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 no more than 10 pages in length, excluding annexes*

Submission Deadline: 30th April 2018

Darwin Project Information

Project reference	24-014 ref 3739
Project title	Carrots and sticks: incentives to conserve hilsa fish in Myanmar
Host country/ies	Country 1: Republic of the Union of Myanmar (also known as Myanmar) Country 2: Bangladesh (collaborating country)
Contract holder institution	International Institute for Environment and Development (IIED)
Partner institution(s)	Department of Fisheries; WorldFish; Network Activities Group (NAG); and Yangon University Zoology Department
Darwin grant value	£301,895 (Year 1 grant £87,221)
Start/end dates of project	Start date: 01 April 2017 End date:30 March 2021
Reporting period (e.g., Apr 2016 – Mar 2017) and number (e.g., Annual Report 1, 2, 3)	April 2017 – March 2018; Annual Report 1
Project Leader name	Dr. Essam Yassin Mohammed
Project website	https://www.iied.org/carrots-sticks-incentives-conserve-hilsa-fish-myanmar
Report author(s) and date	Michael Akester (World Fish Myanmar), Eugenia Merayo (IIED) and Essam Y. Mohammed (IIED) 18 May 2018 (date agreed)

1. Project rationale

Breaking away from poverty' is central to Myanmar's long-term national development plan, which recognises fishing as the primary source of acutely-needed animal protein and of employment opportunities for thousands of fisher communities.

Hilsa shad, *Tenualosa ilisha* (locally called *Nga Tha Lauk*), is among Myanmar's most important fish in coastal and inland regions. The fishery employs 1.6 million people among the country's most impoverished communities. Hilsa fishing generated an estimated US$45M in export earnings in 2011-12 but this plummeted to US$15M in 2015 as catches fell.

Hilsa is increasingly facing overfishing and habitat destruction. Previous studies suggest exploitation rates (the proportion of mortality caused by fishing) reach 0.7 in the *Ayeyarwady Delta (AD)* —well beyond sustainable levels.

Overfishing and habitat loss threaten millions of livelihoods, exacerbating poverty and reducing access to the staple food many communities need for survival.

Hilsa presents a transboundary fisheries management challenge between Myanmar and Bangladesh. With Darwin Initiative support, IIED and host-country partners have worked on

incentive-based hilsa fishery management in Bangladesh, aiming to conserve biodiversity and so protect livelihoods. At a regional seminar sharing project achievements (Dhaka, May 2016), scientists and officials from Myanmar called for a similar scheme. Therefore, this project aims to design a cost-effective, scientifically-researched and participatory 'incentive-based' hilsa fishery management mechanism for Myanmar.

Main project sites include:

1. Maubin Township (eastern delta flank) – important for migrating and spawning hilsa because of seasonally brackish water where the Maubin, Yangon and Toe Rivers converge;
2. Hinthida Township (central northern delta) – a shallow seasonally-flooded freshwater nursery for hilsa and an important 'seed collection site' for commercial inland aquaculture;
3. Nhaputawn / Luppata Townships (western delta flank) – an up- and down-steam transit route for large and small hilsa. It attracts many commercial and subsistence fishers targeting both large and small fish.

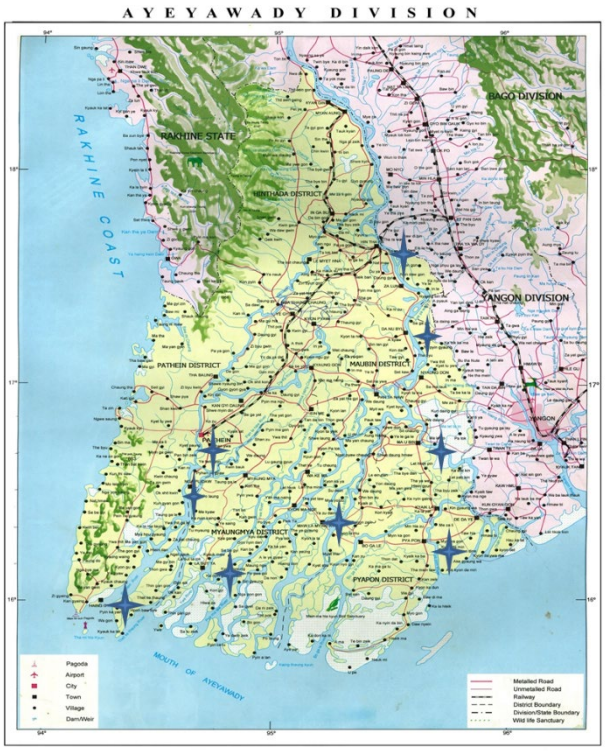

Figure 1 Hilsa sampling sites by Yangon University

2. Project partnerships

This research project was developed and is being carried out in partnership with IIED, WorldFish Myanmar, Yangon University (YU), the Network Activities Group (NAG) and the Department of Fisheries (DoF) of the Ministry of Agriculture, Livestock and Irrigation of Myanmar.

The Department of Fisheries (DoF) is the entity required to monitor the illegal use of fish traps and out of season Illegal, unreported and unregulated (IUU) fishing. Fund constraints make their work difficult hence, the need to promote community based or co-management fishery agreements passed on sound management plans. In this respect, WorldFish is promoting improved inland fisheries management at representative sites leased by the DoF to private sector lease owners (and at times fishing communities). The project has also worked in close liaison with the FAO on an FAO funded fisher vulnerability study. The latter indicates how dependent fisherfolk are on their fishing activities, analyses their wellbeing and notes the most vulnerable areas in the Ayeyarwady Delta. The Yangon University and NAG partnerships are working well – although the distances and poor road infrastructure make sampling difficult. A further link comes from work with the IDRC funded AQUADAPT project designed to look at current adaptations to climate change: cases of fisherfolk extending their livelihood options to

micro-scale commercial aquaculture to offset reduced earnings from lower yields from inland and inshore capture fisheries – including the hilsa fishery. Some of the micro-ponds are as small as 15m2 and therefore do not require DoF pond licences (ponds below 58m2 are exempt). The ponds are dug by hand and abandoned when the monsoon rains flood them – an adaptation to climate change and increased storm frequencies (see Fig. 2).

Figure 2 A micro-pond operated by a fisher household in Maubin, Ayeyarweady Delta. Fish from inland capture fisheries are gutted, headed and sun-dried. The waste goes to feed catfish in the shaded pond

3. Project progress

Most of year 1 activities are on track. However, inevitably there have been some delays particularly on the transboundary dialogues between Bangladesh and Myanmar mainly due to political tensions regarding the Rohingya situation. Details of progress of Year 1 activities are provided in the subsequent sections.

3.1 Progress in carrying out project Activities

Enhanced Understanding of the biology and ecology of hilsa fishery in the Ayeyarwady Delta

Inception workshop: The inception workshop was held on 15th August 2017 in Yagon, Myanmar. The attending participants included representatives from IIED, Yangon University (YU), Network Activities Group (NAG), Department of Fisheries (DoF) of the Ministry of Agriculture, Livestock and Irrigation; British Embassy, Danida, Pyoe Pin; and WorldFish as well as local government officials. It was unfortunately not possible to bring representatives from Bangladesh.

The workshop included technical sessions which outlined the methodological building blocks of the project and coordination of activities. It was decided that Activity 1.2 ('biophysical assessment of hilsa habitat using remote sensing data') did not add much value to the outcomes of the project and therefore it was substituted by 'identifying breeding, spawning and nursery grounds' of hilsa.

Data collection: Data collection process for the biological and ecological studies of the project has already commenced. It includes an analysis of the spawning seasonality of hilsa using the gonadosomatic index, as well as an assessment of the migratory routes of hilsa. Under this activity, the team has managed to weigh and measure 4,270 hilsa from 9 sites over a period of 6 months (November 2017- April 2018). Among these, 352 fish were dissected for gonad analysis. Using this information, the team will be able to determine a no-take season and zone for hilsa fishing. The team expects to deliver an initial report by the 30th May 2018.

Table 1 Study areas by Region, District and township with ID codes (Pcode numbers)

Study areas by Region, District and township with ID codes (Pcode numbers)									
Region	**Pcode**	**District**	**Pcode**	**Township**	**Pcode**	**Study Sites / Town**	**Pcode**	**Lattitude**	**Longitude**
Ayeyawady	MMR 017	Pathein	MMR017D001	Pathein	MMR 017001	Pathein	MMR 017001701	16.77924	94.73303
				Ngapudaw	MMR 017004	Ngapudaw	MMR017004701	16.54510	94.69224
						Hainggyikyun Town	MMR017004703	16.01602	94.34411
		Labutta	MMR017D004	Labutta	MMR 017016	Labutta Town	MMR017016701	16.14557	94.75889
				Mawlamyinegyun	MMR 017018	Mawlamyinegyun Town	MMR017018701	16.37894	95.26298
		Maubin	MMR017D005	Pyapon	MMR 017023	Pyapon Town	MMR017023701	16.28430	95.68322
		Maubin	MMR017D005	Maubin	MMR 017019	Maubin Town	MMR017019701	16.73023	95.64940
		Pyapon	MMR017D006	Danubyu	MMR 017022	Danubyu Town	MMR017022701	17.25468	95.59583
		Hinthada	MMR017D002	Hinthada	MMR 017008	Hinthada Town	MMR017008701	17.64958	95.45818

Enhanced understanding of the complex socio-economics of hilsa fishery in the Ayeyarwady Delta

Data collection: The data collection process for the socioeconomic study of the project is already ongoing. It involves household questionnaires, focus group discussions (FGD), participatory rural appraisal (PRA) tools and key informant interviews (KII). KII were intended to find out the perspective of the township Department of Fisheries (DoF), village administrator, village tract administrator and fish collector while the other tools were used for community respondents.

It was decided that the initially planned 1600-household survey were reduced to half, due to budget constraints. The sample size *n* was estimated through the following formula:

$$n = \frac{NZ_{\alpha/2}^2 p(1-p)}{(N-1)d^2 + Z_{\alpha/2}^2 p(1-p)}$$

Where *N* stands for population size, $Z_{\alpha/2}$ for standard normal value for 5% sig.level; *p* percentage of success (set to 50%) and *d* margin of error (set to 5%).

The research team consisting of 4 team leaders and 16 enumerators was organized to collect data in April and May 2018. The DoF consulted on selecting samples on respective townships, namely Mawlamyainggyun, Ngapudaw, Maubin, Hinthada and Laputta. The pilot test was carried out in Myawlamyainggyun Township after 3 days training workshop with the team in Yangon. Two separate teams travelled to Kywe Chan Wa and Myin Ka Kone from 6 April to 8 April conducting one Focussed Group Discussion (FGD) and Participatory Rural Appraisal (PRA) each, 18 and 17 household questionnaires, and 2 and 3 KII respectively. The team met up in Yangon to finalize the questionnaires and the sample size. After coordinating for the field trip and refining the questionnaires, the whole research team travelled to Mawgyun to collect data in 11 different villages with four different teams. Each team consist of five members. Each research team divided into 3 teams in order to travel to Ngapudaw, Maubin, Hinthada and Labutta. Two teams visited two villages of Hinthada, but it was not possible to collect any information at that time. It is expected that the team will go back to the area of Hinthada to finally collect data there too. Except for that area, the large scale covering more than 800 households is completed and analysis is already undergoing.

Table 2 Household survey sampling in four townships

#	Township	No. of villages	Key Informant Interview				FGD		PRA		HHQ
			DOF	Tsp FC	Village Admin	Local FC	Male	Female	Male	Female	
1	Mawlamyinegyun	13	1	3	13	19	75	28	64	37	235
2	Maubin	9	1	0	9	6	62	8	58	17	162
3	Ngapudaw	9	1	2	9	10	48	22	55	41	162
4	Laputta	15	1	3	15	27	85	36	86	30	275
	Total	**46**	**4**	**8**	**46**	**62**	**270**	**94**	**263**	**125**	**834**

Initial findings of the socioeconomic analysis include:

1. The Township Department of Fisheries (DoF) officer plays a vital role in the environment conservation, legalizing fishing gears, and enforcing measures for illegal fishing.

2. Fishing gear license fees and boat license fees are different from one Township to another. The fishing gear license fees vary from 3,500 MMK to 12,000 MMK [USD2.63 to 10.0] while the registration card shows only 500 MMK [USD0.40]. Some respondents claimed that the department covered the official fees with the ID photo on the card, and some of them pay a 12,000 MMK license fee for an illegal fishing net. Most villages do not pay boat license fees. Only six villages showed evidence of paying boat license fees.

3. The educational status of the household respondents and their families is low, as most of them could not finish their primary school education. They find it difficult to send their children to middle and high schools. This factor is also affected by the proximity of the schools.

4. According to the fisherfolk respondents, they could not focus on the environmental conservation as they are in day-to-day struggle to maintain their livelihoods. Thus, they admitted that they also fish during the close season and use illegal fishing gears. Some villages do not fish Hilsa during the closed season only because there is no Hilsa season for them – possibly due to hilsa migrations being blocked by tidal barriers.

5. The other main source of income for the villages is farming, either farm labour or as farmers. The main source of employment and income during off-season (Hilsa) is doing farm labourer for paddy farmers. The fishers from limited farm land villages either borrow money from money lenders with high interest or take an advance from a fish collector with no interest but to sell their catch at a low price in return to the collector.

6. Some fisherfolk and their families, who do not have labour opportunities in their villages, often migrate to Yangon and better-connected people go to Thailand and Malaysia.

7. Some villages have access to loans from the government or NGOs or private organizations such as Mya Sein Yaung, Cooperatives or Micro-finance.

8. No one can indicate the locations of Hilsa fish spawning area although they have a rough idea where Hilsa can spawn.

9. The participants were concerned about the use of stow nets in the coastal area because they can destroy Hilsa fish fry (returning to the sea) without benefiting the stow net owner.

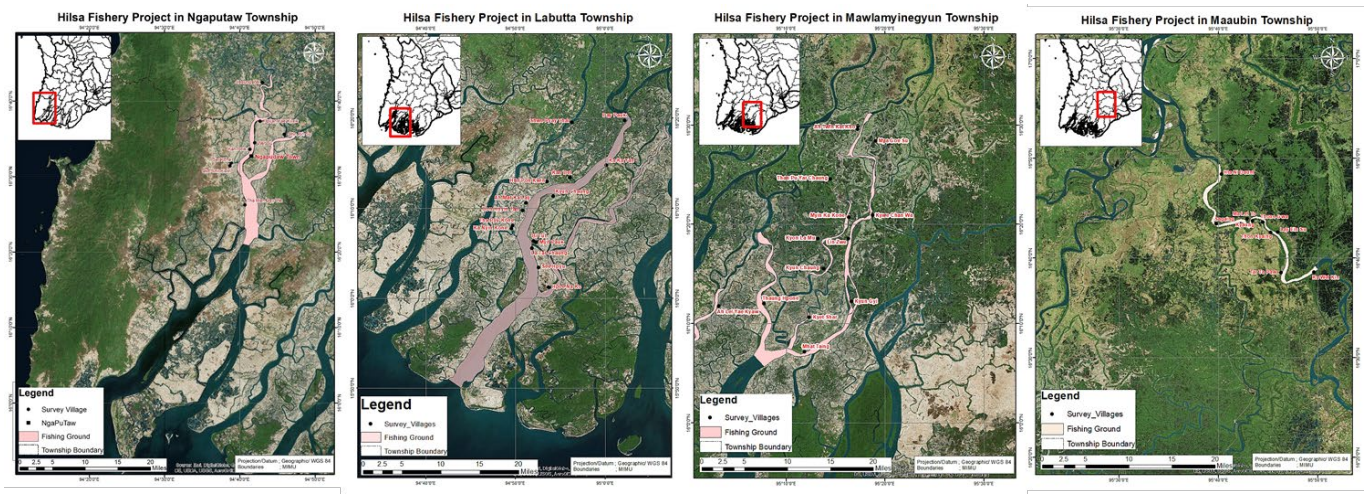

Figure 3 Household Participatory Rural Assessment (PRA) survey areas in the Ayeyarwady Delta coordinated by NAG to coincide with the spawning seasonality of hilsa using gonadosomatic index and assessment of hilsa migratory routes (Fig 1.)

The assessment of preferences using the choice experiment method and estimation of short-term economic costs (opportunity cost) are still pending but on schedule (to be completed by Q2 Y2).

A transboundary hilsa fishery management system in place

The current political instability due to the Rohingya situation between Myanmar and Bangladesh has delayed the beginning of the transboundary dialogues between the two countries. Therefore, activity 5.1 ('Participation of delegates from Bangladesh in project inception workshop') was not carried out. However, it is expected that dialogue between the two countries is possible in Y2 and onwards (see section 11).

3.2 Progress towards project Outputs

As discussed above, project activities are mostly on track. Outputs 1 and 2 are ongoing, while outputs 3 to 5 are planned to be carried out from Year 2 onwards. However, due to some delays mainly caused by political unrest (tensions regarding the Rohingya situation) the production of some knowledge products has been delayed. It includes an IIED article on transboundary dialogues between fisheries managers from Myanmar and Bangladesh (expected Q1 Y1), which has not yet taken place for the reduced liaison between the two countries.

3.3 Progress towards the project Outcome

The project outcome is "Cost-effective and scientifically-researched 'incentive-based' sustainable hilsa management scheme is designed, reducing threats to biodiversity and contributing to poverty alleviation by maintaining a food source and continued employment for small-scale fishers". During Year 1, the project has been mainly focussing on project design and data collection on biology and ecology of hilsa fishery and socioeconomics of the fishery community associated. Therefore, it is still early to assess the impact of the project on biodiversity conservation and poverty alleviation.

3.4 Monitoring of assumptions

Table 4 Assumptions and position statement at the end of Year 1.

Important Assumptions	Comments at the end of year 1
It is expected that the Burmese Government will accept and act on the project findings. DoF will be engaged in the research and hilsa is a high priority and high value species. Myanmar has formulated a fishery development policy that respects national and international agreements and the conditions and nature of the resources.	Assumption still valid. Lessons learnt from Bangladesh have shown the adoption of similar findings have had a significant impact on the recovery of the hilsa fishery.

The findings of the studies should corroborate with previous studies of the hilsa's ecology and biology in the region. However, migratory fish can show considerable variability in the timing and duration of spawning in response to climactic factors, with the result that the limited duration of this study may prove inconclusive in its findings regarding the level of inter-annual variability in the duration and timing of spawning in hilsa under a rapidly changing climate in the Bay of Bengal region.	Assumption still valid. Studies linked to otolith analysis under an ACIAR funded project will help corroborate the spawning patterns.  *Figure 4 Hilsa otoliths from the Darwin survey* Climate change adaptation projects will help provide additional information.
A high '*don't know*' rate is usually expected in survey answers due to the newness of public surveys in Myanmar, and the recent establishment of many government institutions and processes since 2011. Nevertheless, 'don't know' responses are expected to be at a lower than average rate given the high level of local knowledge in the subject matter and its intrinsic importance to local livelihoods.	Assumption still valid, as was the case during a recently terminated vulnerability study.
Burmese government generally encourages private investment in fisheries sector with recent introduction of legal reforms and tax incentives. It generally views foreign direct investment in fisheries as a potential means to improve lack of capital and technology and poor management practices in the sector.	Assumption still valid. WorldFish works closely with the Private Sector Myanmar Fisheries Federation.
Myanmar commerce law allows the establishment of a legally independent fund management system.	Assumption still valid.
Diplomatic relationship between Myanmar and Bangladesh is not severed (at least status quo is maintained). There has been tensions between Muslim Rohingya and Buddhist Residents in Rakhine State in Myanmar. Occasionally, this has led to strained relationships between the two countries. We believe that cooperation between scientific communities in both countries has not been affected.	There have been continued tensions between the Muslim Rohingya and Buddhist Residents in Rakhine State in Myanmar. Close to 700,000 fled to neighbouring Bangladesh. Northern Rahkine state is a no-go area. There have been some travel restrictions between the two countries. This has had a negative impact on the transboundary dialogue.

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

The project's goal is that 'threats to hilsa and marine biodiversity are avoided in line with CBD targets (Aichi Biodiversity Targets 6) and food security and employment opportunities of millions of poor people are maintained'. Even though it is very early to examine the contribution of the project to this goal at this stage, we believe that an effective economic incentive mechanism (compensation scheme) can potentially reduce threats to biodiversity. We expect that improved management will also protect the jobs and livelihoods of the more than 1.6 million who depend on the fishery by making fishing communities more resilient to both economic and climate shocks.

The visibility of the Darwin project coupled with the WorldFish 'Gateway to Fisheries Research and Development' status with the Department of Fisheries has led to links with a number of projects adding synergistic benefits to the Darwin Project. These include:

- The ACIAR funded Fish Pass Project designed to allow hilsa to migrate to spawning grounds blocked by tidal barrages;
- FAO vulnerability study in the Darwin project area;

- 2018 Norwegian funded Nansen fisheries study in the Bay of Bengal as a follow-up to studies under a 40-year agreement with the FAO

The links of the project with the Fish Pass project, the Nansen Survey and the FAO vulnerability analysis project contribute to a combined effort to protect biodiversity.

In addition, the link between Yangon University on the Darwin project and the ACIAR (fish-pass and otolith study project) will create useful comparisons between the gonadosomatic index work and the otolith studies. Both of which should have a positive impact on the site selection for a pilot level fish pass to allow hilsa to migrate to spawning grounds on the landward side of tidal barrages, which will also contribute to improving the sustainability of the resource.

4. Contribution to the Global Goals for Sustainable Development (SDGs)

The project is at an early stage and the team is involved in data collection and analysis, so it is too early to assess the impact of the work on the achievement of SDGs. However, efforts are underway to ensure that project outcomes contribute to the achievement of the SDGs in the country, specifically goals 1, 2, 3, 5, 8, 10, 13, 14, 15, 16 and 17. Currently, Myanmar ranks 110 out of 157 countries globally in SDGs performance.

At present, IIED is developing a monitoring toolkit for SDG14 which will be tested in Burma in Year 2 of the project period.

5. Project support to the Conventions, Treaties or Agreements

It is still early to assess the impact of the project on supporting conventions, treaties or agreements on sustainability. Nevertheless, during the first year of the project, WorldFish has actively engaged and contributed to the Ayeyarwady fresh water fisheries law, an institutional tool intended to protect the freshwater resources by implementing more sustainable management practices, as well as supporting local and fisher communities and ensure food security in the region

It is expected that during Year 2, the team will organize and participate in structured meetings with the CBD focal point in Myanmar.

6. Project support to poverty alleviation

The project expects to contribute to poverty alleviation among fisher communities through:

1) Improved assistance that ensures the poorest fishers are not made worse off by fishing regulations
2) Maintaining a food source that is important for the poor
3) Enabling continued employment in artisanal fisheries. The hilsa fishery alone supports about 1.6 million jobs, of which an estimated 30% (400,000) are held by women involved in fishing, marketing and processing.

During Year 1, the team has been collecting households' socioeconomic data through questionnaire, as well as through focus-group discussions and key informant interviews. Initial key findings can be found in Section 3.1. Knowledge on resilience of the fishing communities to reductions in hilsa catches regarding livelihood alternatives, financial access or educational level may help our project to deliver a compensation scheme well-aligned with the reality of the communities involved and therefore contribute to their resilience to environmental and economic shocks and reduce their vulnerability to suffer from poverty. This has also been the first step in the process of raising awareness regarding the need to respect close seasons.

7. Project support to gender equality issues

Systemic constraints faced by women along the hilsa value chain are at the core of the incentive-based scheme's design. Therefore, during Y1 the data collection process has differentiated between male and female respondents, to include separately women's views on the analysis. This has been done in both FGD and PRA (see Table 2 in section 3.1).

8. Monitoring and evaluation

A project scientific advisory committee comprising a sub-group of the Fishery Research and Development Network (FRDN) and international scientists has been established. The advisory committee will evaluate project activities twice a year (8 times in total). The project leader has

visited Myanmar to evaluate progress against the logical framework. In Year 2, similar M&E activities will be carried out. It is expected that a team of M&E experts from IIED will conduct a mid-term review of the project in Year 2.

The Darwin project acts as a platform for improved dialogue and hence improved interaction regarding planning. The joint monitoring of activities in coordination with the Regional and Union level authorities will become more apparent in year two when we are able to share the initial baseline and gonadosomatic study results.

9. Lessons learnt

Myanmar suffers from poor road infrastructure. Except for the excellent highway that links Yangon-Naypyidaw-Mandalay roads are narrow and dangerous considering the volume of traffic. Accidents are frequent and the death-toll high. WorldFish has a strict no after dark travel policy, which we encourage our partners to follow. The lesson learnt is that we will have to adjust for the time it takes to carry out fieldwork activities (improved field planning), because it might be longer than initially expected. It has been positive for our work that the government of Myanmar likes to keep projects in distinct 'ring-fenced' areas of interaction. There are many advantages in having projects work closely together to ensure the benefits of this synergy in terms of fieldtrips and interactions with both local authorities and fisher beneficiaries.

10. Actions taken in response to previous reviews (if applicable)

N/A

11. Other comments on progress not covered elsewhere

Regarding transboundary dialogues between Bangladesh and Myanmar and the current political unrest due to the Rohingya situation, it has not been possible to start this cooperation on hilsa fishery management scheme. However, we believe the project is not compromised in this regard as we have noticed there is several initiatives both countries are engaged on and may help smoothing the potential for dialogue and future arrangement of a transboundary incentive-scheme for hilsa. WorldFish Penang and the country offices in Myanmar and Bangladesh are continuing to promote a dialogue between the two countries based on fisheries research. The latest opportunity, discussed over the last 6-months, arises from having a scientist from both countries on-board the new marine research vessel RV Dr Fridtjof Nansen (owned by the Norwegian Agency for Development Cooperation (NORAD). The vessel was built as part of the United Nations' (UN) Food and Agriculture Organization (FAO) project and is jointly operated by the Institute of Marine Research (IMR) and the University of Bergen (UIB) to help developing countries improve their fisheries management. In the central, northern and eastern Indian Ocean NORAD has defined 4 sub regions: The waters around Sri Lanka, Bay of Bengal including coastal waters of Bangladesh and Myanmar, and The Andaman Sea. In addition, they have defined the large area of northern and central Indian Ocean as a target area for joint investigations as part of the Indian Ocean Expedition II. Dr. Abu Ansar Md. Rizwan has been chosen by WorldFish to join the Nansen cruise for three weeks leaving from Chittagong. A similar candidate is being chisen from Myanmar. Both will be responsible for the preparation of a 'booklet' for their work prior to departure

Bangladesh and Myanmar, together with other countries in the region, have been involved in the BOBLME project that produced a Strategic Action Program for the Bay of Bengal Large Marine Ecosystem, in 2015. It is a negotiated policy document that sets up a programme of actions to protect the environmental, social and economic sustainability of the Bay of Bengal marine resources. It encourages dialogue and cooperation among the countries involved so we believe this forum additionally ensures transboundary dialogues to happen and the project outcomes to be achieved.

12. Sustainability and legacy

As described above WorldFish refers to the Darwin Project at all the national and international events where Myanmar Projects are discussed. This has included the American Fisheries Society (AFS) meeting in Tampa Florida, the Global Environment Facility (GEF) meeting in Cape Town South Africa and the FAO Hidden Harvest meeting in Rome – all in 2017. In addition, WorldFish holds a Secretariat role for the Department of Fisheries led Myanmar Fisheries Partnership (MFP). This forum provides a platform for fisheries development in

Myanmar and links between projects e.g. the ACIAR funded fish pass pilot and otolith analysis which will complement the hilsa management strategy being promoted by this Darwin project.

The exit strategy is still valid.

13. Darwin identity

Darwin logo has been used in the Banner and Folder of the Inception Workshop of the project 'Carrots and sticks: incentives to conserve hilsa fish in Myanmar' held on 15th August 2017. Also, in all meetings where the WorldFish programme is referred to globally.
Representatives of the British Embassy in Yangon, Myanmar, have been invited to participate not only in the Inception Workshop in 2017 but also to attend events and fieldtrips for fish sampling.
The project is always referred to as a distinct project with a clear identity. At the same time the links with other projects to create synergy, has always been noted. Darwin Initiative is recognized and familiar to all partners involved in the project (DoF, YU, NAG, Worldfish) as well as to other collaborating international NGOs such as FFI, IUCN, WCS or WWF.

14. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2017 – 31 March 2018)

Project spend (indicative) since last annual report	2017/18 Grant (£)	2017/18 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			154%	Only 2 days charged in January and 3 days in February 2018
Consultancy costs			-84%	Consultant fee only for Jan and Feb18 as Dr. Khin Mon Soe's time shared with other projects
Overhead Costs			-44%	Based on actual expenses, we have less charged to project
Travel and subsistence			-51%	Field travel initiated late 2017 after contract signing with partners. Most fieldwork from January 2018.
Operating Costs			-99%	As above
Capital items (see below)				
Others (see below)				
TOTAL			**-59%**	

The project is underspent as it has taken time to reach agreements with local partners and then initiate the fieldwork. The latter will be completed at the end of May 2018 (in Q1 Year 2 of the project). Hence there is a need to carry over funds from year one to cover contractual agreements with the University of Yangon and the Networks Activity Group (NAG).

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2017-2018

Project summary	Measurable Indicators	Progress and Achievements April 2016 - March 2017	Actions required/planned for next period
Impact Threats to hilsa and marine biodiversity are avoided in line with CBD targets (Aichi Biodiversity Targets 6) and food security and employment opportunities of millions of poor people are maintained.		Project links with the Fish Pass project, the Nansen Survey and the vulnerability analysis all contribute to a combined effort to protect biodiversity	[redacted]
Outcome Cost-effective and scientifically-researched 'incentive-based' sustainable hilsa management scheme is designed, reducing threats to biodiversity and contributing to poverty alleviation by maintaining a food source and continued employment for small-scale fishers.	0.1. One document on design essentials of the incentive-based scheme submitted to and endorsed by the Department of Fisheries by Q3 of Y4. 0.2. number of fishing communities and households affected by regulatory regimes and their short term cost identified by Q2 of Y2	Communities have been identified and PRA studies carried out. This is the first step in the process of awareness raising regarding the need to respect close seasons.	During year two fishing communities will receive training courses under the Darwin and ACIAR funded projects to improve fisheries management and adherence to the newly formulated Ayeyarwady Fisheries Law.
1. Output 1. Enhanced Understanding of the biology and ecology of hilsa fishery in the Ayeyarwady Delta.	• Ecological survey on biophysical assessments and migratory and spawning seasonality studies in the 3 intervention sites by Q1 of Y2. • 3 scientific reports on the ecology and biology of hilsa fishery in Ayeyarwardy Delta by Q3 of Y2	Reports will be ready as scheduled at the start of year 2 (June 2018).	
Activity 1.0 Inception workshop		Inception workshop was completed on the 15th August 2017 and reported on. Participants included members of the Ayeyarwady parliament, senior DoF officials, other donors, the British Embassy, local NGOs, and international NGOs. It was not possible to bring representatives from Bangladesh.	

Activity 1.1 Spawning seasonality of hilsa using gonadosomatic index		Study ongoing and drawing to a close. Initial reporting due 30th May 2018
Activity 1.3 Assessment of migratory routes of hilsa		Study ongoing and drawing to a close. Initial reporting due 30th May 2018
2. Output 2. Enhanced understanding of the complex socio-economics of hilsa fishery in the Ayeyarwady Delta	2.1. Large scale survey covering 800 households by Q2 of Y2. 2.2. Assessment of preferences using the choice experiment method by Q2 of Y2 2.3. Short-term economic cost (opportunity cost) estimated by Q2 of Y2. 2.4. One national multistakeholder workshop: incentive-based hilsa management: Design essentials by Q3 of Y3.	Survey completed and undergoing analysis. Other aspects output 2 pending but on schedule.
Activity 2.1 Socioeconomic assessment of hilsa fishing communities in the delta (survey design, execution and reporting)		Due Q2 Y2
Activity 2.2. Assessment of preferences using the choice experiment method		Due Q2 Y2
Activity 2.3. Estimation of short-term economic cost (opportunity cost)		Due Q2 Y2
Activity 2.4 Whitepaper: the design of incentive-based hilsa management in the AD		Due Q3 Y3
Activity 2.5 National multistakeholder workshop: incentive-based hilsa management: design essentials		
Output 3. Use and non-use values of hilsa fishery estimated and business case developed.	3.1 Monetary estimation of non-use value of hilsa fishery estimated by Q4 of Y2. 3.2 Proposal to increase investment/expenditure levels *by 75% from current levels* – by Q1 of Y3.	Work ongoing by NAG

Output 4. Sustainable financial mechanism developed	4.1Proposal to establish a hilsa conservation trust fund (*seed capital of at least US$5,000,000*) by Q1 of Y4. 4.2Multi-stakeholder workshop Fiscal reforms to increase revenue across the value chain (*increase revenue collection efficiency by 30%) by Q3 or Y3* 4.3Multi-stakeholder workshop: Assessment of the plausibility of establishing a national hilsa fishery management trust fund	Not started as yet
Output 5. A transboundary hilsa fishery management system is in place	5.1 Three transboundary dialogues between fisheries managers from Myanmar and Bangladesh (in Q1 of Y1; Q1 of Y3; and Q4 of Y4). 5.2 MoU on common hilsa fishery management between Myanmar and Bangladesh governments signed by Q4 of Y4.	To date the dialogue with Bangladesh has been at the IIED and WorldFish level only as the tensions regarding the displaced Rohingya people have reduced contacts between the two governments. Not started.

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed)

LOGICAL FRAMEWORK

Darwin projects will be required to report against their progress towards their expected outputs and outcomes if funded. This section sets out the expected outputs and outcomes of your project, how you expect to measure progress against these and how we can verify this.

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: (Max 30 words) Threats to hilsa and marine biodiversity are avoided in line with CBD targets (Aichi Biodiversity Targets 6) and food security and employment opportunities of millions of poor people are maintained.			
Outcome: (Max 30 words) Cost-effective and scientifically-researched 'incentive-based' sustainable hilsa management scheme is designed, reducing threats to biodiversity and contributing to poverty alleviation by maintaining a food source and continued employment for small-scale fishers.	0.1. One document on design essentials of the incentive-based scheme submitted to and endorsed by the Department of Fisheries by Q3 of Y4. 0.2. number of fishing communities and households affected by regulatory regimes and their short term cost identified by Q2 of Y2	0.1. One [signed] copy of design essentials document 0.2. One news article that includes a testimony from the Director General of DoF 0.3. Whitepaper: the design of incentive-based hilsa management in the AD	It is expected that the Burmese Government will accept and act on the project findings. DoF will be engaged in the research and hilsa is a high priority and high value species. Myanmar has formulated a fishery development policy that respects national and international agreements and the conditions and nature of the resources.
Outputs: **1.** Enhanced Understanding of the biology and ecology of hilsa fishery	1.1. Ecological survey on biophysical assessments and migratory and spawning seasonality studies in the 3 intervention sites by Q1 of Y2.	1.3. One report on spawning seasonality of hilsa fish using gonadosomatic index 1.4. One report on biophysical assessment of hilsa habitat using remote sensing data	The findings of the studies should corroborate with previous studies of the hilsa's ecology and biology in the region. However, migratory fish can show considerable variability in the

	1.2. *3* scientific reports on the ecology and biology of hilsa fishery in Ayeyarwardy Delta by Q3 of Y2	1.3. One report on migratory routes of hilsa.	timing and duration of spawning in response to climactic factors, with the result that the limited duration of this study may prove inconclusive in its findings regarding the level of inter-annual variability in the duration and timing of spawning in hilsa under a rapidly changing climate in the Bay of Bengal region.
2. Enhanced understanding of the complex socio-economics of hilsa fishery in the Ayeyarwady Delta.	2.3. Large scale survey covering 1600 households by Q2 of Y2. 2.4. Assessment of preferences using the choice experiment method by Q2 of Y2 2.5. Short-term economic cost (opportunity cost) estimated by Q2 of Y2. 2.6. One national multistakeholder workshop: incentive-based hilsa management: Design essentials by Q3 of Y3.	2.1. Copy of questionnaire survey 2.2. One report on socioeconomic assessment of hilsa fishers 2.3. One report on assessment of preferences for compensation packages. 2.4. workshop report	A high '*don't know*' rate is usually expected in survey answers due to the newness of public surveys in Myanmar, and the recent establishment of many government institutions and processes since 2011. Nevertheless, 'don't know' responses are expected to be at a lower than average rate given the high level of local knowledge in the subject matter and its intrinsic importance to local livelihoods.
3. Use and non-use values of hilsa fishery estimated and business case developed	3.3. Monetary estimation of non-use value of hilsa fishery estimated by Q4 of Y2. 3.4. Proposal to increase investment/expenditure levels *by 75% from current levels* – by Q1 of Y3.	3.1. One report on economic valuation of hilsa fishery 3.2. One Briefing paper on optimal level of investment to conserve hilsa.	Burmese government generally encourages private investment in fisheries sector with recent introduction of legal reforms and tax incentives. It generally views foreign direct investment in fisheries as a potential means to improve lack of capital and technology and poor

			management practices in the sector.
4. Sustainable financial mechanism developed	4.3. Proposal to establish a hilsa conservation trust fund (*seed capital of at least US$5,000,000*) by Q1 of Y4. 4.4. Multi-stakeholder workshop Fiscal reforms to increase revenue across the value chain (*increase revenue collection efficiency by 30%) by Q3 or Y3* 4.5. Multi-stakeholder workshop: Assessment of the plausibility of establishing a national hilsa fishery management trust fund	4.1. workshop report 4.2. White paper: memorandum and articles of association (MAA) of trust fund 4.3. Policy briefing paper: fiscal reforms diagnostic analysis	Myanmar commerce law allows the establishment of a legally independent fund management system.
5. A transboundary hilsa fishery management system is in place	5.3. 3 transboundary dialogues between fisheries managers from Myanmar and Bangladesh (in Q1 of Y1; Q1 of Y3; and Q4 of Y4). 5.4. MoU on *common hilsa fishery management* between Myanmar and Bangladesh governments signed by Q4 of Y4.	5.5. New article (IIED) for each transboundary dialogue 5.6. A copy of signed MoU between Myanmar and Bangladesh	Diplomatic relationship between Myanmar and Bangladesh is not severed (at least status quo is maintained). There has been tensions between Muslim Rohingya and Buddhist Residents in Rakhine State in Myanmar. Occasionally, this has led to strained relationships between the two countries. We believe that cooperation between scientific communities in both countries has not been affected.
Activities Output 1. Enhanced understanding of the biology and ecology of the hilsa fishery 0.0 Inception workshop 1.1 Spawning seasonality of hilsa using gonadosomatic index 1.2 Biophysical assessment of hilsa using remote sensing data 1.3 Assessment of migratory routes of hilsa			

Output 2 Enhanced understanding of the complex socio-economics of hilsa fishery in the Ayeyarwady Delta.

2.1 Socioeconomic assessment of hilsa fishing communities in the delta (survey design, execution and reporting)

2.2 Assessment of preferences using the choice experiment method

2.3 Estimation of short-terms economic cost (opportunity cost)

2.4 Whitepaper: the design of incentive-based hilsa management in the AD

2.5 National multistakeholder workshop: incentive-based hilsa management: Design essentials

Output 3 Use and non-use values of hilsa fishery estimated and business case developed

3.1 Estimating economic value of hilsa fishery in AD (using revealed and stated-preference techniques)

3.2 Estimating income elasticity of willingness to pay for hilsa conservation (distributional study)

3.3 Cost benefit analysis of investment in sustainable management of hilsa fishery

Output 4 Sustainable financial mechanism developed

4.1 Multi-stakeholder workshop: Diagnostic analysis of fiscal reforms for sustainable fisheries management

4.2 Policy briefing paper on capacity gaps/needs for fiscal reforms

4.3 Multi-stakeholder workshop: Assessment of the plausibility of establishing a national hilsa fishery management trust fund

4.4 Development memorandum and articles of association of the fund

Output 5 A transboundary hilsa fishery management system is in place

5.1 Participation of delegates from Bangladesh in project inception workshop

5.2 Workshops: transboundary hilsa management

5.3 Workshop: signing MoU (Myanmar and Bangladesh) on transboundary hilsa management (and end of project)

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
6A	On the job training for research workers from Yangon University and the Networks Activity Group (NAG)	Two women and ten men	Myanmar citizens	11				

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. weblink or publisher if not available online)
Productivity and Coastal Fisheries Biomass Yields of the Northeast Coastal Waters of the Bay of Bengal Large Marine Ecosystem	Deep Sea Research II LME theme volume	Michael Akester, 2018	Male	British	Elsevier's journal Deep-Sea Research Part II: Topical Studies in Oceanography	Under review. It can be provided under request

Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

A publication by Michael Akester, WorldFish host country leader of the project, is currently under review (available under request). The title of the article is 'Productivity and Coastal Fisheries Biomass Yields of the Northeast Coastal Waters of the Bay of Bengal Large Marine Ecosystem'.

Abstract (unpublished):

Myanmar (Burma) is the second largest territory in Southeast Asia with a 2,200 km coastline and continental shelf of 230,000 km2. The Myanmar exclusive economic zone (EEZ) occupies 80% of the Northeast coastal waters of the Bay of Bengal Large Marine Ecosystem (BoBLME); a 300 km stretch of the Bangladesh coastline completes the area. Four decades ago a combination of extensive mangrove forests, large continental shelf and fertile deposits from the rivers systems discharging into the Bay from two mega deltas (Ganges–Brahmaputra–Meghna and the Ayeyarwady) generated high productivity and valuable coastal fisheries. In terms of productivity, the end of the dry season (April) is the most productive, with 2,590 ± 1,560 mg C m^{-2} day^{-1} and high concentrations of chlorophyll a (3.14 ± 2.64 µg L^{-1}). In 2016, the Department of Fisheries (DoF Myanmar) reported marine fishery landings in Myanmar's waters of 2.9 million metric tons (mt), which would have accounted for 47% of the total BoBLME fish catch and 3% of global fisheries coming from 10% of the BoBLME maritime area of 6.2 million km2. Sequential fisheries assessments by Fridtjof Nansen Fisheries Research vessels over four decades have shown that in 2015 a combination of factors has led to reduced yields of valuable fish species by 80% while low value, fast-recruiting fish species have increased. A 2011 Transboundary Diagnostic Analysis (TDA), delivered by the Global Environment Facility (GEF) co-funded FAO implemented BoBLME eight-country project, describes the causes for this dramatic reduction in biomass yields. A Sustainable Action Programme (SAP) designed to mitigate the problems was endorsed in 2016 and will be implemented in 2019. The area's coastal fishing fleets are 95% artisanal. There is a combined total of 442 species of fish, prawn, shrimp and lobster in the area. The transboundary hilsa (Tenualosa ilisha) fishery is the most economically important in both Bangladesh and Myanmar. WorldFish and the DoF (Bangladesh and Myanmar) are currently operating hilsa conservation projects in both countries with the International Institute for Environment and Development (IIED) and USAID funded Enhanced Coastal Fisheries in Bangladesh (ECOFISH) projects. A 2018 FAO-WorldFish fisherfolk vulnerability and social protection study has demonstrated the precarious nature of coastal fishers.

In addition, a presentation of the Darwin Initiative project with the title 'Carrots and sticks: incentives to conserve Hilsa fish in Myanmar' has been accepted at the third World Small-Scale Fisheries Congress 22-26 October 2018, Chiang Mai, Thailand. Dr. Kyi Thar Myint is a woman working at the Yangon University Zoology Department currently carrying out the Gonadosomatic analysis of hilsa.

Abstract:

The objective of this research is to design a cost-effective, scientifically-researched and participatory 'incentive-based' hilsa fishery management mechanism for Myanmar. The project is using five methodological building blocks to achieve its intended outcomes: ***1. Understanding the biology and ecology of hilsa fishery*** *to determine a no-take season and zone for hilsa fishing;* ***2. Understanding the complex socio-economics of hilsa fishing*** *by conducting a large-scale household questionnaire survey to map livelihood options in fisher communities affected by fishing restrictions and determine the level of incentive packages required to offset the short-term cost (opportunity cost) of abiding by fishing regulations;* ***3. Making a business case*** *for investment in hilsa management in order to inform the government and the private sector as to why they should make sufficient investments to restore the fishery (including an estimate of the economic value of the hilsa fishery);* ***4. Developing a sustainable financing mechanism****, to ensure fishers do not return to unsustainable practices (policy briefs); and* ***5. Transboundary learning****: hilsa fish is a resource shared between Myanmar and Bangladesh, making transboundary learning and cooperation crucial with the aim of establishing a common hilsa fishery management plan between the two countries by 2020.*

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
Do not include claim forms or other communications with this report.	