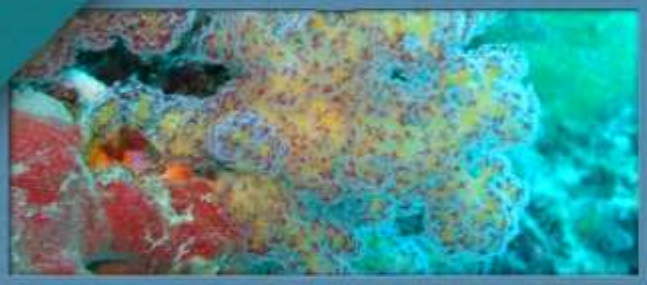
Bay of Bengal Large Marine Ecosystem Project



Report of the Bangladesh hilsa Working Group meeting

19 May 2011 • Dhaka Bangladesh

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Bay of Bengal Large Marine Ecosystem Project

Report of the

Fisheries Assessment Working Group meeting on

Hilsa (*Tenualosa ilisha*)

BARC, Dhaka, Bangladesh

19th May, 2011

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1. OPENING OF THE MEETING AND ADOPTION OF THE AGENDA

1. A Workshop on assessing the data and assessment potential from Bangladesh was held on 19th May, 2011 at BARC, Dhaka, Bangladesh. The BOBLME Stock Assessment Coordinator, Dr. Rishi Sharma welcomed the participants and wished them well in their work

2. Dr. Sharma reminded the meeting that BOBLME Project is mandated to develop regional fishery assessments for hilsa, and this meeting was the second step to assessing what data are available and what the current assessment process is in Bangladesh.

3. The meeting was chaired by Mr. M. Shamsul Kibria (Project Steering Committee Member) and Dr. Gulam Hussain (Bangladesh) National Coordinator, Bangladesh facilitated the meeting.

4. The participants of the meeting are listed in Appendix I and the agenda for the Meeting was adopted as presented in Appendix II.

5. Dr. Hussain welcomed everyone, gave an introduction to the BOBLME project in Bangladesh and its various components, and Mr. Kibria presided over the meeting.

6. Mr. Kibria informed the meeting about the scope of the project, and how far the work has proceeded. The agenda was adopted (Appendix II); and the participants were introduced.

7. The list of documents presented to the meeting is given in Appendix III.

2. INTRODUCTION TO SELECTED STOCK ASSESSMENT TOPICS AND STATUS OF HILSA ASSESSMENT IN BANGLADESH

2.1 Information Needs for a Defensible Stock Assessment – Dr. Rishi Sharma

8. Dr. Rishi Sharma gave a presentation on the essential elements of a stock assessment. Crucial to this are catch, CPUE and effort at the resolution that mimics the stock and the life-history of the species. A basic stock assessment was presented using a Surplus Production (SP) Model and how B_{MSY} would be estimated as well as elements of a age-structured assessment were presented. The working group discussed the adequacy (quality) of the data in Bangladesh. There appeared to some debate as to whether data in Bangladesh is representative and useful in a stock assessment. Alternative assessment options should be pursued, rather than a single approach taking into account data from uncertain sources. Life history based modeling approaches like Leslie Matrix models, age-structured integrated assessments, FISAT based assessments, Surplus Production based assessments and PSA approaches should be developed.

2.2 Hilsa Fisheries in Bay of Bengal (Bangladesh): Challenges and Management – Dr. M. Anisur Rahman

9. Hilsa is the national fish of Bangladesh and numerous people are involved in the fishery.

10. Habitat destruction and overfishing are major factors affecting the abundance of hilsa. A recent survey indicated that hilsa has disappeared from 35 out of 235 rivers. This problem has becoming exacerbated after the Farraka Barrage project, and other habitat damaging projects due to large sediment loads brought down by rivers in Bangladesh and India. However, contrary view points that these rivers coming from the Himalayas have always had large sediment loads and with respect to that not much has changed in the last couple of decades. However, other anthropogenic effects such as pollution and poor floodplain management are affecting the hilsa population in a negative manner.

11. Freshwater catches have remained fairly stable, but in recent years catches from the marine sector have increased markedly. In 2010, the marine sector took 209 450 t , while the freshwater sector took 103 162 t . The catches of the marine and freshwater sectors are given in the table below:

Table 1: Catch by marine and inland sectors since 1984 (source M. A. Rahman, BFRI).

Year	Freshwater	Marine	Total
1984	90,082	56,000	146,082
1985	73,388	71,050	144,438
1986	94,797	96,294	191,091
1987	91,167	103,814	194,981
1988	78,551	104,950	183,501
1989	81,641	110,311	191,952
1990	112,408	113,943	226,351
1991	66,809	115,358	182,167
1992	68,356	120,106	188,462
1993	74,715	123,115	197,830
1994	71,370	121,161	191,531
1995	84,420	129,115	213,535
1996	80,625	126,660	207,285
1997	83,230	131,204	214,434
1998	81,634	124,105	205,739
1999	73,809	140,710	214,519
2000	79,165	140,396	219,561
2001	75,060	154,654	229,714
2002	68,250	152,343	220,593
2003	62,944	136,088	199,032
2004	71,000	184,438	255,839
2005	77,500	198,363	275,860
2006	78,273	198,850	277,123
2007	80,453	199,875	280,328
2008	89,900	200,100	290,000
2009	95,507	202,951	298,458
2010	103,162	209,450	312,612

12. Starch Gell Allozyme analysis performed by CSIRO indicated that Hilsa is a single stock in the region shared by Bangladesh, India and Myanmar. However, some Bangladesh scientists are of the opinion that a sub-stock structure may exist.

13. While the basic life-history of hilsa is known and morphometric measurements indicate that fish from different rivers are quite distinct in their features and taste there are some areas of uncertainty, including:

- where hilsa disperse after leaving the freshwater
- where hilsa go after entering the river

- whether hilsa exhibit homing fidelity
- whether hilsa is semelparous or iteroparous by nature or if both patterns exist in the population
- whether hilsa have the ability to residualize into a freshwater only life-history is also largely disputed by scientists.

14. Gonadal Somatic Index (GSI) indicates that peak spawning occurs in September to October in 4 distinct areas in Bangladesh, namely Kalirchar (down of Sandwip), (2) Moulavirchar (south of Hatia), (3) surrounding of Monpura (east of Bhola) and (4) Dhalchar Island (Charfashion, Bhola). These areas were found as the most significant areas of hilsa spawning. Nursery areas are both freshwater and estuarine and nursery areas have been established in major parts of the Meghna River.

15. Results using the FISAT program indicate a large variation in exploitation on the stock between 1992-2003 (Table 2). However this analysis did not estimate what the spawning biomass targets should be and this could be one area of possible improvement in an integrated assessment. In addition with recent age data, this assessment needs to be updated as well as the last year performed was 2003. Regardless, exploitation rates up to 2003 appear to have been high. However, it is possible that exploitation rates have decreased since then as a result of strict management measures primarily closures in the juvenile jatka fishery and during peak-spawning, as well as the establishment of sanctuaries. This is implicit as FISAT rates are highly sensitive to the size of first capture, and if size of first capture is delayed, implicitly the exploitation rate drops significantly in the modeling process.

Table 2: Results from FISAT of multiple years of length based data assessments

Parameters	**Years & Results**								
	1992	1995	1996	1997	1998	1999	2000	2002	2003
Asymptotic length (L∞)	61.1	58.3	59.97	61.50	66.00	60.00	62.50	53.70	53.60
Growth constant (K)	0.74	0.74	0.99	0.83	0.67	0.82	0.72	0.86	0.60
Total mortality (Z)	2.41	2.61	3.19	3.29	3.43	3.77	2.79	3.51	3.03
Natural mortality (M)	1.16	1.18	1.41	1.28	1.25	1.28	1.17	1.36	1.09
Fishing mortality (F)	1.25	1.43	1.78	2.01	2.18	2.49	1.62	2.15	1.94
Exploitation rate (E)	0.52	0.55	0.56	0.61	0.63	0.66	0.58	0.61	0.64
Maximum yld/recruit (Emax)	-	-	0.71	0.69	0.60	0.59	0.46	0.58	0.63
Size at first capture (Lc)	35.0	30.0	30.34	30.25	27.06	22.80	13.12	19.87	21.21
Growth performance (∅)	-	3.40	3.55	3.50	3.46	3.47	3.45	3.51	3.03

16. Based on the assessment conducted using data up to 2005 the conclusion Bangladesh scientists arrived at were the following:

i. **Hilsa fishery is suffering from serious recruitment over-fishing (indiscriminate catching of *jatka*, i.e. juvenile hilsa)**

ii. **There is growth over-fishing (indiscriminate killing of mature female hilsa)**

iii. **<u>The fishing mortality has increased due to fishing pressure with decrease in size at first capture .</u>**

17. DOF and BFRI have undertaken many research initiatives that are dealing with community partnership programs such as giving the *jatka* fishers and alternative source of livelihood, as well as more community outreach programs.

18. BFRI pointed to some short-comings in the current survey systems and designs, as being outdated in terms of the sample frame, as well as being short-staffed to do an adequate job.

19. Ideas such as developing a marine park for no-take of hilsa could be pursued as well as developing integrated plans with transboundary nations that may limit anthropogenic impacts.

3. HILSA (*Tenualosa ilisha*) STOCK ASSESSMENT NEEDS IN BANGLADESH AND WORKPLAN

3.1 *Lack of Information and future needs for Bangladesh Assessment for Hilsa*

20. Although not discussed at length a similar approach as that suggested in India could be pursued in Bangladesh. A three pronged approach that includes the following could be pursued: i) on building capacity, ii) long-term objectives, and iii) short-term needs and objectives. They are described below.

3.1.1 CAPACITY BUILDING

21. In order to build capacity, the needs for establishing the quality needs for the data in the region need to be adequately developed and addressed. These include both temporal and spatial resolution of the hilsa in the Bangladesh in the various major rivers, namely the Padma, the Meghna and the Brahmaputra.

22. Improvements on understanding stock structure using morphometry and size distribution could be developed in collaboration with India.

23. A joint session with all the stake-holders in the region needs to occur to assess what exists and what improvements might occur. Possible locations for this are in the latter half of September (after the 15th of September) in either Thailand, Bangladesh or India.

3.1.2 LONG TERM GOALS

24. Long term monitoring protocols at the sub-stock level needs to be prioritized. Government funding needed to be dedicated for this. These are directly related to catch and effort as well as size-distribution of the catch based on the proposed management units (i.e. if the proposer think that each river has a separate management unit, or some other stock aggregate that could be managed by life-history e.g. October versus January spawners).

3.1.2 SHORT TERM GOALS

25. The short term goals are included in the following. This will be the priority of some of the funding available from BOBLME in the near-term (2011-2012 year). Most of these pertain to existing organization of the data, and to understand homing fidelity, and migration life-history of hilsa:

i. Assemble and organize length frequency data from catch statistics. These will then be centralized and kept in a database that we could use in the stock assessment.
ii. Collection (new and current) and assessment (historic) of catch and effort data.
iii. Estimate missing periods of effort data through an effort based index that correlates with boat days or some other methods of estimating effort. Design a system to collect effort data at same resolution as catch data.

iv. Based on data made available build simple yield per recruit, surplus production and integrated model assessments for Hilsa, as per time available. Update and compare the current system techniques with new methods. Capacity building and training course to be developed by BOBLME for staff of BFRI.
v. Initiate tagging activities to understand life-history parameters, namely migration and distribution of hilsa in the BOB region. This will be an experimental study that may include mark and recapture based estimation of abundance.

Note that activity i-iv will be collaborative with Dr. Sharma and Dr. Anis help at Chandpur at some suitable time. This will be coupled with a basic course for Bangladesh scientists on stock assessment. Simultaneous stock recruitment methods using length frequency analysis, surplus production and yield per recruit will be tried by the scientists and training will be provided by Dr. Sharma to the scientists in the region.

3.2 Identification of future assessment approaches and data needs

26. Based on the information presented on hilsa at the meeting and subsequent discussions, the Bangladesh Workgroup (BWG) identified the following fundamental activities that should be undertaken to support the advancement of a regional stock assessment of hilsa. The BWG noted that most recent assessment by both Bangladesh, and India are length based assessment using FiSAT (see http:// www.fao.org/fishery/topic/16072/en). However, it appears that sufficient data exists to undertake an assessment using use Stock Synthesis based approaches and/or Surplus Production Models. A proposal to examine alternative models including existing length-based assessment, integrated assessment and Leslie Matrix approaches could be investigated to address the following objectives:

a. To evaluate the results of the existing length based Stock Assessment approaches using FiSAT. While FiSat is unlikely to yield a definitive assessment and reliable estimates of MSY, etc it should highlight the key areas of uncertainty and identify areas for direction of data collection in future. On the otherhand, it may enable more specific conclusions regarding exploitation pattern (estimation of selectivity and compare to maturity, etc) and has the potential to evaluate suitability of current management approaches such as mesh size restrictions to minimize age of first capture.
b. The sources of data were identified and a review of the data is proposed for future working group meetings. Bangladesh catch data is quite good (based on Dr Anis and Dr. Haldar). However effort data needs to be improved and methods to estimate how the effort varied over time through examining different covariates should be investigated. This would be a high priority and could possibly lead to development of a simple Biomass dynamics (SP) assessment.
c. The use of Stock Synthesis and simplistic Surplus Production Model approaches are recommended if the data exist and can be organized. Bangladesh has indicated that this is a high priority and will pursue this in 2011. If the data are patchy and scattered simplistic life stage based models (or Leslie Matrix Models) could be developed to assess sensitivity of different management activities on long-term persistence. If the data exist, with respect to the Stock Synthesis analysis, a statistical catch at age model could be developed for Hilsa Shad where recruitment would be estimated as a function of the available Biomass and CPUE data. In this model, the components such as total catch by sector and the available length/age data would also be incorporated into the statistical likelihood that the model estimates would be fitted to.

d. The assessment approaches developed will need to consider stock structure issues, or at the very least management units that may consider geographical boundaries (India, Myanmar and Bangladesh stocks), and possibly even a finer sub-stock structure (e.g. river of origin).

e. The WG noted that there was an immediate need to increase stock assessment capacity in each country through future training on Fishery Statistics and Stock Assessment, including running some simplistic assessments such a surplus production models, length based models, etc with regional technical teams. Proposed workshop for BGD in Chandpur will be determined at a later date.

3.3 Stock status advice for hilsa in Bangladesh

27. The workshop conducted in India considered the range of information available, and adopted the following stock status advice for the regional (Bangladesh) hilsa fish-stock in the Bay of Bengal.

The stock status of hilsa in Bangladesh remains uncertain.

It appears possible growth and recruitment over-fishing patterns are discerned in the stock. Consequential management measures have tried to control the selectivity of gear to delay the age of first capture (closure of the juvenile *jatka* fishery).

In Bangladesh, current catch has averaged 202,245 t in the marine sector for the last 5 years, while the freshwater sector 89,459 t averaged in the last 5 years. It is not clear whether the current level of catch is sustainable, though Bangladesh scientists think that the *jatka* closures are primarily the reason for the continuous increase in catch and continued persistence of the stocks in their waters.

While hilsa, is a highly productive species and this may protect it to some extent from overfishing, pollution and loss and degradation of habitat are affecting the distribution and probably the productivity of the stock.

ADOPTION OF THE REPORT

The Report of the First meeting of the BOBLME Bangladesh Fisheries Assessment Working Group in Dhaka was adopted by email [June 8th, 2011].

APPENDIX I: LIST OF PARTICIPANTS

Participants

Sl.No.	Name and designation
	M. Samsul Kibria Joint Secretary Ministry of Fisheries & Livestock
1	Dr. Md. Gulam Hussain Director General Bangladesh Fisheries Research Institute Mymensingh-2201 & National Coordinator, BOBLME- Bangladesh
2	Mr. Md. Zaher Chief Scientific Officer Riverine Station, Bangladesh Fisheries Research Institute Chandpur-3602 & Project Director, Jatka Conservation Project
3	Dr. M. Enamul Hoq Project Director, Support to BOBLME Project, Bangladesh Fisheries Research Institute Mymensingh-2201
4	Dr. Md. Jalilur Rahman Senior Scientific Officer Marine Fisheries & Technology Station, BFRI Cox's Bazar
5	Dr. M. Anisur Rahman Senior Scientific Officer Riverine Station, BFRI Chandpur-3602
6	Mr. Md. Asraful Alam Scientific Officer Riverine Station, BFRI Chandpur-3602
7	Dr. A. K. Yousuf Haroon NTA, Support to BOBLME Project BFRI, Mymensingh-2201
8	Mr. A.B.M. Zahid Habib Project Director, Jatka Conservation Project Department of Fisheries Matshya Bhaban, Dhaka
9	Dr. Md. Sharif Uddin Assistant Director Marine Fisheries Wing Department of Fisheries, Chittagong
10	Dr. Nirmal Chandra Roy

	Assistant Director Jatka Conservation Project Department of Fisheries Matshya Bhaban, Dhaka
11	Dr. G. C. Haldar Ex-Chief Scientific Officer & Hilsa Expert Bangladesh Fisheries Research Institute House #27, Road #11 Sector #6, Uttara, Dhaka-1230
12	Ms Shahzia Mohsin Khan Dialogue Coordinator, Ecosystems for Life IUCN Bangladesh House 11, Road 138 Gulshan-1, Dhaka 1212
13	Mr. Nasim Aziz Ecosystems for LifeIUCN Bangladesh House 11, Road 138 Gulshan-1, Dhaka 1212
14	Dr. Md. Golam Mostafa Biophysical Advisor The WorldFish Center- Bangladesh & South-Asia Office House # 22B, Road # 7 Block # F, Banani, Dhaka-1213
15	Dr. Rishi Sharma Stock Assessment Coordinator BOBLME RCU Thailand

APPENDIX II

The Director General &
National Coordinator, BOBLME- Bangladesh
Bangladesh Fisheries Research Institute

Cordially invites you

to the

Consultation on Hilsa Stock Assessment

on the Thursday, 19 June 2011

at Conference Room (2nd Floor)
Bangladesh Agricultural Research Council (BARC)
Farm Gate, Dhaka

Programme

10.00	Registration
10.05	Ice breaking/Self introduction
10.10	Welcome Address & Introduction to the Consultation Meeting on Hilsa Fisheries **Dr. M.G. Hussain**, National Coordinator, BOBLME- Bangladesh and Director General, Bangladesh Fisheries Research Institute
10.20	Overview of Hilsa fisheries stock assessment in Bangladesh, India and Myanmar **Dr. Rishi Sharma**, Stock Assessment Coordinator, BOBLME- RCU, Thailand
10.40	Country status paper on Hilsa fisheries and its stock assessment in Bangladesh **Dr. M. Anisur Rahman**, Riverine Station, BFRI, Chandpur
11.00	Tea break
11.30	Open discussion and consultation
12.30	Recommendations and plan of actions
13.00	Lunch

APPENDIX III
LIST OF DOCUMENTS PRESENTED TO THE MEETING

Presenter	Title
Dr. Rishi Sharma	Hilsa: Information Needs for a Defensible Stock Assessment
Dr. M.A. Rahman	Country status paper on hilsa fisheries and its stock assessment in Bangladesh

Bangladesh, India, Indonesia, Malaysia, Maldives, Myanmar, Sri Lanka and Thailand are working together through the Bay of Bengal Large Marine Ecosystem (BOBLME) Project and to lay the foundations for a coordinated programme of action designed to improve the lives of the coastal populations through improved regional management of the Bay of Bengal environment and its fisheries.

The Food and Agriculture Organization (FAO) is the implementing agency for the BOBLME Project.

The Project is funded principally by the Global Environment Facility (GEF), Norway, the Swedish International Development Cooperation Agency, the FAO, and the National Oceanic and Atmospheric Administration of the USA.

For more information, please visit www.boblme.org