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TITLE: Minutes of Workshop (Ratnagiri)**Workshop on Stock Assessment of India Oil Sardine (IOS) Along
the Coastal Waters of Goa and Maharashtra****Persons attended:**

S.NO	NAME	POSITION
1	Dr. Hukum singh Dhaker	Associate Dean, College of Fisheries, Ratnagiri
2	Dr. M.M. Sridhankar	College of Fisheries, Ratnagiri
3	Mr. Pichaiyut Tachapong	CP Aquaculture (India) Private Limited
4	Mr. Duncan Leadbitter	Director (Fish Matters) - Project Manager
5	Mr. Chandrakant Velip	Deputy Director, Department of Fisheries, Goa
6	Mr. Anand Palav	Department of Fisheries, Ratnagiri (Maharastra)
7	Dr. T.R. Gibin kumar	Deputy Director, MPEDA, Ratnagiri
8	Mrs. Megha Kerkar	Directorate of Fisheries, GoA
9	Ms. Trupti Jadhav	Department of Fisheries, Ratnagiri (Maharastra)
10	Ms. Bhakti peje	Department of Fisheries, Ratnagiri (Maharastra)
11	Dr. Vishnudas Gunaga	Deputy Director, MPEDA, Ratnagiri
12	Mr. Amol patil	OMEGA fishmeal & Oil PVT. LTD Ratnagiri
13	Mr. Manoj Kushe	OMEGA fishmeal & Oil PVT. LTD Ratnagiri
14	Mr. Rohit Sancelcar	Manager, , Zuari Marketing Fisheries Co-operative Society, Goa
15	Dr. S.T. Indulkar	College of Fisheries, Ratnagiri
16	Dr. S.D Naik	College of Fisheries, Ratnagiri
17	Dr. A.S. Mohite	College of Fisheries, Ratnagiri
18	Dr. G.N. Kulkarni	College of Fisheries, Ratnagiri

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19	Dr. S.B. Patange	College of Fisheries, Ratnagiri
20	Dr. S.A. Mohite	College of Fisheries, Ratnagiri
21	Dr. R. A. Pawar	College of Fisheries, Ratnagiri
22	Dr. B.P. Bhosale	College of Fisheries, Ratnagiri
23	Dr. V.H. Nirmalea	College of Fisheries, Ratnagiri
24	Dr. Mohd Ashraf Rather	College of Fisheries, Ratnagiri
25	Dr. santhosh Metar	MBRS, Ratnagiri
26	Dr. K.J. Antony	OMEGA Fishmeal & Oil PVT.LTD
27	Mrs. Latha Srinivasan	CP Aquaculture (India) Private Limited
28	Mr. Sakthivel M	CP Aquaculture (India) Private Limited
29	Mr. Kamlesh Parab	OMEGA Fishmeal & Oil PVT.LTD
30	Mr. Ashish Salvi	OMEGA Fishmeal & Oil PVT.LTD
31	Mr. Chinar Prasade	OMEGA Fishmeal & Oil PVT.LTD
32	Mr. Yogesh Bhatkar	OMEGA Fishmeal & Oil PVT.LTD
33	Mr. Amit Kumar	OMEGA Fishmeal & Oil PVT.LTD
34	Mr. Sanjay Dhumal	OMEGA Fishmeal & Oil PVT.LTD
35	Mr. Abhijeet Padalkar	OMEGA Fishmeal & Oil PVT.LTD

Mrs. Latha, CP Aquaculture (India) Private limited, Host and Anchored the workshop throughout the day. She invited the guests Dr. H.S. Dhaker, Associate Dean, College of Fisheries (CoF), Ratnagiri, Mr. Duncan Leadbitter, Director of Fish Matters, Australia, Mr. Pichaiyut, Senior Vice President, CPF (India) Private Limited, Mr. Amol Patil, Director, OMEGA Fishmeal & Oil PVT. LTD and Mr. Anand Palav, Assistant Commissioner, Department of Fisheries, Ratnagiri (Maharashtra) to gather on the dais and Mr. Amol patil are invited to deliver the welcome address.

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TITLE: Minutes of Workshop (Ratnagiri)**Welcome Address:**

Mr. Amol Patil Director, Omega fishmeal and Oil Company opened the meeting by welcoming the chief guests who are presented on the dais, government officials from various government agencies and institutes and other guests for the workshop on Stock Assessment of India Oil Sardine (IOS) Along the Coastal Waters of Goa and Maharashtra which is regards to FIP.

During his speech he mentioned that, this is the 3rd workshop we are conducting for FIP project and we are now entering into the next phase of the project. He summarised about the previous workshops which was held in GoA during the years 2017 and 2018. He encouraged all the stake holders & guests and spoke about the interest of Omega Fishmeal and Oil in ensuring the long term sustainability of the IOS resource as it provided not only a basis for his business but helped to create jobs across India via aquaculture production and exports. He also requested them to give the feedbacks and opinions on the points which are going to be discussed in the later sessions. After his welcome note, the respective chief guests are invited for lightning of the lamp ceremony. Also, the Respective dignitaries are honoured with bouquet.

Key Note Address:

Dr. Hukum Singh Dhaker are invited to deliver the key note address and during his speech, he states that, the Indian Oil Sardine resource was under a lot of fishing pressure and managers needed to take note of scientific advice. Kerala government has following the rules and regulations for fish catching (minimum size of catch) and the same thing Maharashtra government also should follow because, the production yield is lesser in Maharastra than kerala according to the last 3 years data.

He highlighted the CMFRI report and said, climate changes also affects the IOS production especially in re-productivity, food & feeding in sea (Environmental Factors).

He also said, IOS is indirectly plays a major role in shrimp farming and he assured that College of Fisheries will support for this Fishery Improvement project.

Session I:

Mr. Duncan Leadbitter from Australia based consulting firm, Fish Matter, provided an overview of the development of the FIP to date, including its rationale and the steps taken by the stakeholder committee to engage interested parties and develop key documents such as the

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fishery Action Plan (FAP). He outlined the purpose of the workshop and what would be the next steps.

Presentation:

Mr. Duncan Leadbitter has presented the outline about the sustainable fisheries from the responsible sources, IFFO certification, FIP for IOS- history to date, Fishery Action Plan, Future needs for FIP.

From his introduction part, Fishery products are widely traded and over the past years or so there has been rapid growth in the number of companies wanting to commit their support to sustainability efforts. The motivations for companies supporting the move to sustainability are divers but include financial considerations, market opportunities and public pressure.

Certification and labelling programs have been part of the demand side of sustainable fisheries. Certification programmes such ASC, BAP has the certification requirements for the fisheries that supply fish or feed. Farmed shrimp is a heavily traded global commodity.

The responsible sourcing program of the IFFO (The Marine Ingredients Organization) uses the CCRF (Code of Conduct Responsible Fisheries) to create the scheme that evaluates the performance of a fishery from a responsible management perspective.

IFFO RS has approved feedfish fisheries that supply about 55% of world demand. This is dominated by some high volume fisheries, such as Peruvian anchovy. In addition it has also approved about 40% of world by product supplies.

Regarding this FIP, Indian oil sardine is the key player which is commissioned by CP Aquaculture (INDIA) PVT LTD and OMEGA fishmeal & Oil PVT LTD for sustainability and this FIP covers the purse seine sector and only part of the range of the west coast stock of IOS (GoA and Maharashtra).

As of now, for this project, received a fishery assessment which was conducted by an independent company and a draft FAP has been created and discussed with stakeholders. It has also been out for peer review and the comments received are being addressed.

The website <http://indiasardinefip.co.in/> which provides information about the FIP and its stakeholders. It is being updated on a regular basis.



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The next major milestone is to have the FIP approved by IFFO-RS and this workshop is part of that process.

FAP is a multiyear document and we aim to address the various gaps over several years depending on their importance, degree of challenge and funding availability. IFFO-RS requirements is for stock assessments on a 3 year basis. There is also insufficient information available on catch compositions and no information available on any interactions with protected/endangered species.

He defined the main work area of the FIP-FAP. The details are,

Clarification of management and enforcement arrangement as short term progress, clarification of management rule (harvest strategy) and determination of ecosystem implications of the fishery are comes under medium term progress.

Data collection for stock assessment, catch composition, threatened species interactions, habitat interactions and it should be a short term progress (One year) and this is the today's agenda to be discussed in this workshop.

Finally he said, this workshop finding will be helpful to fill the gaps and it will be resubmitted to IFFO RS for further process and approval. The FIP committee will continue to work with government, stakeholders to implement the FIP.

Session II

Dr. Shridhankar, Head, Department of Fisheries, Ratnagiri are invited for this session and he presented the topic behalf of Dr. V. D. Deshmuk retired CMFRI because of his absence due to flooding in Mumbai. Dr. Shridhankar has 20 years of experience in both teaching and research experience.

He presented on Current stock assessment approaches and method and topics about

- How is the current stock assessment conducted?
- What data are used and how and where are they collected?
- What stock assessment model is used?
- What is the process for conducting the stock assessment?

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He defined the fish population dynamics model as Stock size fluctuations can be estimated by accounting for four key processes, additive processes (growth, recruitment) and subtractive processes (fishing mortality, natural mortality) over time.

$$B_{t+1} = B_t + R + G - M - C$$

Stock assessment can be approached in two levels. 1. Micro level assessment for catch and effort analysis. 2. Macro level assessment for stock characteristics (Growth, mortality, recruitment, age structure and length structure) and fishery characteristics (Gear characteristic, age/length at capture and fishing effort).

For the stock assessment, he spoke about the Holistic or macro or surplus models, recruit model, Virtual population analysis (VPA), Length coherent analysis (LCA), Time series modeling, ecological modeling, and simulation model. Also he defined the merits and demerits of the models.

Holistic and macro models do not consider events within the population and ignore growth and mortality of individuals and the effect of mesh size on age of fish capture.

The Schaefer and Fox models which are termed as surplus production model are popular model of this approach and it is an short time, required few month to complete.

Many inputs are required for recruit model (Yield per recruit) and for VPA, its time consuming and long term. Minimum 3 years data are required for length coherent analysis but with short data series (even one year) something can be said about the state of the stock, group wise length can be analysed by this model.

Time series analysis has been used for prediction of next year landing but changes in the catches because of environmental changes. Ecological modeling is a multispecies model, VPA and MSVPA are belongs to this group. Two systems ECOPATH & ECOSIM are available for this modeling. Simulation model will become global model.

During the discussion, the followings are pointed, IFFO RS requires that a stock assessment is conducted at last once every 3 years but is not perspective as to how such an assessment is to be undertaken.

A surplus yield model would enable estimates to be provided of MSY and fMSY.

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Dr. Pawar said to consider the length frequency analysis and ecological systems during the study and the same said by Dr. Mohite, Dr. V.H. Nirmalea said to consider about the climate changes and Dr. Santhosh suggested the length – weight relationship.

Mr. Velip said more than 20 years of data available in GoA for stock assessment. So that, Dr. H.S. Dhaker asked to make combined efforts (GoA & Maharashtra) for stock assessment and Dr. Shridhankar agreed for that. Sampling frequency also discussed.

Session III

Dr. V.H. Nirmalea, College of fisheries are invited to present on the topic of Stock assessment of IOS along the coast of Ratnagiri. He has 10 years of total experience in teaching and research.

During his presentation, the results of a study of the 5867 Indian oil sardine (82-218 mm long) sampled over the period of 2010-2012. Maharashtra state is responsible for about 15% of india's catch of Indian oil sardine and ratnagiri is the dominant port. The study made use of analytical tools such as ELEFAN and von Bertalanffy growth curves to generate estimates of total instantaneous mortality (5.23/year), natural mortality (1.45/year) and fishing mortality (3.78/year). These figures collectively indicate, heavy fishing pressure. Other indicators included probability of capture and exploitation ratio. Other relevant information included maximum length (233 mm), K-0.92/year, age at length-0.0023/year, length at first capture (LC50) – 164 mm and size at first maturity – 175 mm. The latter two indices indicate growth overfishing as a result of too many immature fish being taken. The exploitation ratio of 0.72 also indicates excessive fishing pressure during the study period.

During the discussion, Dr. shridhankar suggest to collect the samples from Maharastra to GoA for this FIP and Dr. V.H nirmalea said selective locations has to be selected.

After post lunch, Mr. Duncan discussed with participants regarding the previous sessions are summarized. The discussion was about stock assessment duration, Who will do the stock assessment, who are will involve in this project etc.,

Regarding the above topics, College of fisheries will do this project for stock assessment and students and field assistants will involve for this assessments (Detailed discussion was there in the college of fisheries on 04/07/2019).

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TITLE: Minutes of Workshop (Ratnagiri)**Session IV:**

Dr. Ravindra Pawar, Professor, COF, Ratnagiri are invited to present on Indian Oil Sardine catch characteristics and he has 20 years of experience in both teaching and research field.

He reported on two studies and in his presentation, Assessment of marine landings of Ratnagiri with reference to some common ecosystem indicators. He explained about Pmat (Proportion of Maturity), Popt (Proportion of optimum), Pmega (Fraction of mega spawning), Pjuv (proportion of juvenile).

Study 1: A PhD thesis undertaken during the period 2016-2018. This thesis evaluated 37 major species against a suite of ecosystem indicators.

This study sampled 2090 fish and was conducted on a weekly basis. The mean length at capture was 14.7cm (range 10.5-22.2cm) and the optimum length was 14.2cm. According to the analyses undertaken the IOS stock in the Ratnagiri area is optimally exploited and the stock is abundant (the average of the past 3 years catches is 82% of the historical maximum).

Study 2: Some aspects of bycatch and discards of marine fisheries of Ratnagiri in the period 2013-2014. This included all major gear type (gill net, longline, trawl and purse seine).

This study was conducted by vessel based observers. It founds that of all purse seine sets, 48% were considered IOS sets (IOS was >80% of the catch in the net). Sampling revealed that sardines comprised just under 94% of the catch, bycatch was about 6% and discarding was negligible (0.002%). Only 3 species groups were discarded (jellyfish, sea snakes and pufferfish). One species of puffer, *Tetraodon pustulatus* is listed as Vulnerable by the IUCN) A list of bycatch species was provided.

It should be noted that for the sets that comprised the other 52% of the catch a small number (3 of 115) were considered to be fimbriated sardine sets whilst the others were dominated by a range of other species such as scads and mackerels. Details are in the thesis.

These studies were able to determine species caught, landed and supplied for fish meal. A number of bycatch species are included in the fishmeal supply chain but in very small quantities.

It was noted that size at first maturity has declined over time.

With regards to the conduct of stock assessments a question was raised about how to account for illegal catches. There have been a number of instances of Chinese vessels reported to be fishing with lights within the India EEZ. There was also a question about how to account for vessels from

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southern ports that may fish in national waters adjacent to Goa and Maharashtra and then land their catch when they head home.

Distribution of Certificates:

After this session, Certificates were distributed to the participants.

Vote of Thanks:

Last but not least, the programme was successfully completed with vote of thanks given by Mrs. Latha and she thanked the respective chief guests and all the participants.

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