

**FISHCODE
MANAGEMENT**

**FAO/NORWAY PROGRAMME OF ASSISTANCE TO DEVELOPING
COUNTRIES FOR THE IMPLEMENTATION OF THE CODE OF CONDUCT FOR
RESPONSIBLE FISHERIES**

SUB-PROGRAMME F : PROVISION OF SCIENTIFIC ADVICE TO
FISHERIES MANAGEMENT

**REPORT OF A WORKSHOP ON THE
FISHERY AND THE MANAGEMENT OF
BALI SARDINELLA (*Sardinella lemuru*) IN BALI STRAIT**

**Denpasar, Bali, Indonesia
6 – 8 April 1999**

Workshop Proceedings and Recommendations

OPENING OF THE WORKSHOP

(1) The Workshop on the Fishery and Management of Bali sardinella (*Sardinella lemuru*), locally known as lemuru, took place at the Kuta Beach Hotel, Denpasar, Bali, Indonesia, from 6 to 8 April 1999. It was funded by the FAO/Norway Inter-Regional Programme of Assistance to Developing Countries for the Implementation of the Code of Conduct for Responsible Fisheries (known as FISHCODE), Sub-programme F: Assistance to Developing Countries for Strengthening the Provision of Scientific Advice to Fisheries Management. The Workshop was attended by 30 participants representing various government institutions: research (RIMF, CRIFI, FTDC), management (Provincial Fisheries Services of Bali and of East Java, DGF), university (UNDIP), fishermen and fish processing industry. A full list of participants is given in Appendix I.

(2) On behalf of FAO, Mr Siebren Venema, Project Manager of FISHCODE, thanked the Government of Indonesia for the excellent preparations for the workshop and extended his welcome to participants. The welcome address was given by the Director-General of Fisheries, Ministry of Agriculture, Indonesia, Mr Untung Wahyono, who also officially opened the workshop. The complete addresses appear in Appendix II.

OBJECTIVES AND PROCEEDINGS OF THE WORKSHOP

(3) The Workshop was organized as a forum where the stakeholders in the lemuru fishery of Bali Strait could openly discuss the status of the resources and management of the fisheries. The objectives of the workshop were: (a) to assess the status of the resource and its level of exploitation; (b) to review the current management practices of the fisheries (prioritizing the issues to be addressed); and (c) to develop a draft management plan. The Agenda is presented in Appendix III.

(4) As the majority of the participants were Indonesian, and to make the deliberations more efficient and productive, the Workshop was conducted in the local language (bahasa Indonesia). Whispered translation and short summaries were provided for the benefit of the FAO staff and consultant.

SUMMARY OF PRESENTATIONS

Tuesday, 6 April 1999

Overview of the Code of Conduct for Responsible Fisheries

(5) In his presentation, Mr Martosubroto, FAO Fisheries Resources Division, highlighted the historical background of the Code of Conduct for Responsible Fisheries (CCRF), a global fisheries undertaking supported by developed and developing countries that led to the formulation of the CCRF. The process of formulation of the CCRF took about four years since the issue was first raised in an international forum (COFI session in 1991) and the CCRF's final endorsement in 1995.

(6) The need of the developing countries for assistance in implementing the CCRF was clearly spelled out in its Article 5. Norway, as one of the donors, provided a positive response

to the inter-regional programme developed by FAO with particular focus on the strengthening of Monitoring, Control and Surveillance (MCS) (Sub-programme C) and the provision of scientific advice to fisheries management (Sub-programme F) under whom the current workshop was organized.

(7) Three countries in Southeast Asia are participating in Sub-Programme F. While Indonesia has chosen the lemuru fishery of the Bali Strait as the referenced fisheries in this project, Malaysia has selected the kembung (short mackerel) fishery of the west coast of peninsular Malaysia and Thailand the anchovy fisheries of the Gulf of Thailand.

Status of the lemuru fishery, the resource, and their management

(a) Presentation by Provincial Fisheries Services, processing industry and fishermen representative

(8) This session was opened with the presentation of the representatives of the Fisheries Services of the two provinces around the Bali Strait (Mr Bangkit from the Bali Province and Mr Ch. Budi Sasongko from the East Java Province). The majority of the fishing vessels are based in Muncar (fishing port in East Java), but the main fishing grounds are found in an area close to Bali. Some of the catch is consumed fresh and some is processed in the form of canned and boiled-salted products for human consumption, while the main part is converted into fishmeal. There are currently 12 canneries in East Java and 7 in Bali, 24 processing plants for boiled-salted products in East Java and 10 in Bali, and 24 fishmeal plants in East Java and 10 in Bali. Representatives of both provinces are concerned about the management of the fishery due to the “boom and bust” nature of the landings mainly caused by natural phenomena.

(9) A representative of the cannery and fishmeal association expressed concern about the present (large) capacity of the canning and fishmeal industry. Some of the canneries in the last five years have relied on raw materials from outside Bali Strait including tuna from Eastern Indonesia and even mackerel imported from the Netherlands (as witnessed by the reporter during a field trip after the workshop). The representative also indicated the likely underestimate of the Government’s sardinella catch statistics, in particular during the periods of a boom in landings. He also questioned the role of a ceiling price policy by the government as in reality the ceiling price had always been below the market price.

(10) A representative of the fishermen referred to the low catch since 1998 and the fact that some fishermen had switched to gillnetting and hook-and-line fishing, targeting hairtail (*Trichiurus* spp.), which fetches a high price in response to the increased demand for export to the Republic of Korea. With the current economic crisis in Indonesia, importing fishmeal becomes expensive and the local fishmeal producers, and in turn the fishermen, have enjoyed the benefit of a price increase for their fishmeal production.

(b) Presentations by the Study Team

(11) A study team, commissioned by the FISHCODE project, prepared the review study. The team was headed by Dr G.S. Merta, senior scientist at the Research Institute for Marine Fisheries. The review of the resources included biology, distribution and the fishing area of lemuru. Lemuru is mainly caught in the Bali Strait and the fishing grounds are generally

much closer to Bali than to East Java. Lemuru is the main target species of the fishery, although small quantities of other small pelagic species are also found such as tembang (*Sardinella sirm*), banyar (*Rastrelliger* spp.) and round scad (*Decapterus* spp). Small tuna species are also caught by gillnet, including bonito (*Sarda* sp.), bullet tuna (*Auxis* spp.) and eastern little tuna (*Euthynus affinis*).

(12) The purse seine with a mesh size of $\frac{3}{4}$ inch (1.9 cm) has been the main gear used in the fishery since 1974. Fishing is conducted at night by means of light attraction, with daily landings. The majority of the catch consists of fish with an average size of more than 11 cm. Smaller sized fish are found inshore and are normally caught by liftnets. The main fishing season is during the west monsoon (September to January) which coincides with the occurrence of upwelling when phytoplankton is abundant. During other seasons of the year, fishing is confined to a certain part of the Bali Strait and only a few boats are fishing.

(13) The lemuru fishery in Bali Strait is a closed fishery in the sense that only fishermen from both sides of the Strait of the two bordering provinces, Bali and East Java, fish in this area. Fishermen from outside Bali Strait are not made welcome by the local fishermen. The landings have shown wide fluctuations. From a peak of 48,000 tonnes in 1983 landings dropped in the following years, with the lowest catch in 1986 of 4,600 tonnes. Another peak occurred in 1991 with landings of 61,000 tonnes, which then dropped again to 13,000 tonnes in 1996, after which the catch rose again to 50,000 tonnes in 1997, to drop again in 1998.

(14) The fishery developed rapidly following the introduction of purse seines in 1974 and the number of purse seiners has increased ever since. The number of fishermen increased in accordance with the increasing number of vessels, in particular in East Java (based in Muncar), and to a lesser extent in Bali (based in Pengambangan). A rapid increase in the number of fishing vessels has led to the adoption of management measures dealing with a maximum allocation of fishing vessels between the two provinces. In 1977 only 100 vessels, comprising 50 vessels for East Java and 50 for Bali, were allowed to fish in the Bali Strait. This allocation was later changed to meet actual developments, namely to 133 (73 for East Java and 60 for Bali) in 1978, and then to 273 (190 for East Java against 83 for Bali) in 1985. The allocation in 1985 was reviewed in 1992 but no change in the number of vessels was made, only the maximum allowable size of net that was increased twofold to 300 m with a minimum depth of 60 m. In the absence of regular monitoring of technological advancement in the fishery due to the weaknesses in MCS, the increases of fishing effort have been undetectable.

(15) The schooling behaviour of lemuru and the dependency of the fish on changes in environmental conditions posed a great challenge to scientists in the assessment of the resources. Past assessments based on production and analytical models provided indications of overexploitation, while acoustic surveys disclosed that schools often stay in relatively deep waters beyond the reach of the current fishing gear. The low landings during the off season could at least in part be a reflection of this condition. Constraints in stock assessment prevented scientists from providing a yearly prediction of catches for the benefit of the processing industry.

(16) The fishery has evolved from a simple two-boat purse seine fishery, with one main boat with a single outboard engine, one small boat to carry the purse seine net and one dingy as a platform for the kerosene lamp. The vessels have evolved to a bigger size, with 4 outboard engines and the net has reached a length of 300 m. Management measures in

addition to limiting the number of vessels have also included a minimum mesh size of 1 inch. The absence of a monitoring system for the fleet and gear has led to the present situation where the number of boats kept increasing until 1995 and the continued use of net with a mesh of less than 1 inch. (Fishermen are reluctant to use the larger mesh size of 1 inch because the fish get gilled).

(17) Socio-economic aspects of the fishermen and the fishing industry was presented by Mr Riyanto Basuki, a member of the Study Team. He indicated that about 11,000 fishers based in Muncar (East-Java) and about 5,000 fishers in Bali were dependent on the lemuru fishery. During the low season, some fishers switched to other fish such as tunas and hairtails. The latter met a good price in recent years due to an increased demand for export to the Republic of Korea.

(18) Mr Yunizal, another member of the Study Team presented the current situation of the processing industry. The economic crisis that hit the country resulted in a decrease in the import of fishmeal and an increased demand for locally produced fishmeal and consequently an increase in the price of local fishmeal. The use of CSW (chilled seawater) in the fishing boats has become popular since its introduction in 1985 by the Post Harvest Research Branch of the Research Institute for Marine Fisheries in Jakarta. However, during the good season the capacity of ice plants was still below the demand for ice. The absence of cold storage capacity at the landing sites was also a hindrance to obtaining a good quality product from the fisheries.

Wednesday, 7 April 1999

The relationship between catch and the environment

(19) Catches have shown large fluctuations in the last two decades despite relatively small changes in fishing effort in terms of operational numbers of boats. Therefore the relationship between catch and fishing effort does not comply with standard stock assessment models. An attempt has been made to include environmental parameters in the assessment of the fisheries as presented by Dr. Abdul Gofar of the Diponegoro University. Incorporating the Southern Oscillation Index (SOI) into a surplus production model led to a better fit. Results of acoustic surveys in the seventies (Venema, 1996)¹ indicated that the schools of lemuru concentrated in deeper waters and further offshore during the low season, generally beyond reach of the fishing gears currently used. It was suggested that regular acoustic surveys should be conducted to help assessing the stock, and to provide predictions of future catches as demanded by the industry.

(20) Several participants mentioned the potential impact of effluents from industries (including the fish processing industry) on the coastal environment. However, in the absence of any study on this matter in the Bali Strait it was not yet possible to make any judgement on the possible impact.

Developing a draft fisheries management plan

¹ Venema, S.C. (1996) : Results of surveys for pelagic resources in Indonesian waters with the *R/V Lemuru*, December 1972 to May 1976. In : Pauly, D. and P. Martosubroto (eds. 1996) : Baseline studies of biodiversity: the fish resources of Wetern indonesia. ICLARM Stud. Rev. 23, 321p.

(21) On the second day, Dr Barry Pollock, consultant, introduced the principles and process of the development of a Fisheries Management Plan (see Appendix IV). He gave examples of the management plans of various fisheries under the jurisdiction of Queensland State in Australia. A management plan is the outcome of a process involving all stakeholders where issues in a particular fisheries are addressed and a plan of action is formulated and agreed upon. He described general elements of a fisheries management plan and in the context of the lemuru fishery he highlighted important elements as a basis for discussion on the development of a management plan. Not only did he emphasize the need for active participation of all stakeholders in the process of development of a management plan, he also stressed that no management plan is perfect. Therefore, it is normal that a regular (annual) review always has to be conducted by the stakeholders.

(22) Based on all presentations regarding the lemuru fishery on the first day, Dr Pollock highlighted the eight components of the lemuru fisheries which should form the management plan; these included: (1) Description of the fishery; (2) Jurisdiction and legislation; (3) Objectives of management; (4) Operational management; (5) Research and stock assessment; (6) Monitoring, Control and Surveillance; (7) Consultations with stakeholders and extension; (8) Post-harvest sector; and finally (9) A provision for a Review of the Plan.

Working group discussions

(23) The eight elements of the management plan were used as a basis for discussion. The Workshop participants were divided into eight groups to draft inputs for the management plan and to discuss issues that needed further attention relevant to each individual components. Based on the issues identified, actions needed were also discussed and formulated. In order to obtain maximum inputs in the discussions, after a first round two groups were combined (e.g. group 1 and 2, 3 and 4, etc.) to discuss the issues further, so that in total results became available from four working groups (see last part of Appendix IV).

(24) The process of working group discussions took about three hours after which a plenary session took place where the four working groups presented their findings.

Thursday, 8 April 1999

(25) The draft management plan (see Appendix V) as presented and discussed in the plenary session of the previous day was discussed once more in the morning session in the form of a voting procedure where individual participants were asked to prioritize the issues and actions to be taken to deal with the management of the lemuru fishery.

(26) A voting mechanism was designed to make the prioritization process as democratic as possible. Each participant was given ten votes to be distributed over the issues concerned according to each individual's priority. The voting process resulted in the final ranking of issues as presented in Appendix VI and further discussions led to the actions proposed in that Appendix.

Summary of findings

(27) It was clear from the workshop that the process of developing a management plan facilitated by the workshop was a first experience for practically all participants, both from the government and the fishing industry. It also became clear that, in addition to government representatives, the role of representatives of fishermen and fish processors is very important in putting together a fisheries management plan.

(28) Among the ten highest priorities in the fisheries management plan, MCS occupies a high rank. A good MCS system does not only provide a report on compliance, but it should also provide good data and information upon which management plans should be based. When management becomes transparent and stakeholders become part of it, they should play a role in MCS as well.

(29) The high rate of fluctuations in the landings of lemuru appear to be a reflection of high fluctuations in abundance and/or catchability of the fish population due to environmental conditions rather than being a direct result of the impact of fishing. This general feature of small pelagic fisheries poses a difficult task for scientists in assessing the fish stock. A complete life history study of the fish is required. It should also cover studies of larval stages, food and feeding, in addition to studies of the mature stock. There is still no clear evidence as to whether or not the adult fish migrate to the Indian Ocean during a certain part of the year. Acoustic surveys are recommended to study further the distribution and abundance as well as behaviour of the schools.

(30) Another important point which came out of the discussion is the recognition of the need to have a Management Committee or Task Force representing stakeholders, and it was agreed that by April 2000 such a Management Committee should be established. The Management Committee should be responsible for the implementation and regular reviews of the Fisheries Management Plan as formulated and agreed by all stakeholders.

APPENDIX I

**WORKSHOP ON THE
FISHERY AND THE MANAGEMENT OF
BALI SARDINELLA (*Sardinella lemuru*) IN BALI STRAIT**

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APPENDIX II

Welcome address by the Indonesian Director-General of Fisheries

Distinguished Representative of FAO, Director of the Central Research Institute for Fisheries, Head of Regional Representative of the Ministry of Agriculture, Head of Bali and East Java Provincial Fisheries Services, Participants, Guests, Ladies and Gentlemen.

It is an honour and privilege for me to welcome you all to the Workshop on the Lemuru Fisheries and their Management in the Bali Strait.

We consider this Workshop as one of the important steps in the implementation of the Code of Conduct for Responsible Fisheries. In this opportunity I would like to extend my gratitude and appreciation for the assistance of FAO through this Norway-funded project. Other activities in Indonesia that have been carried out in the context of the Code include assessments of fish stocks in the exclusive economic zone. This activity has been initiated more than 20 years ago when Dr. Purwito Martosubroto was still one of our scientists in the Research Institute for Marine Fisheries.

Updating assessment of fish stocks in Indonesia has been conducted recently by the National Scientific Committee on Marine Fish Stocks Assessment. This committee established by the Indonesian Institute of Sciences (LIPI) consists of scientists from various institutions. Based on the result of the assessment, the potential maximum sustainable yield (MSY) of the marine fish stocks in the Indonesian territory is about 6.26 million tonnes. Our target in the management of fishery resources is to reach the development of fisheries to a level where the exploitation of the fish stocks should be at 80% of MSY. In 1997, overall production from the marine sector is still only about 57% of MSY. It means that there is room to increase marine fishery production. However, in reality fish stocks in some areas have already been exposed to high levels of exploitation and some are already over exploited. The sardine stock in Bali Strait is one of our resources that is reported to be over exploited.

The Bali Strait fishery has played a significant role in supporting the development of regional economy, especially after the introduction of small purse seines in 1975. Development of this fishery has positive impacts on the development of upstream and downstream industries, embracing both traditional and modern industries. Fishing has been conducted by small scale/household industry and also by fishing companies. The development of fisheries industries has also resulted in the increase of job opportunities. Currently, there are many fishery households and companies dependent on the sardine fishery and therefore they rely on the sustainability of the fishery. In other words, the health of the sardine stock determines the sustainability of the regional economy.

It is in this context that the initiative of the Food and Agriculture Organization to conduct a review study upon which sound management policy would be generated is highly appreciated. The result of the study will be an important contribution to our effort in ensuring sustainable fisheries development. I hope that the outcome of this Workshop will guide us in the management of sardine fisheries in Bali Strait and more importantly the process in the development of management plan in the workshop should form a basis for our staff in developing such a plan for other fisheries in the archipelago.

Finally, I would like to extend my special thanks to the Head of Bali Provincial Fisheries Service for the assistance and excellent preparation of the Workshop and I wish you all successful deliberations. Finally I declare the Workshop open.

Thank you

Ir. Untung Wahyono M.Sc
Director-General of Fisheries

Address by the Project Manager of FISHCODE

Director General Perikanan, Director Program, Kepala Dinas Perikanan Bali and Jawa Timur, other Directors, and staff of DGF, Research Institutes, Universities, and Provincial Offices, Representation of the fishing industry and fishermen associations, colleagues,

Ladies and Gentlemen,

On behalf of the Director General of FAO, Mr Jacques Diouf, the acting ADG of the Department of Fisheries, Mr Harcharik and as Project Manager of the new FISHCODE project (GCP/INT/648/NOR), I welcome you to this workshop dealing with the fisheries on and the management of the Bali Sardinella (*Sardinella lemuru*).

The FISHCODE project has been set up to provide assistance to Governments in the implementation of the Code of Conduct for Responsible Fisheries (CCRF) that was agreed to by FAO's Member States in 1995. This CCRF is intended to assure Sustainable Fisheries for the future through good management.

The CCRF is only a small booklet, but it covers many complicated issues. Therefore, FAO has decided to assist Governments in two ways, 1) by producing Guidelines that clarify issues related to implementation of the CCRF, and 2) by setting up projects that can assist Governments in the implementation of the Code.

The Government of Norway has been kind enough to fund two project elements, one dealing with Monitoring, Control and Surveillance (MCS) and one dealing with the Provision of Scientific Advice for Management. Indonesia has already started to benefit from activities organized for both components, viz. a workshop on MCS held at Kuala Lumpur in 1998 and the workshop that will be starting today.

It is the intention that both Workshops will have follow-up activities in Indonesia, within the constraints of funding.

The sub-project dealing with Scientific Advice has selected a small number of fisheries in the Caribbean, southern Africa and SE Asia, of which the fishery for lemuru in Bali Strait is one. The fisheries in South and Southeast Asia are the direct responsibility of my colleague, Purwito Martosubroto.

The choice of the Bali Strait fishery is a lucky one. It is a relatively simple situation and a basis for research and management has already been established many years ago. Therefore, it is an ideal fishery to use as an example for similar activities on other resources and fisheries in Indonesia and abroad.

The fishery, its research, development and management have a history of about 30 years. The FAO/UNDP research vessel LEMURU was deployed in the early seventies to find out why the resource was apparently fluctuating widely. The results of the study showed that the resource was always present in the Bali Strait, but periodically it would concentrate in an area out of reach for the non-motorized boats operating from Java and Bali. The introduction of outboard engines around 1975 changed this situation dramatically, and the second introduction of purse seines led to a very substantial increase in landings.

In recent years we have seen that despite management measures to control fishing effort, the landings have shown dramatic fluctuations. It is quite evident, because of similarities in other fisheries in India, for example, that also environmental condition can play a dramatic role in the abundance of the resource. It is of course impossible to control such environmental effects.

The best that can be done is to try to regulate the human aspects of the fishery. The aim of this particular workshop is to document what is already in place in terms of a Fishery Management Plan and also which issues need further attention and improvements. In subsequent Project Activities, which could be in the form of another workshop, the present Fishery Management Plan could be improved, trying to solve the often delicate management issues. This may include activities of the other element of the FISHCODE project, dealing with Monitoring, Control and Surveillance.

Fortunately, the task of documenting the present fishery and its management is facilitated by the excellent report that has already been produced by our colleagues Gede Sedana Merta, Ketut Widana, Yunizal and Riyanto Basuki. Also the reports prepared by the Provincial Offices will be very helpful in this endeavour.

Unfortunately, the knowledge of bahasa Indonesia of Dr Pollock and myself is very limited, so we will not be able to follow the discussion in great detail. But we hope that you will all freely participate in the discussions and contribute your knowledge to the benefit of all.

Let me stress that it is of utmost importance that the whole process of setting up and changing a Fishery Management Plan is done with the input of all stakeholders, i.e. all those who have an interest in a well-managed fishery. I therefore would like to extend a special welcome to the fishermen and fish processors who will be taking part in this workshop.

On behalf of FAO I should like to express my sincere thanks to the organizers of this workshop, to the Government of Norway that has made this event possible and also the Government of Queensland, Australia that has provided the services of Dr Pollock free of charge. I wish you a pleasant and productive workshop.

Terima kasih,

Siebren Venema

APPENDIX III

**WORKSHOP ON THE
FISHERY AND THE MANAGEMENT OF
BALI SARDINELLA (*Sardinella lemuru*) IN BALI STRAIT**

| Date and hour | Meeting Items | Presenter | Chairman | Rapporteur |
|----------------------|--|---|-----------------------|---------------------|
| 6 April 1999 | | | | |
| 08.00 - 09.00 | Registration | | | |
| 09.00 - 10.00 | Opening Session : | | | |
| | - Report of the Organizing Committee | K. Widana | | |
| | - Welcome Address | FAO/FISHCODE | | |
| | - Opening Address | DG of Fisheries | | |
| 10.00 - 10.30 | Coffee break | | | |
| 10.30 - 11.00 | Proceedings of meeting and the Code of Conduct for Responsible Fisheries. | Purwito Martosubroto. | Dir. Binus/ DGF | Salim / Gofar |
| 11.00 - 11.45 | Presentations by Fisheries Services of East Java and Bali Province | Fisheries Services | Dir. Binus/ DGF | Province |
| 11.45 - 12.15 | Presentation by stakeholders | Fisher Report Processors Report | Purwito M. | Suparno/ Yunisal |
| 12.15 - 13.00 | Discussion | | Purwito M. | Suparno/ Yunisal |
| 13.00 - 14.00 | Lunch | | | |
| 14.00 - 15.00 | Status of Exploitation and Management of Lemuru Fishery in the Bali Strait | Mertha, Riyanto Basuki, Yunizal, Widana | Subhat Nurhakim | Gofar / Salim |
| 15.00 - 15.30 | Coffee Break | | | |
| 15.30 - 16.30 | Discussion | | Subhat N. | Gofar / Salim |

| Date and hour | Meeting Items | Presenter | Chairman | Rapporteur |
|----------------------|---|-----------------------------|-----------------|-------------------|
| 7 April 1999 | | | | |
| 08.30 - 09.00 | Potential Impacts of Environment on lemuru stock | Abd. Gofar (UNDIP) | M. Fachturi | Salim / Riyanto |
| 09.00 – 09.30 | Common Features of Fisheries Management Plan and its process | Barry Pollock | M. Fatuchri | Salim/ Riyanto |
| 09.30 - 10.30 | Coffee Break | | | |
| 10.30 - 11.00 | Formation of Working Groups | Venema | Purwito M. | |
| 11.00 – 12.00 | Working Group Discussion | | | |
| 12.00 - 13.00 | Lunch | | | |
| 13.00 - 14.00 | Presentation by Working Groups | W.G. Leaders | Purwito M. | |
| 14.00 - 14.30 | Coffee break | | | |
| 14.30 - 16.00 | Working Group Discussions | W.G. Leaders | Purwito M. | Salim / Riyanto |
| 8 April 1999 | | | | |
| 08.30 - 10.00 | Identification of Action to Strengthening the management of lemuru (Follow up Action) | Venema / Purwito M. | Ali Supardan | Gofar / Salim |
| 10.00 - 10.30 | Coffee Break | | | |
| 10.30 - 12.00 | Conclusion & Recommendation Closing of the Workshop | FAO/ Purwito Dir Program | Ali Supardan | Gofar / Salim |

WORKSHOP NOTES – LEMURU FISHERY IN BALI STRAIT

by
Barry Pollock

Introduction: Several subjects and questions were raised at the Workshop on management of the Lemuru fishery in Bali Strait, which was held in Bali in April 1999. These notes are a summary of some of the matters raised and the responses provided.

Contents of a Fishery Management Plan: There are no rules on what should be contained in a fishery management plan. However such a plan would have a title and contain a description of the fishery as well as details on jurisdiction, objectives, operational management (access arrangements and input/output controls), MCS (monitoring control and surveillance), and details of how and when the plan will be reviewed.

The plan could also contain details of research and stock assessment, pricing policies for the fishery, environmental issues, socio-economic information, consultation arrangements, post-harvest issues, and bycatch.

Practical Models for Fishery Management Planning: New approaches are being developed to provide for effective planning in the management of fisheries. Two examples are given one for a fishery under single jurisdiction and the other for a multi-jurisdictional fishery.

1. Single jurisdiction



2. Multi-jurisdictional fishery

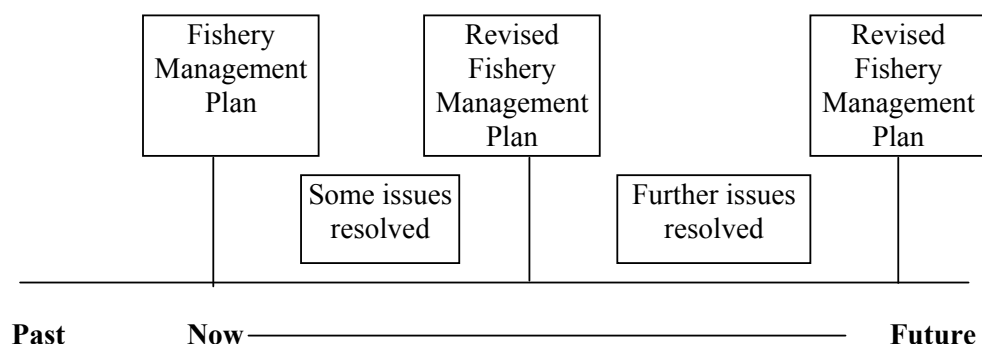


A MAC is a management advisory committee of stakeholders, usually chaired by an independent person. The MAC provides advice on the contents of the

fishery management plan to the fishery agency and government. The Joint Authority is a high-level committee (often composed of Ministers or their representatives) to agree on the overall policies for management of the multi-jurisdictional fishery.

Fishery Management Planning Process: The fishery management planning process is an iterative one that uses a fishery management plan or similar “vehicle” for detailing all the elements involved and providing a reference to how the fishery is managed. This planning process operates on the principle that the fishery management plan has a series of issues that need to be addressed for the plan to be improved and eventually updated. A simple diagram explains this on-going process.

Diagram of Fishery Management Planning



Common Questions: The following are some of the questions about fishery management planning, with a response provided.

1. *Why prepare a fishery management plan?*

Answer: The fishery management plan is the document that describes the fishery, what is known about it, and how the fishery is managed. It is the “vehicle” for organising the administration of the fishery, and for ensuring the integration of the functional aspects of the fishery such as jurisdiction, operational management, MCS, research, etc. The plan also enables deficiencies and other problems to be identified and actions taken for their resolution. Another important feature of a fishery management plan is that it provides transparency, that is an open and accountable documentation of the total status of the fishery and its management.

2. *When should a Fishery Management Plan be produced?*

Answer: The short answer is “now”. It is not difficult to draft a plan, provided you have access to all the existing information. The options are for either a small working group to prepare a draft and circulate it to others with expertise or to form a workshop of expert stakeholders to draft the plan.

3. *Is there a perfect Fishery management plan?*

Answer: No. Fishery management plans are documents that point to various shortcomings and other unresolved issues. These problems need to be worked on and resolved where possible so that the plan can be updated. The above diagram shows the model for continuous improvement of the fishery management plan. One of the issues in beginning a fishery management plan is the lack of information, particularly research information. However this should not be used as an excuse for preparing a plan to manage the fishery – remember the Precautionary Principle.

4. *Who are the stakeholders in the fishery management planning process?*

Answer: Stakeholders are those with an interest in the fishery and its management. Depending on the fishery they could include some or all of the following; fishers, middlemen, factory operators/owners, consumers, researchers, government officials, MCS operators, conservation agencies.

Workshop Presentation: The documentation used at the Workshop is presented below Attached as Appendices are the OHP transparencies presented at the Bali workshop;

1. Possible Contents of a Fishery Management Plan
2. Information for working groups

FISHERY MANAGEMENT PLAN - POSSIBLE CONTENTS

1. DESCRIPTION OF THE FISHERY

- Area
- Species
- Fishing methods
- Socio-economic information

2. JURISDICTION

- Governments and their agencies with roles in the fishery
- Formal or informal agreements between governments on fishery management
- Roles of all responsible agencies

3. OBJECTIVES OF FISHERIES MANAGEMENT

- Biological
- Social
- Economic

4. OPERATIONAL MANAGEMENT

- Access arrangements including licensing and non-licensed access
- Input/output controls
- Pricing policy/licence costs

5. RESEARCH AND STOCK ASSESSMENT

- Current research and stock assessment program
- On-going data collection
- Socio-economic studies
- Environmental issues
- Implications for management

6. MONITORING, CONTROL AND SURVEILLANCE

- Regulations/rules to be enforced
- Description of existing capacity
- On-going data collection

7. CONSULTATION WITH STAKEHOLDERS AND EXTENSION

- Stakeholders
- Consultation processes
- Provision of information

8. POST-HARVEST SECTOR

- Description of post-harvest sector
- Management implications

9. REVIEW OF THE PLAN

- How and when will the plan be reviewed
- Who has responsibility for the plan and its review

INFORMATION FOR WORKING GROUPS ON THE MANAGEMENT PLAN AND ON ASSOCIATED ISSUES

Background: Each of the 8 working groups (with 4 members) will be assigned to one of the headings in the Management Plan for Lemuru in Bali Strait. The tasks of each working group are:

Task 1.

- Provide details of the **current** situation relating to that heading. This should be done briefly, using headlines or bullet points.
- Provide separately a list of any **issues** such as problems, deficiencies or unresolved matters associated with that heading in the management plan

Task 2.

- Combine with one other working group (about 8 persons in total) and review each others work from Task 1, and list the issues in order of priority

Task 3.

- Each combined working group reports back to the whole audience and the results are discussed

Task 4.

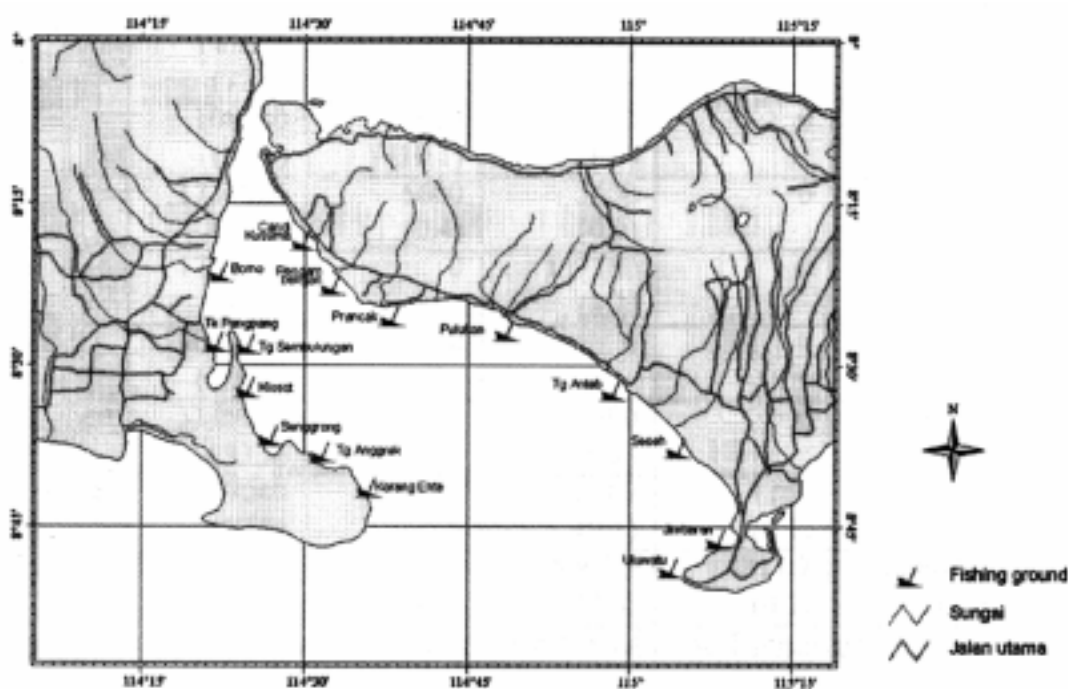
- The working group finalises both the details for the management plan and the list of issues. These are supplied to the secretariat by 4pm Wednesday.

DRAFT MANAGEMENT PLAN OF LEMURU FISHERY IN THE BALI STRAIT

1. Description of the fishery

Bali Strait is located between Java and Bali Island (see Figure 1). It has a funnel shape with a northern opening of about 2.5 km wide and a southern one of 55 km respectively. The shelf area extends from north to south with an average depth of 50m. The strait becomes deeper in the southern area especially in the centre part bordered by a narrow shelf in the western and eastern part. The width of the shelf in the western part ranges from 0.5 to 1.8 km, while in the eastern part it ranges from 3.5 to 15 km from the coast. The water mass of the Bali Strait tends to be more affected by the water mass of the Indian Ocean. Upwelling occurs during the southeast monsoon and it reaches a peak in July-August.

Figure 1. Bali Strait



The fishery exploits the Bali Sardinella (*Sardinella lemuru*). Other small pelagic species caught as bycatches include other sardine species (*Sardinella* spp.), round scad (*Decapterus* spp.), bonito (*Sarda* sp.), mackerel (*Rastrelliger* spp.) and small tunas (*Auxis* spp., *Euthynus affinis*). Purse seine is the main fishing gear used both by fishermen from East Java (based in Muncar) and Bali (based in Kedonganan). The fishing season occurs during the northwest monsoon, from September to January. However, due to rough seas, especially from late November to March, some of the purse-seiners will not operate, especially those based in Kedonganan (Bali), because there is no harbour.

Following the adoption of purse seine fishing in 1974, the catch has increased significantly in line with the increased number of vessels. However, the catch has shown a marked fluctuation, typical of a small pelagic fishery. The first peak was reported in 1983 with a total catch of 48,075 t. The catch then declined to an all-time low of 4,661 t in 1986, then it slowly increased and reached a peak of 61,669 t in 1991. In the following years the catch showed another decline and in 1996 the catch was only 13,327 t, it then climbed up again in 1997 to 50,202 t.

A large number of fishermen are involved including those in the post-harvest sector. The 1996 statistics indicated that there were about 12,000 from the East Java and 9,000 from the Bali Provinces engaged in this fishery.

2. Jurisdiction and legislation

The overall responsibility of fisheries development and management in Indonesia rests with the Ministry of Agriculture (i.e. Directorate General of Fisheries (DGF)). In implementing this responsibility, the DGF has delegated some of its mandate to Provincial Fisheries Services. Fishing and registration for vessels of less than 30 GT is under the responsibility of Provincial Governments, i.e. the Provincial Fisheries Services. As purse seine fleets operating in the Bali Strait are of less than 30 GT, their licences are issued by East Java and Bali Provinces.

There have been several joint agreements regarding management of lemuru fishery in the Bali Strait since 1977 between East Java and Bali Provinces. The latest agreement, dated 1995 and still in operation, constitutes various important elements :

- zoning, which delineates distribution of fishing for artisanal fishermen (without powered vessels – Zone I) from those with powered boats (Zone-2, see Figure 2);
- dimension of purse seine fishing in Zone II, being 300m of maximum length and 60m minimum depth;
- limitation on the number of fishing boats for a total of 273, of which 190 for East Java and 83 for Bali Province.

In addition, Ministry of Agriculture Decree No. 123/Kpts/Um/3/1975, dealing with minimum mesh size of 1 inch, still applies to this fishery, although there has been some resistance by fishermen. In practice fishermen have been using $\frac{3}{4}$ inch mesh net. In the absence of law enforcement in fisheries, the Provincial Fisheries Services rely on the work by the Coordinating Committee on Sea Security, headed by the Navy, for the implementation of rules and regulations.

3. Management Objectives

At present there are no lemuru fishery management objectives as such. However, general objectives of fisheries development and management are laid out in the development plan of the two Provincial Fisheries Services. These follow the general objectives stated in the national fisheries development plan of the Directorate General of Fisheries: (a) to increase

fishery production and export; (b) to increase fishermen's income; (c) to provide employment opportunities; and (d) to protect and conserve fishery resources.

It is clear that the various objectives listed above are not compatible with each another. Certainly, both Provincial Governments' main concern is towards the fishermen. The present fishing fleets still employ a large number of fishermen but modernization of fishing technology may reduce this number. It is high time to spell out the objectives of the lemuru fishery, a responsibility that management authority ought to establish in order to have a clear formulation for the future.

4. Operational management

Despite the absence of management units in each individual Provincial Fisheries Service, various rules and regulations are aimed at supporting the management of the fisheries. Regulation on mesh size, length and depth of purse seine net, zoning by gear and limitation in the number of vessels are measures that have been taken. Ineffectiveness of regulation enforcement has been very much related to the absence of such units in the Fisheries Offices.

Effort by local government to protect fishermen is reflected in the price policy at peak season, during which time a minimum price of lemuru will have been determined. In practice, however, the regulation was not effective as the market price has been always above the price set by the government.

Landing statistics had been collected by the staff of Provincial Government in the landing places servicing the auction of the catch. This practice stopped early this year due to a new rule enforcement by the Ministry of Internal Affairs which caused the auction in the landing places become inoperational. In the absence of catch monitoring through auction, it becomes difficult for the Provincial Fisheries Service to collect statistics of catch and fishing effort.

5. Research and stock assessment

Research on the lemuru fishery has been conducted by scientists of the Research Institute for Marine Fisheries (RIMF) based in Jakarta and by staff of various Universities including those of Brawijaya University, Udayana University, Diponegoro University and Bogor Agricultural University.

Sardinella lemuru is a fast growing fish and has a life span of about 2-3 years. Many studies have been carried out on the growth and mortality of lemuru, but the most recent one is by Merta (1992). He showed various biological parameters, as follows: $k = 0.961/\text{year}$; $t_0 = -0.1789$ year; $L_\infty = 22.71\text{cm}$; $M = 1.00$ and $F = 3.38$.

Some attempts have been made by various people to assess the impact of fishing on the resources through various methods and most of the analyses indicate that the fishery has reached a level of overfishing, as shown in Tables 1 and 2 below.

Table 1. Assessment of lemuru stock in the Bali Strait using surplus production model

| Year | Model | MSY (t) | F _(opt) | Level of exploitation | |
|--------------------|-------------------------------|-------------|--------------------|-----------------------|--------------|
| 1986 ¹⁾ | Schaefer | 66,306 | 238 | Over fishing | |
| | Fox | 62,317 | 242 | Over fishing | |
| 1986 ²⁾ | Schnute | 80,332 | 207 | Over fishing | |
| | Gulland (with moving average) | 60,559 | 123 | Over fishing | |
| | Schaefer: | q = 0.00108 | 49,440 | 260 | Over fishing |
| | | q = 0.00068 | | | |
| | Jacknife: | q = 0.00108 | 48,835 | 257 | Over fishing |
| | | q = 0.00068 | 49,581 | 259 | Over fishing |
| | | 47,512 | 320 | Over fishing | |
| 1992 ³⁾ | Schaefer | 40,000 | 180 | Over fishing | |

Table 2. Assessment of lemuru stock using analytical model

| Model | Y/R _{max} (g) | F _{max} (y ⁻¹) | Level of exploitation |
|---------------------------------|------------------------|-------------------------------------|-----------------------|
| Beverton and Holt ⁴⁾ | 14.22 – 11.85 | 0.5 – 0.8 | Fully exploited |
| Beverton and Holt ⁵⁾ | 3.90 | 1.2 | Over fishing |
| Jones ⁶⁾ | 25.83 | 3.0 | Over fishing |
| Thompson and Bell ⁷⁾ | 34,041 t (yield total) | X= 0.8 (F array) | Over fishing |

¹⁾ Martosubroto, P., N. Naamin and S. Nurhakim (1986). Menuju manajemen perikanan lemuru yang rational. *Jurnal Penel. Perik.Laut*, 35 :59-66.

²⁾ Salim, S. (1986). Assessment of the lemuru (*Sardinella longiceps*) fishery in the Bali Strait, Indonesia. MSc Thesis . School of Anim. Biol., Univ. Coll. North Wales, Bangor, U.K.: 52p.

³⁾ UNDIP (1992). Studi penyusunan dan penataan zona penangkapan perikanan industri dan skala kecil di perairan Selat Bali. Jurusan Perikanan, Fakultas Peternakan UNDIP, laporan akhir Proyek Pengembangan Desa pantai, Ditjenkan, deptan, jakarta, 95p.

⁴⁾ Ritterbush, S.W.(1975). An assessment of the population biology of the Bali strait lemuru fishery. LPPL 1/75-PL.051/75: 37p.

⁵⁾ Gumilar (1985). Tingkat upaya penangkapan ikan lemuru (*Sardinella longiceps*) di perairan Selat Bali. Karya ilmiah, IPB Bogor, tidak dipublikasikan.

⁶⁾ Merta, I G, S. (1992). Dinamika populasi ikan lemuru, *Sardinella lemuru* Bleeker 1853 (Pisces : Clupeidae) di perairan Selat Bali dan alternatif pengelolaannya. Disertasi. Program Pasca-sarjana, IPB, Bogor : 201p.

⁷⁾ Merta, G, S. dan H.M. Eidman (1995) : Predicted biomass, yield and value of the lemuru (*Sardinella lemuru*) fishery in the bali Strait. In : Potier, M. and S. Nurhakim (1995, eds.) : Biodynex. Pelfish, jakarta : p.137-144.

Stock assessment of lemuru, as is the case for most small pelagic fish resources, is limited by the schooling behaviour of the fish. Fluctuation in abundance as reflected by variation of the schools has challenged the assumption of constant catchability in the assessment. This leads one to question the validity of the method used in the assessment above as summarized on Table 1 and 2. Ability to assume a predictive catch in the years ahead, a figure that is always in the mind of the industry, is still far from reality.

From the acoustic survey it was indicated that the potential yield of the small pelagic fish in the Bali Strait was about 66,000 t per year (Sujastani, Amin and Merta, 1972). The present practice was not effective in catching schooling fish which, during certain seasons, inhabit greater depths (Venema, pers.comm.). Further studies in this area are recommended in order to comprehend the dynamics of the school and its implication to fisheries.

6. Monitoring, control and surveillance (MCS)

As mentioned in the earlier sections, the Provincial Fisheries Offices in East Java and Bali do not have an MCS unit. Law enforcement by patrol vessel is conducted by the Coordinating Committee on Sea Security (BAKORKAMLA) under the chairmanship of the Navy. There has been a “gentlemen’s agreement” between Provincial Fisheries Service in East Java and Bali to the effect that only fishermen from the coastal areas of the Bali Strait are allowed to fish there. Any foreign intruder into the Strait will be forced to leave by the local fishermen.

7. Consultation with stakeholders and extension

The National Fishermen’s Association, locally called HSNI (Himpunan Seluruh Nelayan Indonesia), being government-established, leans very much towards the government. Government consultation has been commonly conducted through this organization. The consultation is not regular and the initiative is more on the government side. This tends to lead to one way communication even in the consultation. On the other hand, the association of fishmeal and cannery has been formed by the industry and is more active. However, consultation among stakeholders in one meeting has never taken place except in this workshop.

8. Post harvest sector

In this fishery fresh fish consumption is relatively low compared to consumption of processed fish. The processed foods are in the form of boiled salted products (pindang), dried-salted and canned. The rest are processed into fishmeal or silage. The current number of processing facilities in the two provinces is:

| | East Java | Bali |
|---------------|------------------|-------------|
| boiled-salted | 49 | 155 |
| fishmeal | 25 | 2 |
| canneries | 12 | 7 |

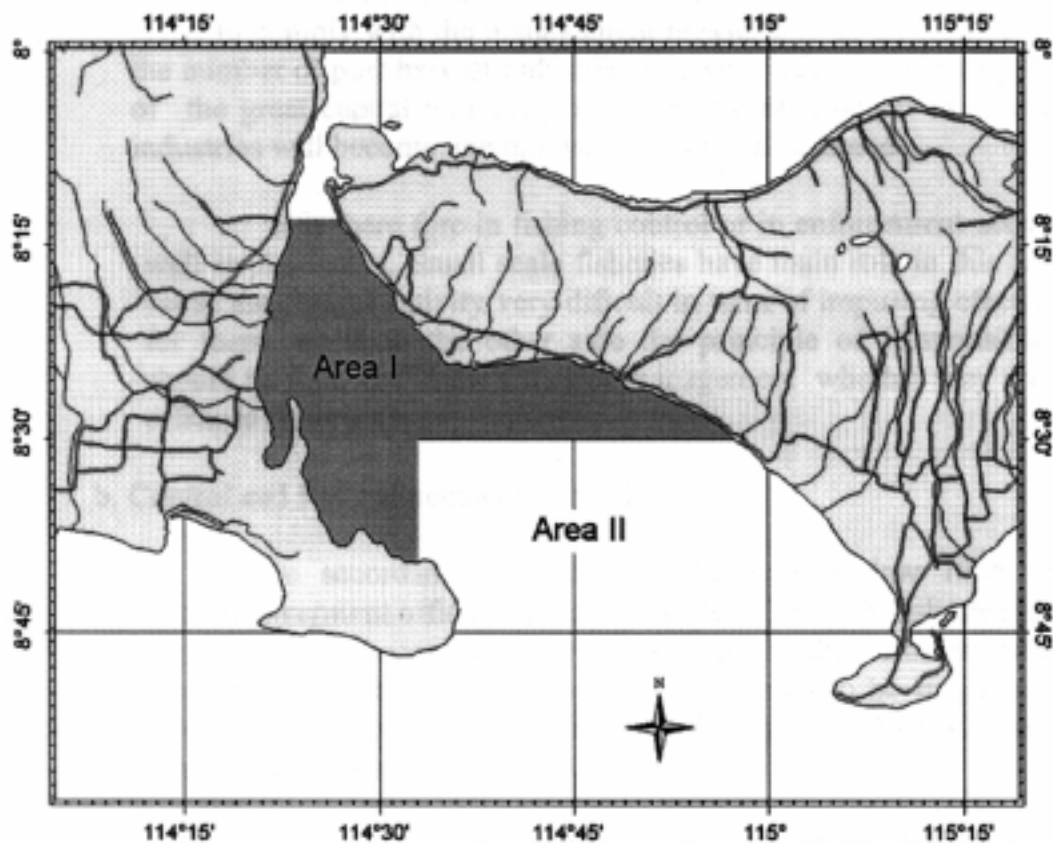
In addition, all canning factories also produce fishmeal as a secondary product.

The “boom and bust” nature of lemuru production provides a special challenge to the processing industry in dealing with the processing operation. During low catch, the capacity of processing may be underutilized while during peak season the facilities could be overused. To make use of the facilities during low lemuru catch some canning factories have canned other fish such as tuna and mackerel. Some have even imported the raw materials from abroad.

9. Review of the plan

This draft management plan contains basic information of the lemuru fishery that is currently available. This information helps to identify issues constraining the fisheries up to present. The stakeholders of the fishery would have an interest in identifying main priority issues and proposing future action for their benefit. Stakeholder consultation should be facilitated, for instance through the establishment of a Management Committee which would develop an agenda supported by stakeholder members, an important step that one would like to see in an effort towards achieving sustainable lemuru fishery development.

Figure 2. Distribution of fishing area (Area I : for non-powered fishing vessels and Area II : for powered fishing vessels)



APPENDIX VI

ISSUES, PRIORITIES AND ACTIONS
related to the
Draft Management Plan of Lemuru Fishery

| | Issues | Priority | Actions |
|------------|---|-----------------|---|
| I | Jurisdiction | | |
| 1 | Permit for processing plant | 4 | DGF to consult Ministry of industry and investment board (BKPM D) |
| 2 | Absence of management institution | 7 | Set up management body by 01/04/2000 |
| II | Objectives of management | | |
| 3 | Review the objectives | 8 | Set up management body by 01/04/2000 |
| III | Operational management | | |
| 4 | Lack of compliance | | |
| 4a | <input type="checkbox"/> Mesh size | | Review of regulations |
| 4b | <input type="checkbox"/> Fishing area | | Task force on MCS |
| 4c | <input type="checkbox"/> Gear size | | Research on gear selectivity |
| 4d | <input type="checkbox"/> Licensing (?) | | Strengthen extension/ awareness |
| 5 | Floor price (obsolete/not realistic) | 11 | Review the regulation |
| IV | Research and stock assessment | | |
| 6 | No monitoring and no prediction | 6 | Better use of R/Vs, AARD, DGF/BPPI cooperation environment research |
| 7 | Data quality | 5 | See no. 9, net working LIPI, BPPL, Universities |
| 8 | Lack of bio-socioeconomic research | 10 | Involve universities, PSE, Networking : Social-economic (Indonesian fish, social, economy, network) |
| V | Monitoring, control and surveillance | | |
| 9 | Low quality of statistics (?) | 2 | Cross check with factories |
| | | | More enumerators |

| | Issues | Priority | Actions |
|-------------|---|-----------------|--|
| | | | Training |
| | | | Improve landing facilities |
| 10 | No MCS unit | 3 | Task force on MCS. Strengthening FKPPS |
| VI | Consultation with stakeholders and extension | | |
| 11 | Lack of extension | 17 | Link to No. 4 Strengthen extension/ awareness |
| 12 | Lack of consultation (only briefing) | 12 | Strengthen fishermen's associations |
| 13 | Lack of coordination among government agencies | 9 | See no. 1 |
| VII | Post Harvest sector | | |
| 14 | Over capacity relative to lemuru stock | 15 | Improve information |
| 15 | Post harvest losses (quality) | 14 | Improve information, improve vessel design and link to licensing |
| 16 | Not meeting future quality standard for export | 17 | Integrated quality programme |
| 17 | Potential for air and water pollution | 15 | Improve information |
| 18 | Not conforming industrial zoning plan | 20 | Improve information |
| 19 | Price relative to quality | 19 | Improve information |
| VIII | Review of the Plan | | |
| 20 | Adoption of a management plan | | See No. 2 |