by the UOS coordinator.



## **8. Lessons learnt**

Initial interactions with some of the communities harvesting oysters indicated a need for closer association to build trust and working relations e.g. through recruitment of local RA's. For example some were unwilling to divulge the locations of their oyster beds and lays as theft can be a key issue.

In addition to limitations placed on field work through travel restrictions, there is also general reluctance for most rural communities to engage with strangers that unable to regularly associate with them. Prior to the outbreak Sierra Leone had one of the highest GDP growth-rates in Africa, albeit from a low base and much of it associated with large mining concessions. An exodus of foreign workers and the general economic decline due to the Ebola outbreak will clearly impact on demand for the value-added products envisaged by the project. The likely persistence and duration of these changes, short or longer terms are questions to be addressed in on-going market assessments.

If these projects were in high risk Ebola outbreak (or similar epidemic) countries we would countenance more contingency planning for the event of a new outbreak. However, ultimately such epidemics represent force majeure largely beyond the scope of a project such as this to respond. Thus when most pressing need is for humanitarian aid, the most and perhaps only realistic option is for such livelihood & bio-diversity oriented projects to be delayed and restarted when the in country situation is clear in terms of new cases i.e. meeting the WHO designated 42 day clearance period.

A more radical option would be to temporarily shift the focus to a neighbouring (Ebola free) country with specially selected mangrove oyster producing communities there (e.g. Senegal, or Gabon) where there is also a history, culture and development need for artisanal oyster production. This however would clearly represent a significant logistical and design challenge – not least in terms of staff mobility and capacities.

## **9. Actions taken in response to previous reviews (if applicable)**

Not applicable

## **10. Other comments on progress not covered elsewhere**

We hope that once in-country conditions change favourably, will be able to follow the initial design, and GANT chart timeframe as a result of the 12 month extension already granted.

Difficulties encountered due to the Ebola outbreak are discussed above. Once the country goes is declared free of Ebola there remains an on-going risk of Ebola reoccurring if it is not eradicated from neighbouring countries (as is currently the concern in Liberia). The WHO has also raised concerns over resurgence in prevalence of other endemic diseases e.g. malaria, typhus etc. for which control measures have been neglected during the Ebola outbreak. Very sadly, the extremely time consuming vetting and isolation for suspected Ebola cases indirectly lead to the loss of a family member of one of our project partners - active on the project.

There remains a risk that low levels of new cases of Ebola could 'rumble-on' for another 6 or 12 months which would prevent the UK partners from being able to collaborate on field-work. However, even if this were the case travel restrictions and the economic situation should improve enough for local partners to better conduct planned activities. Although less ideal, in this scenario – we may consider/ propose the option of conducting collaborative work in a neighbouring disease free country as described above i.e. to develop an integrated approach and shared training of field-staff as necessary.

## **11. Sustainability and legacy**

Not applicable at this stage since the project still to gain significant profile, however the scoping visit to Bonthe clearly demonstrated interest from local stakeholders including administrators.

The original exit strategy of developing standalone financially viable small scale women producers and associated beneficiaries along a chilled value chain to regional markets still applies; if the project is available to develop in an Ebola free country.

## 12. Darwin Identity

Logos and links to the Darwin website have been included on the project website. Other opportunities will taken as the project progresses

This project was always conceived and the proposal written as a distinct standalone entity.

At this stage the Darwin initiative is well understood by senior individuals in the Department of Fisheries through engagement with Sierra Leonean consortium staff. Understanding will be brought to a wider stakeholder group when the delayed in-country inception workshop can be implemented.

We find Facebook (linked to a Twitter account) in a range of our other developing country projects to be by far the most effective way to disseminate out project outcomes and also create interactive networks with a wide range of (thousands) of international stakeholders working in the same area. This is being incorporated in our website design and we expect to be producing some short instructional videos as project outputs which we will post online.

## 13. Project Expenditure

**Table 1 Project expenditure during the reporting period (1 April 2015 – 31 March 2016)**

Project spend (indicative) since last annual report	2015/16 Grant (£)	2015/16 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)				
Consultancy costs				
Overhead Costs				
Travel and subsistence				
Operating Costs				
Capital items (see below)				
Others (see below)				
<b>TOTAL</b>				

This significant variance in expenditure shown above is entirely due to delays linked to the Ebola outbreak. We anticipate disbursing this in year 2 when/ assuming the crisis abates. Part of the original Year 1 and Year 2 budget has been shifted to cover costs in the additional 2017/18 year with Darwin agreement.

## 14. **OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes**

I agree for the Darwin Secretariat to publish the content of this section.

At this stage we have no additional comments to add regarding outstanding achievements – but hope to be able to do so in future reports!.

## Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2014-2015

Project summary	Measurable Indicators	Progress and Achievements April 2014 - March 2015	Actions required/planned for next period
<p><b>Impact:</b> Environmentally sustainable and pro-poor livelihood opportunities created in Sierra Leone through enablement of community-managed, mangrove-based oyster culture systems with value-added marketing attributes.</p>		<p>(Report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity e.g. steps towards sustainable use or equitable sharing of costs or benefits)</p>	
<p><b>Outcome:</b> Incomes of oyster-fisherwomen in at least 40 households of the Sherbro MPA increased by 45% pa and abundance/ mean-size of adjacent wild-oyster populations increased by at-least 18% over base-line levels.</p>	<p>Indicator 1. Annual income of oyster-fisherwomen increased by at least 45% above baseline levels through oyster culture</p> <p>Indicator 2. Contribution of wild-oyster culture to annual income of target-beneficiaries decreased by 50% during first culture cycle and 100% by the second cycle</p> <p>Indicator 3. Adjacent abundance and mean shell-size of wild-oyster populations increased by 18% (along with stable or increased cover of associated mangrove assemblages)</p>	<p>Negligible progress due to Ebola travel restrictions</p>	<p>Engage with and secure commitment from 3-4 community groups in Sherbro MPA to engage in planned action research activities</p>
<p><b>Output 1. Sustainable production and collective management systems (WP2)</b></p>	<p>Indicator 1. Technical and economic efficiency of alternative culture systems for at least two mangrove-oyster species (annual yield &gt; 20kg/m<sup>2</sup> substrate area)</p> <p>Indicator 2. Spatial mapping and field surveys of wild oyster and mangrove assemblage abundance/ diversity indicating specified improvement above baseline levels</p> <p>Indicator 3. LMC and/ or community area-management and collective production activity</p>	<p>Negligible progress due to Ebola travel restrictions</p>	

	agreements formalised and documented)	
Activity 1.1. Multi-stage sample-design for selection of 6-8 intervention-communities according to social & environmental criteria (e.g. harvesting mangrove oysters along salinity and primary-productivity gradients).		A sample frame of 16 communities currently involved in mangrove harvesting in the MPA has been developed. Further baseline information to be collected for selection of 6-8 communities for two phases of in-depth/ action research over the remaining project duration.
Activity 1.2. Environmental, rapid rural appraisal (RRA) and household livelihood surveys for selection of target-households and establishment of intervention baselines.		Only scoping work completed– systematic households surveys to be developed and implemented in next project year
Activity 1.3. Development of initial oyster artificial-substrate based culture-technology and depuration options.		Field visits by UoS staff required to asses potential for adaptation of low-cost system trialled in Gambia – and alternatives - to local production, social and market conditions
Activity 1.4. LMC and/or community agreements brokered on collective-production activities and extractive-restrictions in adjacent mangrove oyster-nursery areas.		Engagement with local MPA authorities and paramount chiefs initiated – further consultation with these and primary stakeholders required in next phase
Activity 1.5. Initial training of 40 wild-oyster harvesters on oyster-spat collection and culture techniques		No progress as yet – contingent on selection of action-research communities in next phase
Activity 1.6. Adaptation of artificial-substrate based oyster culture techniques (e.g. post, tray, raft, long-line) through two full iterative phases of action research.		No progress – see comments above
<b>Output 2. Supply chain enhancement (WP3)</b>	Indicator 1: Solar-freezer systems procured, adapted, maintained and operated by target-community-groups  Indicator 2: Supply-chain systems operate effectively under seasonal conditions most associated with demand for value-added oyster products	Technologies (and costs) appropriate to ground conditions in Sierra Leone reviewed (with linked Bath MSc project contribution).  Further implementation delayed to next phase
Activity 2.1. Procurement and adaptation of solar powered freezers for transport of oysters from the Sherbro MPA to free town under variable seasonal conditions		Notes produced on prices and operation of solar freezers in Sierra Leone (Annex 8)
Activity 2.2. Training staff/ beneficiaries in operation and maintenance of freezer plant		No progress to date
Activity 2.3. Seasonal testing of freezer systems & cold-chain implementation		No progress to date
<b>Output 3. Market promotion and value-addition (WP 4)</b>	Indicator 1: Sales inventories of producer-groups and buyers increased Freetown compared to baseline levels	No progress to date

	Indicator 2: Project and media reports of outcomes of the oyster recipe competitions documented	
Activity 3.1. Analysis of markets for premium oyster-based products (and their substitutes) in Freetown and other regional markets		Initial Market surveys carried out in Freetown and in Bonthe district (further assessment of value-addition options considering Ebola market distortion still required).
Activity 3.2. Staging of regional and national oyster recipe competitions		No progress to date
Activity 3.3. Development and testing of value-added oyster ready meals with super-markets, restaurants and beach-bars in Freetown		No progress to date
Activity 3.4. Evaluation of wider international demand & market-based certification potentials & statutory recommendations for MPA policy-makers		No progress to date
<b>Output 4. Training and dissemination</b>	<p>Indicator 1: Documentation of curricula and attendance at 2 Farmer Field Schools (FFS) and final project workshop</p> <p>Indicator 2: Relevant decision-makers as identified by stakeholder analysis rate usefulness of policy briefs on a five point scale.</p> <p>Indicator 3: At least 2 peer-reviewed primary research papers made available in open access format.</p>	No progress to date
Activity 4.1. Establishment of project web-site (with links to partner web-sites and the regional Sarnissa research network)		Website now up and operational <a href="http://www.stir.ac.uk/aquaculture-mangrove-oyster/">http://www.stir.ac.uk/aquaculture-mangrove-oyster/</a>
Activity 4.2. Extension to neighbouring communities through 2 'Farmer Field-Schools' (in each case for separate female and male groups).		No progress to date
Activity 4.3. Regional best-practice/ policy workshop (inviting participants from comparable initiatives in Benin, The Gambia, local EJP project, MPA representatives)		No progress to date
Activity 4.4. Project reports & publications (x2) on environmental social and economic sustainability outcomes in international peer-reviewed journals		No progress to date

## Annex 2: Project's full current logframe

Project summary	Measurable Indicators	Means of verification	Important Assumptions
<p><b>Goal.</b> Effective contribution in support of the implementation of the objectives of the Convention on Biological Diversity (CBD), the Convention on Trade in Endangered Species (CITES), and the Convention on the Conservation of Migratory Species (CMS), as well as related targets set by countries rich in biodiversity but constrained in resources.</p>			
<p><b>Outcome.</b> Incomes of oyster-fisherwomen in at least 40 households of the Sherbro MPA increased by 45% pa and abundance/ mean-size of adjacent wild-oyster populations increased by at-least 18% over base-line levels.</p>	<p>Indicator 1. Annual income of oyster-fisherwomen increased by at least 45% above baseline levels through oyster culture</p> <p>Indicator 2. Contribution of wild-oyster culture to annual income of target-beneficiaries decreased by 50% during first culture cycle and 100% by the second cycle</p> <p>Indicator 3. Adjacent abundance and mean shell-size of wild-oyster populations increased by 18% (along with stable or increased cover of associated mangrove assemblages)</p>	<p>Project reports &amp; peer reviewed publications (at least 2)</p> <p>Local media coverage of project initiatives</p>	<p>Containment of the Ebola outbreak will allow local and international project partners full access to project field sites.</p> <p>Sustained &amp; sufficient demand will be exist for value-added ready-meals by consumers in Freetown</p>
<p><b>Outputs:</b> <b>1. Sustainable production and collective management systems (WP2)</b></p>	<p>1a. Technical and economic efficiency of alternative culture systems for at least two mangrove-oyster species (annual yield &gt; 20kg/m<sup>2</sup> substrate area)</p> <p>1b. Spatial mapping and field surveys of wild oyster and mangrove assemblage abundance/ diversity indicating specified improvement above baseline levels</p> <p>1.c LMC and/ or community area-management and collective production activity agreements formalised and documented</p>	<p>1a. Technical efficiency report</p> <p>1b. Biodiversity report (inc. site maps)</p> <p>1c. Livelihoods report and documentation of management agreements</p>	<p>Enhanced oyster culture and negotiated formal/ informal access rights can reduce fishing effort on wild oysters around culture areas.</p>
<p><b>2. Supply chain enhancement (WP3)</b></p>	<p>2a Solar-freezer systems procured, adapted, maintained and operated by target-community-groups</p> <p>2b Supply-chain systems operate</p>	<p>2a. Procurement inventory and training/ operation reports</p> <p>2b. Supply-chain enhancement 'action-</p>	

	effectively under seasonal conditions most associated with demand for value-added oyster products	research' report(s)	
<b>3. Market promotion and value-addition (WP 4)</b>	3a Sales inventories of producer-groups and buyers increased in Freetown compared to baseline levels 3b Project and media reports of outcomes of the oyster recipe competitions documented	3a. Market report inc. testimonials of producer groups, supermarket and food service-sector stakeholders 3b. Coverage by local media and project website	Market demand for value-added oyster products is not significantly depressed by the Ebola outbreak over the project duration.
<b>4. Training and dissemination (WP1)</b>	4a. Documentation of curricula and attendance at 2 Farmer Field Schools (FFS) and final project workshop 4b. Relevant decision-makers as identified by stakeholder analysis rate usefulness of policy briefs on a five point scale. 4c. At least 2 peer-reviewed primary research papers made available in open access format.	4a. Training manual, FFS and workshop reports. 4b. Policy brief evaluation report 4c. Papers submitted to appropriate peer-reviewed scientific journals	
<b>Activities</b> (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)			
Activity 1.1 Multi-stage sample-design for selection of 6-8 intervention-communities according to social & environmental criteria (e.g. harvesting mangrove oysters along salinity and primary-productivity gradients)			
Activity 1.2 Environmental, rapid rural appraisal (RRA) and household livelihood surveys for selection of target-households and establishment of intervention baselines.			
Activity 1.3 Development of initial oyster artificial-substrate based culture-technology and depuration options			
Activity 1.4 LMC and/or community agreements brokered on collective-production activities and extractive-restrictions in adjacent mangrove oyster-nursery areas			
Activity 1.5 Initial training of 40 wild-oyster harvesters on oyster-spat collection and culture techniques			
Activity 1.6 Adaptation of artificial-substrate based oyster culture techniques (e.g. post, tray, raft, long-line) through two full iterative phases of action research			
Activity 2.1. Procurement and adaptation of solar powered freezers for transport of oysters from the Sherbro MPA to free town under variable seasonal conditions			
Activity 2.2. Training staff/ beneficiaries in operation and maintenance of freezer plant			
Activity 2.3. Seasonal testing of freezer systems & cold-chain implementation			
Activity 3.1. Analysis of markets for premium oyster-based products (and their substitutes) in Freetown and other regional markets			
Activity 3.2. Staging of regional and national oyster recipe competitions			
Activity 3.3. Development and testing of value-added oyster ready meals with super-markets, restaurants and beach-bars in Freetown			
Activity 3.4. Evaluation of wider international demand & market-based certification potentials & statutory recommendations for MPA policy-makers			
Activity 4.1. Establishment of project web-site (with links to partner web-sites and the regional Sarnissa research network			
Activity 4.2. Extension to neighbouring communities through 2 'Farmer Field-Schools' (in each case for separate female and male groups).			

- Activity 4.3. Regional best-practice/ policy workshop (inviting participants from comparable initiatives in Benin, The Gambia, local EJF project, MPA representatives)
- Activity 4.4. Project reports & publications (x2) on environmental social and economic sustainability outcomes in international peer-reviewed journals



## Annex 3: Standard Measures

**Table 1 Project Standard Output Measures**

Cod e No.	Description	Gender of people (if relevant )	National ity of people (if relevant )	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planne d during the project
2	Aquaculture MSc student dissertations	M &/or F	TBC	0	1-2	1-2	0	2-4
6A	Initial training of 40 wild-oyster harvesters on oyster-spat collection and culture techniques	Mainly F	Sierra Leone	0	20	20	0	40
6B	Weeks training on spat collection (above)	Mainly F	Sierra Leone	0	1-2	1-2	0	2-4
6A	Training staff/ beneficiaries in operation and maintenance of freezer plant	M &/or F	Sierra Leone	0	10	10	0	20 (tbc)
6B	Weeks training on freezer plant (above)	M &/or F	Sierra Leone	0	1-2	1-2	0	2-4
6A	Extension to neighbouring communities through 2 'Farmer Field-Schools' (in each case for separate female and male groups)	M & F	Sierra Leone	0	0	40-50	0	40-50 tbc
7	Freezer plant operation training manual FFS training manual	M & F	Sierra Leone, UK	0	1	1	0	2
9	Policy brief on intervention recommendations based on action research outcomes	M &/or F	Sierra Leone UK	0	0	1	0	1
11B	Number of papers to be submitted to peer reviewed journals	M & F	Sierra Leone, UK	0	0	1-2	0	1
12A	Excel database of abiotic, biotic and social mapping survey results - for research areas in Sherbro MPA	M &/or F	Sierra Leone, UK	0	0	1	0	1

14A	Regional best-practice/ policy workshop (inviting participants from comparable initiatives in e.g. Benin, The Gambia, local EJF project, MPA representatives)	M &/or F	Sierra Leone	0	0	1	0	1
14B	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	M &/or F	International – TBC	0	1	1-2	0	2-3
20	Estimated value (£'s) of physical assets (freezer & culture system equipment, to be handed over to host country(ies))	NA	Sierra Leone	0	22,200	25,000	0	47,200
23	In-kind funding (£'s) through UoS MSc student participation	M &/or F	UK (UoS)	0	1000-2000	1000-2000	0	2000-4000
23	West African Regional Fisheries Project (Contribution in kind)	NA	Sierra Leone	5000	5000	5000	5000	5000

**Table 2 Publications**

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. website link or publisher)
NA						

### Checklist for submission

	Check
<b>Is the report less than 10MB?</b> If so, please email to <a href="mailto:Darwin-Projects@ltsi.co.uk">Darwin-Projects@ltsi.co.uk</a> putting the project number in the Subject line.	Y
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Have you completed the Project Expenditure table fully?	Y
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