

Workshop report

Regional hilsa knowledge-sharing workshop (Bangladesh–Myanmar): lessons for incentive-based hilsa management

5-8 March 2019, Dhaka and Chandpur, Bangladesh



Organised by:

WorldFish
Yangon University
Network Activities Group
Department of Fisheries Myanmar
Department of Fisheries Bangladesh
International Institute for Environment and Development

Funded by the Darwin Initiative, Darwin-Hilsa^{MM}



Table of contents

Background	3
Objectives	3
Participants.....	4
Status of hilsa fishery in Bangladesh and Myanmar	5
Ecology and biology of hilsa fishery	5
Migration and distribution of hilsa	7
Socioeconomics of hilsa fisher households	11
Current hilsa fishery management.....	12
Incentive-based hilsa management: lessons from Bangladesh and opportunities and challenges in Myanmar	15
Lessons from incentive-based hilsa management in Bangladesh	15
Establishing an incentive-based hilsa management scheme in Myanmar.....	16
Formation of a transboundary hilsa expert group.....	17
Next steps and recommendations	18
Conclusions.....	18
Field visit to Chandpur.....	19
Appendices	20
I List of participants	20
II Agenda	21

Background

Hilsa shad (*Tenualosa ilisha*) is one of the most important fish in coastal and inland regions of Myanmar and Bangladesh. More than 75% of global hilsa fish production comes from these two countries – 60% from Bangladesh and 15% from Myanmar.¹ In Bangladesh, hilsa accounts for about 12% of total fish production and 1% of national gross domestic product (GDP).² It also provides direct employment for 0.5 million professional fishers and 2.5 million people engaged in part-time fishing and related activities.³ In Myanmar, the capture fishery sector accounts for 10% of GDP.⁴ While hilsa accounts for just 4.5% of the total national catch, hilsa fishery employs 1.6 million people in the country's most impoverished communities.⁵ Hilsa is increasingly subject to overfishing and habitat degradation, however, threatening millions of livelihoods, exacerbating poverty and limiting access to the food that many communities rely on for survival.

Hilsa presents a transboundary fisheries management challenge between Myanmar and Bangladesh. With Darwin Initiative support, the International Institute for Environment and Development (IIED) and its partners recently worked on a project aimed at conserving biodiversity and protecting livelihoods in Bangladesh through incentive-based hilsa fishery management. At a regional seminar to share project achievements, scientists and officials from Myanmar called for a similar scheme in their country (Dhaka, May 2016). Now, another Darwin Initiative project, led by IIED, in partnership with WorldFish Myanmar, Yangon University, the Myanmar Department of Fisheries and the Network Activities Group, aims to design a cost-effective, evidence-based and participatory incentive-based hilsa fisheries management mechanism for Myanmar.

The 2019 workshop aimed to establish a platform for knowledge sharing between stakeholders in Bangladesh and Myanmar. Experts in Bangladesh shared their experience and lessons learned with regard to hilsa management and incentive schemes, while experts in Myanmar shared their unique needs and opportunities and gained real-world insight into the implementation of incentive-based hilsa management in a neighbouring context.

Objectives

The main objective of the workshop was to move towards cost-effective and scientifically researched sustainable hilsa management for Bangladesh and Myanmar by establishing a dialogue on a future transboundary management system.

The workshop aimed to contribute to the goals and objectives of the Darwin Initiative project in Myanmar by:

- Facilitating a discussion between experts from Bangladesh and Myanmar to share experiences and reflect on Bangladeshi experience in hilsa management and incentive schemes
- Developing recommendations for incentive-based management in Myanmar (documented in a workshop report)
- Reinforcing good relations and building dialogue between Bangladesh and Myanmar that could lead to the development of a transboundary hilsa management scheme between the two countries
- Establishing a Bangladesh–Myanmar hilsa expert group.

Participants

The participants included representatives from the departments of fisheries of both Bangladesh and Myanmar, members of WorldFish Bangladesh and Myanmar, academics, non-governmental organisations (NGOs) and fishers' representatives. A list of participants is attached as Appendix I.

Representatives from Bangladesh and Myanmar held presentations on specific agenda topics and these were followed by questions-and-answers sessions. On the second day, one of the main sessions was structured as a table discussion, facilitating greater interaction among participants. The workshop agenda is attached as Appendix II. Key elements included:

- The current status of hilsa fishery in Bangladesh and Myanmar, including the biology, ecology, migration and distribution of hilsa in both countries
- The current socioeconomic status of hilsa fisher households in Bangladesh and Myanmar
- Lessons from the incentive-based hilsa management scheme currently in operation in Bangladesh and the opportunities and challenges for Myanmar of introducing such a scheme
- The formation of a transboundary hilsa fisheries management expert group between Bangladesh and Myanmar.

'Hilsa knowledge basket' memory sticks, produced for the Darwin-Hilsa^{BD} project, containing publications and other relevant information from the previous Darwin Initiative project in Bangladesh, were distributed to Myanmar participants.

Status of hilsa fishery in Bangladesh and Myanmar

Ecology and biology of hilsa fishery

Bangladesh

Dr M Jalilur Rahman, a scientist from WorldFish Bangladesh, gave a presentation on the ecology and biology of hilsa fish in Bangladesh. He explained the biological makeup of the hilsa, which is high in protein and lipids, with 138 pin bones. Its lipid content depends on habitat, age, feed and maturity, as does its flavour; hilsa from the River Padma, for example, are famous and prized for their flavour.

The lifecycle of the hilsa is similar to that of the salmon, but it is both anadromous (it migrates up river from the sea to spawn) and amphidromous (it also migrates from freshwater to the sea, and vice versa, but not necessarily to breed). For example, some hilsa may not migrate up river, but stay in coastal or estuarine regions. Only a subset of the population completes its lifecycle in the riverine environment.

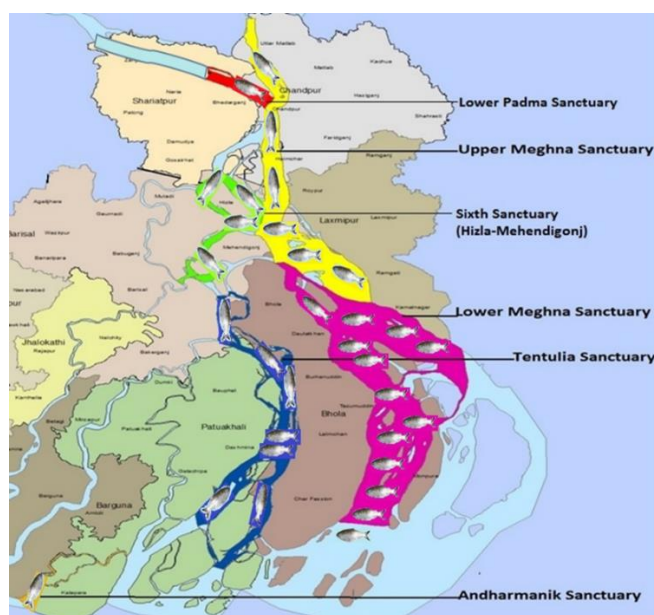
Dr Rahman also noted that hilsa is not just one species, but several (*tenualosa ilisha* and *tenualosa toli*), and has similarities to the river shad and sardine.

The hilsa occupies the second trophic level and is a primary-level consumer. In estuaries and at sea, its predators are seabass, mackerel, tuna and shark, while in freshwater, it is preyed upon by catfish, croaker and featherback, among others.

Hilsa spawn up to 5-6 times in their lifetime and reach maturity in year one, at 18-24cm long. The fecundity rate is 0.3-2.3 million, at 2kg bodyweight. The peak spawning season is from September to October (mainly the latter), though there are differences from region to region: the peak spawning season in the Padma river occurs two weeks after that of the Meghna river and downstream, for example. Three different stocks of hilsa have been identified in Bangladesh: in the Padma and Meghna rivers and in marine waters.

Hilsa spawning grounds span about 7,000km² in coastal regions, while the six major nursery grounds, known as hilsa sanctuaries, are predominantly in riverine areas (although they exist in some coastal areas too) (Figure 1). *Jatka*, or juvenile hilsa of less than 25cm in length, become visible at 1-2cm in November, a month after spawning. They are generally between 5cm and 15cm in size. The main *jatka* season is January to April, peaking in March.

Figure 1 Map of the main hilsa nursery grounds and sanctuaries in Bangladesh



Source: Dr Jalilur Rahman, WorldFish Bangladesh

Dr Rahman's presentation described the growth, survival and mortality rates of hilsa in Bangladesh. Hilsa grow 1.5cm a year in the first two years of their life, then 0.5cm a year after that. The natural survival rate is 24%, although fishing reduces their overall survival rate to 2%. The total mortality rate, the sum of natural and fishing mortality, is 4.19% a year. It is estimated that the current annual catch (517,000 tonnes) is lower than the maximum sustainable yield of 526,000 tonnes. The carrying capacity of the hilsa fishery in Bangladesh is 750,000 tonnes.

Dr Rahman highlighted the positive ecological relationship between hilsa and other species: an increase in hilsa numbers due to fishery closures has been associated more abundant catfish, panga, baghair and rita, among other species, as they share the same spawning areas or sanctuaries.

Myanmar

Dr Kyi Thar Myint and Dr Thida Ei, professors from the Department of Zoology of Yangon University, Myanmar, gave a presentation on the ecology and biology of hilsa in Myanmar. They presented the results of 12 months of data sampling on fish length and gonadosomatic index undertaken as part of the Darwin Initiative project. The sampling took place in different locations in the Ayeyarwady Delta, in three ecological zones: the saline or coastal zone, the freshwater zone and the brackish water zone (Figure 2).

Figure 2 Map of study sites

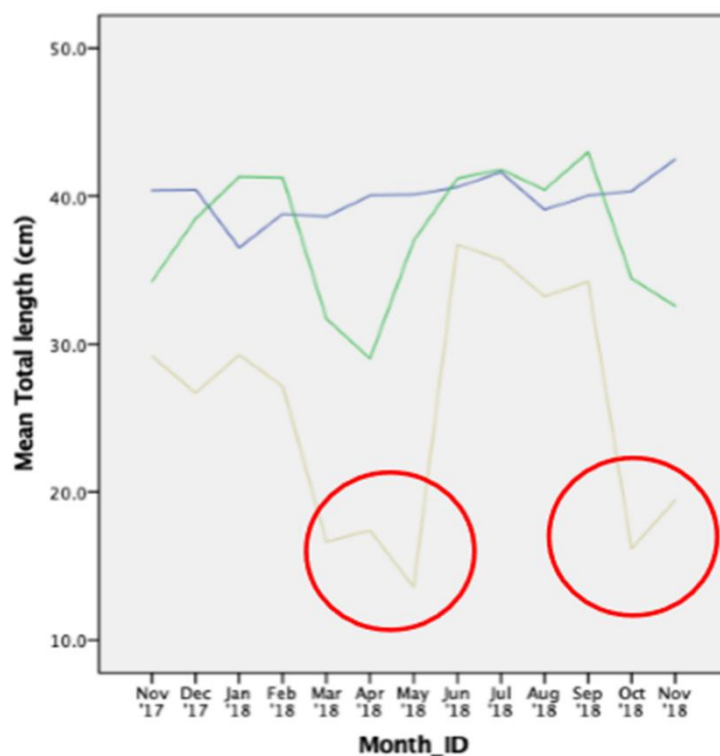


Source: Dr Thida Ei and Dr Kyi Thar Myint, Yangon University

Note: The coastal zone (Haigy, Laubatta, Mawgyun and Pyapon townships) is marked in red, the brackish water zone (Ngaputaw, Patrhein and Maubin townships) is in blue and the freshwater zone (Hinthada and Danuphyu townships) is in orange.

In the brackish and freshwater areas, 10–15cm hilsa juveniles were found from March to May, suggesting a spawning period in November–December. Juveniles were also found in October–November, indicating another spawning period in May–June. No juveniles were found in saline waters. In coastal or saline waters, mature hilsa fish of 30–45cm in length were found over the course of the entire year. In the freshwater upper delta, there was evidence of mature hilsa fish in June–September, while juveniles were found in March–May and October–November (Figure 3).

Figure 3 Size of hilsa fish sampled monthly in coastal areas (blue), brackish waters (green) and freshwater (orange) in Myanmar



Source: Dr Thida Ei and Dr Kyi Thar Myint, Yangon University

This study also collected data on the hilsa gonadosomatic index (GSI). An analysis of the coastal zone indicated two spawning peaks, with the highest GSIs in July and November. Male hilsa accounted for at least 40% of the hilsa population throughout the year (peaking at 80% in March), except for August and October, when the ratio decreased to around 25%.

In brackish areas, the highest GSI was found in November, although there were other peaks over the course of the year, depending on location (in February, April, June and August). The proportion of male hilsa ranged from 8% in August to 70% in November. The periods with the highest female ratio were December–February and August–September.

In freshwater areas, the highest GSI was found in November, although ratios were also high in December, April and July. The male hilsa accounted for 0–65% of the population, depending on the month. Only female hilsa were found in January, with proportions as high as 95% in August and 83% in December. In May and June, males predominated, accounting for 61% and 65%, respectively, of the total hilsa population.

Dr Myint and Dr Ei recommended, based on the results of their study, that a second closed fishing season be implemented in October–December to allow for spawning, in addition to the current closed season of May–July.

Migration and distribution of hilsa

Bangladesh

Dr Md Anisur Rahman, chief scientific officer of the Bangladesh Fisheries Research Institute, gave a presentation on the migration and distribution of hilsa in Bangladesh. He started by highlighting the importance of hilsa fishery to his country, citing its contribution to overall fish production (12% of the total national production and 60–70% of the world's hilsa catch), to GDP (1%), to livelihoods (460,000 fishers depend on hilsa for their livelihoods) and to employment (2.6 million people are directly or indirectly involved in hilsa fishery). Improvements in hilsa management since the beginning of the 2000s

have resulted in an increase in catch per unit effort (CPUE) of juvenile hilsa in nursery grounds and hilsa production in Bangladesh.

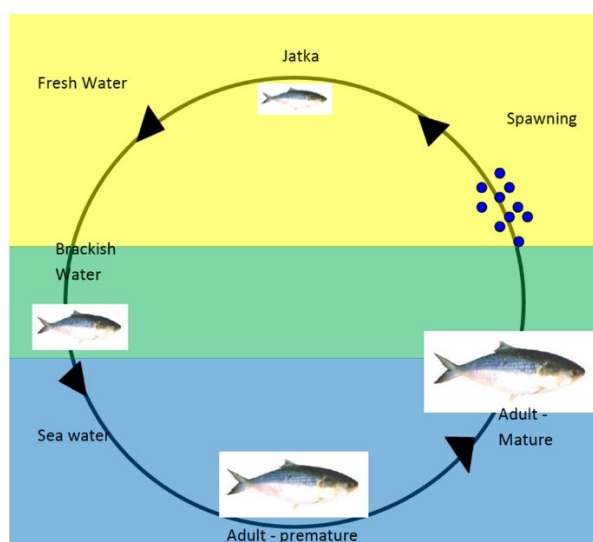
Dr Rahman pointed to the diversity of hilsa species: five different hilsa species are found in the Indo-Pacific region, three of them in Bangladeshi waters (*tenualosa ilisha*, *tenualosa toli* and *hilsa kelee/hilsa kanagurta*). He then reviewed the major research projects carried out in recent decades in relation to hilsa resources – on biology, ecology, population and distribution – focusing on the distribution of different hilsa species in the region.

Hilsa (*tenualosa ilisha*) can be found from Myanmar to the Persian Gulf, as well as in Indonesia, though it lives primarily in the Bay of Bengal region. In the past, hilsa was available all year round, mainly in the upper stretches of the major Bangladeshi rivers, towards the coastal waters of the Bay of Bengal. Due to the development of the fishing sector and the rise in fishing activity, nowadays, it is mainly caught in the lower parts of the Meghna, Tetulia, Arial kha and other rivers in the southern region, including their estuarine areas.

What's more, in recent decades, more than 30 rivers have run out of hilsa, and they have become a rarity in another ten. This situation, largely caused by overfishing, has led to significant losses in terms of forgone fish production – estimated at as much as 20,000–25,000 million tonnes (mt). Thus, more than 45,000 fishers have lost the opportunity to make a living from hilsa fishing.

Dr Rahman also presented the lifecycle and movement patterns of hilsa in Bangladesh (Figure 4).

Figure 4 Life cycle of hilsa in Bangladesh



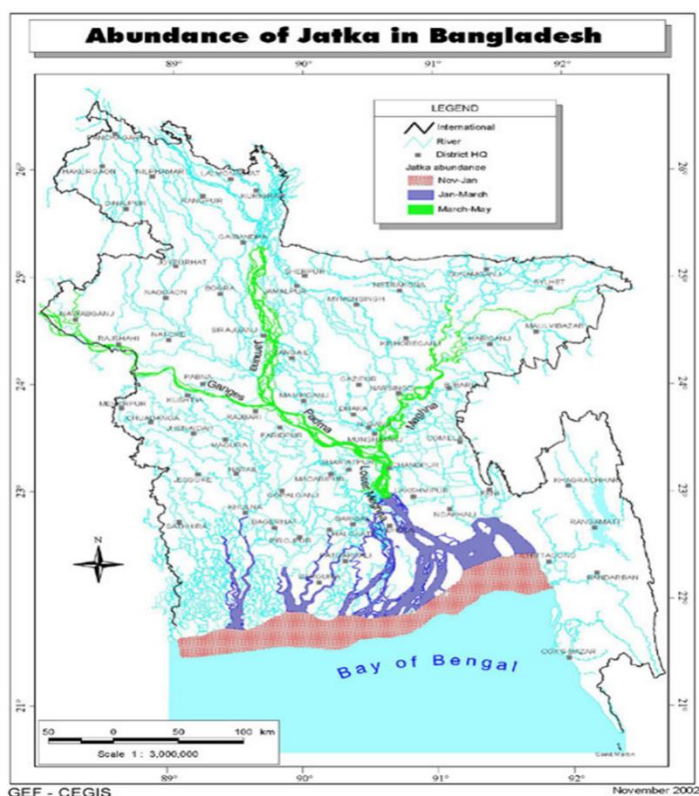
Source: Dr Md Anisur Rahman, Bangladesh Fisheries Research Institute (BFRI)

Most hilsa are born in freshwater and migrate to the sea in their first year, where they mature. They subsequently migrate upstream for breeding and feeding, returning to the sea as adults after spawning. Juveniles remain upstream for 6–7 months (until they reach 12–20cm long). When rivers become turbid (at the onset of the monsoon), juveniles migrate to the sea for maturation.

There are two major nursery grounds for hilsa in Bangladesh. One is a riverine location spanning the confluence of the Padma and Meghna rivers, as well as the Meghna river from Shatnol (Chandpur) to Char Alexander (Laxmipur), the Tetulia river and the Shahbazpur channel. The other is coastal and extends from Kuakata (Patuakhali) to Dublar Char (Khulna).

The migratory routes of hilsa in Bangladesh can be seen in the map in Figure 5.

Figure 5 Hilsa migratory routes in Bangladesh



Source: Dr Md Anisur Rahman, BFRRI

Dr Rahman further addressed the anthropogenic impacts of hilsa fishery, mainly due to increased overfishing and a rise in fishing mortality as a result of catching juveniles and gravid female hilsa. Studies also observed a decrease in the size of hilsa at first capture. A study of a hilsa sanctuary area showed that the health of young hilsa was not optimal and that water quality was inadequate. While the problems were largely related to overfishing, pollution, maritime transport and the levels of sediment carried by rivers also played a role.

Dr Rahman suggested that the management of hilsa spawning and nursery grounds needed to improve and that greater research collaboration and knowledge sharing should be encouraged. He also cited the added challenge of climate change in a fisheries context, in particular, its effects on migratory routes and spawning frequency. He proposed a multi-country agreement between India, Bangladesh and Myanmar on hilsa management.

Myanmar

Mr U Win Myint Saw, deputy director of the Ayeyarwady region for the Myanmar Department of Fisheries, gave a presentation on the migration of hilsa shad in Myanmar. He started with an overview of the main species of hilsa in Myanmar (*tenualosa toli*, *tenualosa ilisha* and *tenualosa kelee*) and their main morphological differences. Landings of hilsa in the Ayeyarwady Delta totalled 1,300 mt a year, on average, in 2011–2016, corresponding to 23% of the national total. The rest were caught in the Yangon, Mon and Tanintharyi regions.

Mr Saw presented a 2013–2015 study of hilsa migration. Through a comprehensive questionnaire, the study collected biological data on hilsa and other fish species. Different ecological parameters were used (such as seasonality, size and breeding data). It covered 42 townships, mainly along the Ayeyarwady and Chindwin rivers, although the Yangon and Sittaung rivers were also assessed. The hilsa migration patterns identified are shown in Figure 6.

Figure 6 Migration patterns of hilsa in Myanmar



Source: U Win Myint Saw, Myanmar Department of Fisheries

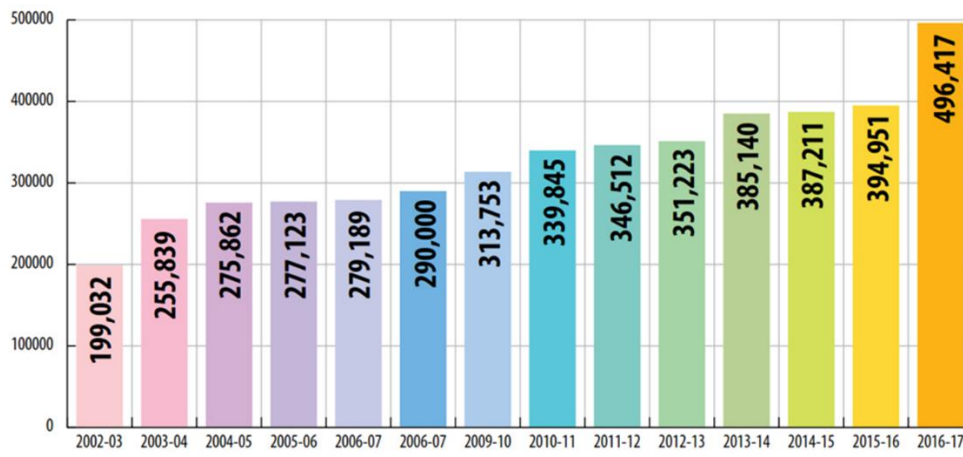
Socioeconomics of hilsa fisher households

Bangladesh

Dr Monirul Islam, a professor in the Department of Fisheries at Dhaka University, gave a presentation on the socioeconomics of hilsa fishery in Bangladesh, focusing on the current situation and on potential future challenges and opportunities.

Hilsa is the largest single species in Bangladesh. As mentioned, it accounts for 12% of total fish production and generating 1% of national GDP. It provides employment for around 2.5 million people (0.5 directly, 2 million indirectly). Over the 15 years from 2002 to 2017, hilsa production increased a cumulative 150%, from 199,032 tonnes to 496,417 tonnes (Figure 7).

Figure 7 Evolution of hilsa fish production in Bangladesh (tonnes) (2002–2017)



Source: Dr Monirul Islam, Dhaka University

Dr Islam discussed the implications of hilsa sanctuaries (fishery closures) in Bangladesh. While they have increased income for some fishers, others have suffered substantial economic hardship due to lost income, as well as food insecurity during the fishing ban. The compensation scheme developed by the government has helped to some extent, but challenges remain. The scheme may not be reaching all affected fishers, for example.

In terms of challenges and opportunities, Dr Islam noted the need to reduce the pressure on fisheries, while increasing fishers' access to credit and better income opportunities. Livelihood diversification and investment in human capital were suggested as ways of reducing the pressure on fisheries. Fishers often depend on very-high-interest informal credit, so Dr Islam recommended the creation of a fisheries bank with terms and conditions appropriate to the country's fisher communities. Equitable benefit sharing and fiscal reforms (using payment for ecosystem services, or PES, schemes) could raise the generally low income levels of fishers.

He also suggested shortening the hilsa value chain and reducing the number of middlemen. He said gender and women's empowerment were also a priority for the socioeconomic improvement of fisher communities, for example, as owners and managers, not just fish-processing employees without much power over decision-making or capital allocation.

Dr Islam emphasized that fishers, their views and needs must be taken into account in managing fishery, not just fish production and the environment. The success of sanctuary management needs to consider the socioeconomic issues affecting fishers and support in this regard. This will require a rethink of national fisheries statistics and the collection and reporting of data on social issues, with a focus on the different social groups of the fisher community, according to poverty level, gender and age group.

Myanmar

Ms Wae Win Khaing, socioeconomic team lead from the Network Activities Group (NAG Myanmar), gave a presentation on the socioeconomics of hilsa fishery in Myanmar, particularly in the Ayeyarwady Delta. The fishery sector in Myanmar is the fourth-largest contributor to GDP (3.5%) and around 3.2

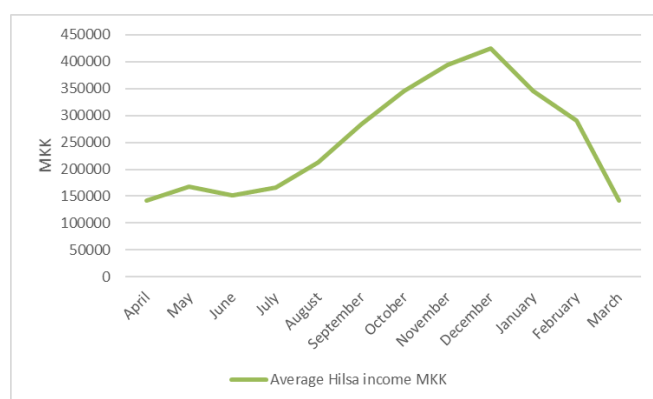
million people depend on it for their livelihoods and food. Almost half (46%) of fishery sector production comes from marine fishery, with 23% from inland fishery and 31% from aquaculture. Fish production from small-scale, inland and coastal operations totalled 1.5 million tonnes in 2017.

Ms Win presented the results of a socioeconomic survey carried out by NAG in 2018 in four different townships in the Ayeyarwady region. The group used a mix of quantitative (household survey) and qualitative methods (focus-group discussions, key informant interviews and participatory rural appraisals) and surveyed a total of 833 hilsa fisher households, as well as Department of Fisheries township officers, fish collectors and administrators. It collected data on demographics, housing conditions, assets, income and expenditure, debt, hilsa market structure, gender roles in the fishery sector and perceptions of nature conservation and fisheries management.

The study's main conclusions were that hilsa fishers were, by and large, some of the poorest people in the region, with no awareness of environmental conservation. Existing fishing regulations were limited and not well enforced and gender-discriminatory practices persisted. There were few alternative livelihood opportunities and there was not enough information on or access to them. The implementation of any temporary fishing ban will need to be weighed against the availability of livelihood alternatives and current market demand for hilsa in the region.

Figure 8 shows the seasonality of the hilsa catch in terms of income. It is interesting to note that the period of highest income from hilsa corresponds with the November spawning peak.

Figure 8 Seasonality of hilsa income (on average) in Myanmar.



Source: Wae Win, Network Activities Group Myanmar

Ms Win made several recommendations with a view to improving the sustainability of hilsa fisheries in the region: improving the fisher registration scheme; establishing protected areas closed to fishing; increasing law enforcement; establishing a minimum legal size to prevent the capture of juveniles; promoting alternative income-generating activities; increasing environmental conservation awareness; improving gender equity; and establishing a no-fishing compensation package that is sustainable and includes additional support, such as technical training.

Current hilsa fishery management

Bangladesh

Dr Md Sainar Alam, district fishery officer at the Bangladesh Department of Fisheries, gave a presentation on the status of hilsa fisheries management in Bangladesh. He highlighted the contribution of the fisheries sector, particularly hilsa, to the Bangladeshi economy. Hilsa is considered the national fish of Bangladesh and its present market value is estimated at around US\$2.5 million.

Dr Alam also provided an overview of the country's Hilsa Fisheries Management Action Plan, launched in 2003–2004. It followed a holistic approach, involving all relevant stakeholders, including the Ministry of Fisheries and Livestock, the Department of Fisheries, research institutes, fisher community leaders and local public representatives, among others. It promoted the revision and update of the fishery regulatory framework by, for example, extending the juvenile ban period to eight months, extending the October hilsa ban to 22 days and imposing fishing bans in six hilsa sanctuaries for a number of months

per year. It also helped to strengthen law enforcement. It included a breeding season and *jatka* protection programme, as well as a social safety-net programme for fishers and the distribution of food grain during the ban season. It further introduced a fisher ID card and increased conservation and environmental awareness through various campaigns in the fisher community. As a result, hilsa production has shown an increasing trend since then.

In terms of next steps, Dr Alam suggested, among other things, an ecosystem-based management approach, stronger institutional capacity, the involvement of fisher communities, improved enforcement of seasonal bans, increased production, equitable sharing of scheme benefits (by introducing PES) and the introduction of a fisher insurance scheme.

Dr Md Abdul Wahab, team leader of WorldFish Bangladesh's ECOFISH-Bangladesh project, also gave a talk on current incentive-based hilsa management initiatives in Bangladesh. He, too, underscored the importance of the hilsa shad, which has received a Geographical Indication,¹ as the national fish of Bangladesh and an important contributor to GDP, nutrition and employment. The Hilsa Fisheries Management Action Plan of 2004 protects six hilsa sanctuaries and four spawning grounds in major rivers and estuaries. It introduced bans on certain destructive nets and on brood hilsa catch for 22 days in October, as well as a total ban on catching juveniles in November-June. It further introduced the closure of sanctuaries to fishing in March and April.

The action plan provides incentives to fishers to promote the sustainability of fishing, as well regulatory enforcement. The scheme is based primarily on providing rice to fishers during the ban season, so they have fewer reasons to fish. The amount of rice provided (in total and by household) has increased since the scheme was put in place. Fisher households obtain 20kg of rice during the ban period in October and 40kg a month during the juvenile ban period in March and April. Compensating fishers has had positive effects on compliance with the ban regulation, although challenges remain. The complex distribution system does not reach all affected fishers, for example, while other households are not fully dependant on fishing. Also, rice is generally not enough to cover household dietary needs during the ban periods. A strong monitoring system has been suggested so that the compensation system can reach full potential.

Dr Wahab also gave an overview of the Darwin Initiative project in 2013–2016, which explored the biology and socioeconomic significance of hilsa fishery and proposed a hilsa conservation fund. He then talked about the ECOFISH-Bangladesh project (2014–2019), which has helped to improve the resilience of the Meghna river ecosystem and the communities reliant on coastal fisheries. The project has assessed the hilsa catch and the status of the hilsa stock, built co-management institutions (such as fisheries management committees) in ten coastal districts, encouraged women's empowerment and provided livelihood support and training in fishing communities using non-incentive-based approaches. The ECOFISH project has also built awareness of hilsa conservation and implemented a Hilsa Conservation and Development Fund (HCDF), originally proposed by the Darwin-Hilsa^{BD} Darwin Initiative project. As a result, the hilsa catch has increased, as has average hilsa size, in the last few years.

Dr Wahab suggested that the science-management interface needed to be strengthened in future. He recommended that an ecosystem approach to fisheries management and co-management be adopted. He said the HCDF needed to be operationalised and that the transboundary character of the hilsa fishery called for management collaboration with India and Myanmar.

Myanmar

Dr Khin Maung Soe, a senior consultant from WorldFish Myanmar, gave a presentation on the current management and status of hilsa fishery in Myanmar. The common hilsa species in Myanmar are hilsa shad (*tenulosa ilisha*), toli shad (*tenulosa toli*) and kelee shad (*tenulosa kelee*) and the main fishing areas are in the Rakhine, Ayeyarwady, Yangon, Mon and Tanintharyi rivers. The total fish catch (12,981 mt) is mainly marine based (9,075 mt). However, depending on the time of the year, fish catches can be predominantly marine (January–March) or inland/coastal water (October–December) based.

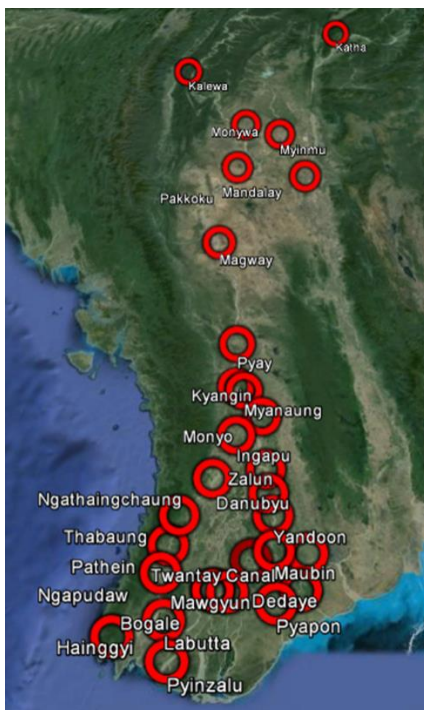
The Bay of Bengal Large Marine Ecosystem Project (BOBLME)(2012–2013) focused on assessing hilsa stock, migration, spawning and nursery grounds and the need for sustainable hilsa fishery

¹ The Bangladesh Department of Patents, Designs and Trademarks (DPDT) issued a geographical indication (GI) Product of Bangladesh certificate to the Department of Fisheries in August 2017. This is a national certification.

management. Myanmar's National Plan of Action was seen as a way forward for transboundary collaboration to deter illegal hilsa fishing, develop human capacity and exchange information. In Myanmar, the main issues were the empowerment of hilsa fishery management capacity, understanding of the socioeconomics of hilsa fisheries, knowledge of the hilsa migratory, spawning and nursery season, grounds and stocks, and the establishment of hilsa sanctuaries. Currently, the focus of changes in fisheries law is the regulation of mesh size and gear types. In terms of policy, the limitation of licences and the establishment of hilsa sanctuaries are seen as priorities. Research is focusing on hilsa migratory routes, the seasonality of catch, stock assessment and value-chain identification. One of the constraints on developing the hilsa fishery management scheme is the lack of available funding.

Dr Soe also gave an overview of the MyFish project (2013–2015), which determined hilsa migration through the collection of biological data on hilsa and other fish species, together with ecological parameters, such as seasonality, size and breeding area. It covered 42 townships along the Ayeyarwady, Chindwin, Yangon and Sittaung rivers. It also identified the main hilsa spawning sites along the Ayeyarwady and Chindwin rivers (Figure 9).

Figure 9 Hilsa spawning sites in the Ayeyarwady and Chindwin rivers in Myanmar



Source: Dr Khin Maung Soe, WorldFish

Incentive-based hilsa management: lessons from Bangladesh and opportunities and challenges in Myanmar

This session was structured as a table discussion. Every table (five in total) included participants from both Bangladesh and Myanmar. First, there was a discussion of the lessons learned, focusing on the strengths and weaknesses of current incentive-based hilsa management schemes in Bangladesh. Bangladeshi participants gave their views and Myanmar participants had the opportunity to ask specific questions. Then, the likely opportunities and challenges of such schemes in Myanmar were discussed. Both Bangladeshi and Myanmar participants took active roles in this discussion. One person per table was in charge of writing down the main points and conclusions and these were then shared with all participants. After every table had shared their conclusions, there was an open questions-and-answers session.

Lessons from incentive-based hilsa management in Bangladesh

Strengths

The incentive-based hilsa management scheme currently in place in Bangladesh is down to the willingness of government to support artisanal fisheries, as well as fishing communities' involvement and commitment to conserving the resource. It is supported by a regulatory framework and is multisectoral, involving various government departments and international projects, such as ECOFISH. It is based on strong scientific research on fisheries and is supported by collaborative monitoring and enforcement by the country's coast guard, community fish guards (for the past two years) and others. A conservation fund is also in place.

The premise of the scheme is to provide rice as compensation during the no-fishing periods, although it follows a holistic approach and encourages alternative income-generating activities, for example, by providing households or communities with sewing machines or cattle. The compensation scheme is based on a fisher ID (FID) card system and is complemented by an awareness-raising programme, which has improved compliance during ban periods. This scheme is also seen as a tool for women's empowerment in the form of training and skills development.

The incentive-based hilsa management scheme in Bangladesh has increased fishers' income, so they have been able to invest in housing and education. GDP and employment in hilsa fisheries have also increased.

Weaknesses

FID cards identify those entitled to compensation. However, not all fishers have received them. Some did not want to register for fear that they might be signing away their property or assets. While the compensation programme has not reached all of the affected fishers, around 5% of people holding FID cards are not, in fact, real fishers, but have obtained their cards through political influence. In addition, the level of compensation is insufficient, both in terms of amount of food provided and number of beneficiaries. This is partly due to a lack of resources and partly due to a lack of political will.

Fisher leaders are not involved in the scheme, particularly when it comes to identifying potential beneficiaries. Some fishers lack motivation and do not want to 'tell on their friends'. That makes participatory monitoring and the co-management of fisheries difficult.

Communication and coordination between different government departments involved in hilsa fishery management and between the government and fisher communities is challenging. There is a lack of human and financial resources for law enforcement, technological improvements and research.

The debt dependence of poor fishers on money-lenders is also a challenge that this incentive-based scheme has still not addressed sufficiently. The encroachment of fishers from neighbouring countries was another weakness mentioned by participants.

Establishing an incentive-based hilsa management scheme in Myanmar

Opportunities

In Myanmar, the establishment of an incentive-based hilsa management scheme has the potential to improve compliance with current and new regulations that will increase fisher income and boost GDP, fish abundance and size. It is also an opportunity to promote women's empowerment, following the example of Bangladesh. The scheme may also support the introduction of accurate and flexible closed seasons; indeed, incentives will be essential if the closed fishing season is to be extended or duplicated. It is also an opportunity to encourage alternative income-generating activities for fisher communities and to encourage collaboration between researchers, government and other actors involved in fisheries management.

Challenges

Fisheries regulation and policy in Myanmar are weak and outdated. Monitoring, control and surveillance are poor and enforcing regulations is difficult. While incentives may improve compliance, capacity needs to be built for the effective enforcement of closed seasons. Also, weak collaboration between government departments, and between government and other agents, such as fisher communities, was mentioned as a challenge that may compromise the success of the scheme.

Myanmar's fishers have already been identified through a licensing system, but hilsa fishers have not, so the identification of beneficiaries maybe challenging, as in Bangladesh, where political influence has undermined the scheme somewhat. The current closed season for all fish, from May to July, may not be appropriate for hilsa. The ban may need to be extended to April and another imposed in October–November for the second spawning period. An additional challenge is that the spawning season in October–November coincides with the largest hilsa catch, so banning fisheries at this time could prompt serious opposition from fisher communities. This needs to be adequately addressed by the compensation scheme.

Spawning and nursery grounds need to be properly demarcated and established as sanctuary areas. This requires scientific research, technical expertise and sufficient human and financial resources.

Fishers' lack of awareness of hilsa conservation also needs to be addressed, for example, in relation to destructive fishing gear, small mesh size and stow nets that unintentionally trap fish during the closed season.

Workshop participants also noted that post-harvest quality control was bad, limiting income and keeping fishers poor.

Formation of a transboundary hilsa expert group

Following the discussion on the lessons and opportunities of hilsa management in Bangladesh and Myanmar, there was a discussion on the potential for establishing a transboundary or regional hilsa management expert group, covering its goals, name, practicalities, participants and next steps.

The main goals of the group would be to improve hilsa fish stocks and to introduce a holistic and sustainable management approach to transboundary hilsa resources. It would be research focused.

Various names were suggested for the group: the regional hilsa fishery working group, the transboundary hilsa management group, the BOBLME hilsa fisheries working group, the joint working group on hilsa management, transboundary coordination for incentive-based hilsa management, the regional hilsa fisheries working group for transboundary management, the transboundary hilsa management council and the Bay of Bengal commission.

A window of opportunity was identified in the implementation of phase II of the BOBLME strategic action programme, due to start in 2020. This will include eight countries, although a transboundary hilsa working group would only need to include Bangladesh, Myanmar and, perhaps, India (the three countries account for 99% of hilsa landings in the Bay of Bengal). Signing a memorandum of understanding under the pre-existing structure of the strategic action programme would be a considerable step forward. The challenge is how to make it sustainable, so that it does not cease to function when the project is over.

The establishment of a permanent secretariat for the group, similar to that of the Benguela Current Commission, was mentioned as a possibility, potentially hosted by Bangladesh. The secretariat would be in charge of organising and coordinating the group and be formed by one or two people from each country. An annual workplan including both short and long-term goals for the group would be drafted and in-person meetings scheduled for once or twice a year, although exchange visits for specific topics could also be arranged.

In terms of who should participate in this transboundary expert group, participants were in favour of a multi-stakeholder approach including representatives from: international organisations (for example, the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme, UN Environment, the International Union for Conservation of Nature and the World Fisheries Congress), autonomous intergovernmental bodies (such as the Southeast Asian Fisheries Development Center, the Network of Aquaculture Centres in Asia-Pacific and Chambers of Commerce), NGOs, the private sector and development partners, fishers' associations, academia, civil society and government representatives at local and national level.

It was highlighted that it was difficult for department of fisheries officials to be involved in this process because of a lack of continuity in their position, or the challenges of attending frequent meetings due to other commitments. It was also noted that only key, leading in-country institutions should be involved in the regional group and that every country should decide internally who to bring to the group as a national representative, rather than a member of each institution involved.

In terms of next steps, it was decided that the group needed to speak with BOBLME and write a document and memorandum of understanding setting out the main goals and principles of the transboundary hilsa management expert group and country commitments with a view to more sustainable joint hilsa management in the region.

Next steps and recommendations

After the table discussions, a representative from the departments of fisheries of Bangladesh and Myanmar gave their final speeches, with a focus on next steps and recommendations for sustainable hilsa fishery management.

In terms of next steps in Myanmar, U Aung Nyi Toe, director of fisheries management at the Myanmar Department of Fisheries, pointed to the development of the country's National Plan of Action for hilsa fisheries management. He said multi-agency committees should be established to monitor the implementation of the plan. Improving CPUE statistics and assessing hilsa stocks are a priority and human and financial resources need to be allocated to those tasks. Links between the various institutions and agencies involved in the management and conservation of natural resources in Myanmar (involved in fisheries, environment, water and land) need to be strengthened, he added.

Mr Toe gave some major recommendations for the sustainable management of hilsa fishery: a reduction in fishing fleet size; the protection of spawning and nursery areas by establishing ban periods; the regulation of mesh sizes; awareness-raising to improve compliance with hilsa regulations; dialogue and collaboration with other agencies working in water management or land use; and the incorporation of hilsa fisheries into the design and management of marine protected areas by fostering dialogue and collaboration with Bangladesh.

Mr Md Monwar Hossain, principal scientific officer at the Bangladesh Department of Fisheries, focused on recommendations for future hilsa fisheries management in his country. He suggested adopting, among other things, an ecosystem approach to fisheries management, operationalising the HCDF, strengthening science-management links and institutional capacity, institutionalising community savings groups led by women, expanding the model fishing village approach, reviewing and updating the legal framework, initiating transboundary fisheries management with Myanmar and India, engaging fisher communities in hilsa conservation, enforcing regulations on mesh size and fishing closures, working towards a total household livelihood approach, sharing equally the benefits of conservation and reducing the vulnerability of fishers by introducing insurance schemes or common funds.

Conclusions

Research from Bangladesh and Myanmar has shown that there are two spawning peaks each year: May–July and October–November. Both countries register maximum catches during the October–November period. Bangladesh has closed seasons in place during both spawning periods – these can be very specific, as they are linked to phases of the moon. Myanmar has a general (not hilsa-specific) freshwater closed season from May to July each year. There is no stipulated marine closed season; this is decided on (and negotiated) annually. Bangladesh has hilsa sanctuaries in place; Myanmar does not.

Most of the hilsa landings in Bangladesh are from freshwater; the opposite is true in Myanmar. This means that artisanal fishers catch more hilsa in Bangladesh, while the industrial fleet dominates in Myanmar. This will have an important bearing on fisheries management and transboundary aspects. Illegal, unreported and unregulated fishing is always very difficult to control at sea.

The social aspects are complicated, as fisher associations are generally weak and, in Myanmar, only just being formed under the country's nascent democracy. Compensation funds to encourage artisanal fishers to respect closed seasons and to meet other legal requirements are insufficient in terms of amount and coverage.

The fact that the Bangladesh hilsa landings have doubled from 250,000 to 500,000 mt per year since improved management techniques have been instigated equates to significant national economic gain. A levy on hilsa exports could be directed back into fisher associations assisting with sanctuaries and closed seasons.

In summary, sustainable hilsa management needs continued scientific research, the establishment of a transboundary working group that also involves fishing communities (capitalising on the opportunity presented by BOBLME phase II) and an improvement in post-harvest quality control.

Field visit to Chandpur

Early in the morning of 7 March, the Myanmar delegation, together with IIED and representatives of WorldFish Bangladesh, took a launch from Dhaka to Chandpur for a field visit.

Participants had the opportunity to visit Borostation Macchghat, the fishing landing centre. They also met Matshya Banik, the fish merchant association, and gained knowledge on their experience with a closed season and associated compensation scheme.

In the afternoon, another boat took the participants from Chandpur to Motlab Uttar Upazila, where pilot fishing villages are models of resilience, based on alternative income-generating activities, community savings groups led by women and other initiatives. There, the Myanmar delegates observed how the local government distributes rice under the fisher compensation scheme (Figure 10) and could talk to local fishers and their families about how the scheme works for them.

Figure 10 Chandpur fishers queuing to collect rice as compensation for not fishing during the ban period



Source: Michael Akester

On the morning of 8 March, the participants visited the District Fisheries Office in Chandpur and the BFRI, where they got to know more about activities related to hilsa conservation and management. At midday, they took another launch back to Dhaka.

Appendices

I List of participants

Name	Organisation	Country
Md Abdul Wahab	WorldFish	Bangladesh
Dr Annabelle Bladon	IIED	UK
Mr Michael Akester	WorldFish	Myanmar
U Aung Nyi Toe	Myanmar Department of Fisheries	Myanmar
Mr Md Monwar Hossain	Bangladesh Department of Fisheries	Bangladesh
Dr Malcolm Dickson	WorldFish	Bangladesh
Dr Zoarder Faruque Ahmed	Bangladesh Agricultural University	Bangladesh
Dr Khin Maung Soe	WorldFish	Myanmar
Dr M Jalilur Rahman	WorldFish	Bangladesh
Dr Kyi Thar Myint	Yangon University	Myanmar
Dr Thida Ei	Yangon University	Myanmar
Dr Md Anisur Rahman	BFRI	Bangladesh
Mr U Win Myint Saw	Myanmar Department of Fisheries	Myanmar
Dr Monirul Islam	Dhaka University	Bangladesh
Wae Win Khaing	NAG	Myanmar
Dr Md Sainar Alam	Bangladesh Department of Fisheries	Bangladesh
Ms Eugenia Merayo	IIED	UK
U Win Nyo	Fishers' representative Myinkakone village	Myanmar
Sri Rabindra Nath Barmon	Fisherman Unity Federation	Bangladesh
M Liaquat Ali	Bangladesh Centre for Advanced Studies	Bangladesh
Hasan Ahmed Chowdhury	Bangladesh Department of Fisheries	Bangladesh
Masud Ara Momi	Bangladesh Department of Fisheries	Bangladesh
Mr Md Wahiduzzaman	Bangladesh Department of Fisheries	Bangladesh
Asadul Haque Baqui	Bangladesh Department of Fisheries	Bangladesh
M Nahiduzzaman	WorldFish	Bangladesh
Ms Tanjina Nazia	WorldFish	Bangladesh
Ms Masud Ara Mome	Bangladesh Department of Fisheries	Bangladesh
Ms Mehnaz Tabassum	WorldFish	Bangladesh

II Agenda

Regional hilsa knowledge-sharing workshop (Bangladesh–Myanmar): lessons for incentive-based hilsa management

5-7 March 2019

Hotel Golden Tulip, House 84, Road 7, Banani, Dhaka

Day 1 (5 March)

Time	Subject	Speaker
9:30	Registration	
10:00	Guests take their seats	
10:05	Welcome address Workshop agenda and objectives	Md Abdul Wahab, PhD, ECOFISH-Bangladesh
10:15	Speech from IIED	Annabelle Bladon
10:25	Speech by special guest	Mr Michael Akester, country director, WorldFish Myanmar
10:35	Speech by special guest	Mr U Aung Nyi Toe, director of fisheries management, Myanmar Department of Fisheries
10:45	Speech by special guest	Mr Md Monwar Hossain, principal scientific officer, Bangladesh Department of Fisheries
10:55	Chair's speech	Dr Malcolm Dickson, country director, WorldFish Bangladesh
11:05	Tea break	
11:30	Ecology and biology of hilsa fishery in Bangladesh	Dr M Jalilur Rahman, WorldFish Bangladesh
11:50	Ecology and biology of hilsa fishery in Ayeyarwady Delta	Dr Kyi Thar Myint, Yangon University
12:10	Open discussion	
12:30	Migration and distribution of hilsa fishery in Bangladesh	Dr Md Anisur Rahman, BFRI
12:50	Migration and distribution of hilsa fishery in Ayeyarwady Delta	Mr U Win Myint San, deputy director Ayeyarwady Region, Myanmar Department of Fisheries
13:10	Open discussion	
13:30	Lunch and prayer break	
14:30	Socioeconomics of hilsa fishery in Bangladesh	Dr Monirul Islam, University of Dhaka
14:50	Socioeconomics of hilsa fishery in Myanmar (socioeconomic status of fishing households, value chain, post-harvest quality control, etc.)	Dr Wae Win Khaing, NAG Myanmar
15:10	Open discussion	
15:30	Concluding remarks from the Chair and close	Dr Malcolm Dickson
15:45	Tea and snacks	

Day 2 (6 March)

9:30	Incentive-based management for hilsa fisheries and experience from Bangladesh	Md Abdul Wahab, PhD, ECOFISH-Bangladesh and Dr Md Sainar Alam, district fishery officer (reserve), Bangladesh Department of Fisheries
10:00	Current management and status of hilsa fishery in Myanmar	Dr Khin Maung Soe, WorldFish Myanmar
10:20	Tea break	
10:40	Table discussion: <ul style="list-style-type: none"> • What are the strengths and challenges of incentives in Bangladesh? • What are the opportunities and challenges for incentive-based management in Myanmar? Each table should take 20 minutes to discuss. The table facilitator should record thoughts from the table. One person from each table will then have 5 minutes to report back to the whole group. We will have 15 minutes for questions and open discussion, before the moderator gives a 5-minute summary.	Moderator: Malcolm Dickson Facilitators: Dr Md Abdul Wahab, WorldFish Bangladesh; Dr Annabelle Bladon, IIED; Eugenia Merayo Garcia, IIED; Mr Michael Akester, WorldFish
11:40	Discussion on the formation of a transboundary hilsa expert group (15 mins at tables, 20 mins reporting back, 25 mins open discussion, 5 mins sum up) <ul style="list-style-type: none"> • What is the goal? • Who should be involved? • What should the name be? Or can we revive the FAO BOBLME hilsa working groups? • How often to engage and how (e.g. Skype or in person) 	Moderator: Mr Michael Akester
12:40	Presentation on next steps and recommendations by representatives from Bangladesh and Myanmar (15 mins each)	Mr U Myint Zin Htoo, deputy director general, Myanmar Department of Fisheries; Mr Saleh Ahmed, additional director general, Bangladesh Department of Fisheries
13:10	Session wrap-up and concluding remarks from Chair	Dr Malcolm Dickson
13:40	Lunch and end of workshop	

Field visit to Chandpur

Day 3 (7 March)

07:20	Depart for Chandpur by Sonar Tori launch	Dhaka Sadarghat, Dhaka
10:40	Reach Chandpur Ghat launch (travelling time approximately 3:20 hrs)	Chandpur Ghat launch
11:00	Visit Borostation Macchghat (fish landing centre), meeting with Matshya Arotders (fish traders)	Borostation Macchghat, Matshya Banik Samiti (Fish merchant Association) office
12:00	Sightseeing at Padma-Meghna confluence	Mule Head, Chandpur
12:40	Arrive at Hotel Grand Hilsa, refreshments	Hotel Grand Hilsa
13:15	Lunch at Hotel Grand Hilsa	Hotel Grand Hilsa
14:30	Field visit to Uttor Bagula model resilience fishing village, Haimchor (fisheries monitoring centre, compliance support guide, alternative income-generating activity supports, sanitary latrines, drinking water tube well)	Paschim Laxmipur, Sadar, Chandpur Travel
16:00	Observe compensatory support distribution to fishers by local government, Union Parishad	Chorvoirovi Union Parishad, Haimchor
18:00	Return to hotel	Hotel Grand Hilsa
20:00	Dinner	Hotel Grand Hilsa

Day 4 (8 March)

8:00	Breakfast	Hotel Grand Hilsa
8:30	Travel to district fisheries office, Chandpur, and exchange of ideas and views	District fisheries office, Chandpur
9:30	Visit to BFRI and brief on activities	BFRI
12:00	Travel to Dhaka by Rof-Rof launch and onboard packed lunch	Chandpur Ghat launch, Meghna river

Notes

¹ Rahman, MA, Alam, MA, Hasan, SJ & Jaher, M (2012). Hilsa fishery management in Bangladesh. In *Hilsa: Status of Fishery and Potential for Aquaculture* (pp. 40– 60). Proceedings of the Regional Workshop Held in Dhaka, 16-17 September, 2012, WorldFish, Bangladesh and Asia, 238 pp.

² Bangladesh Department of Fisheries (2017) *Yearbook of Fisheries Statistics of Bangladesh 2016–17* Fisheries Resources Survey System (FRSS). Director General, Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh. (http://fisheries.portal.gov.bd/sites/default/files/files/fisheries.portal.gov.bd/page/4cfbb3cc_c0c4_4f25_be21_b91f84bdc45c/Fisheries%20Statistical%20Yearbook%202016-17_Final.pdf)

³ Rahman et al. (2012)

⁴ Myanmar Department of Fisheries(2017) *Myanmar Fishery Statistics 2017*. Republic of the Union of Myanmar, Ministry of Agriculture, Livestock and Irrigation, Nay Pyi Taw, Myanmar. (<http://www.dof.gov.mm/phocadownload/FS%20BOOK%202017A5.pdf>)

⁵ International Institute for Environment and Development (IIED), Carrots and sticks: incentives to conserve hilsa fish in Myanmar. <https://www.iied.org/carrots-sticks-incentives-conserve-hilsa-fish-myanmar>