

Marine Fisheries Management Plan in Indonesia a Case Study of the Bali Strait Fishery

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Abstrak

Pengelolaan perikanan laut di Selat Bali mencakup wilayah berairan seluas 2,500km² Selat Bali terutama dipengaruhi oleh perairan dari Samudera Hindia, dan hampir tidak ada pengaruh dari laut Flores dan laut Bali. Perikanan di Selat Bali bersifat perikanan tunggal (purse seine) dan mempunyai target yang jelas (ikan lemuru) serta menerapkan teknologi yang relatif telah maju. Meskipun begitu, secara alamiah perikanan Selat Bali melibatkan 2 propinsi Bali dan Jawa Timur, dan meliputi 4 kabupaten, sehingga administrasi maupun pendekatan-pendekatan yang dilakukan cukup kompleks. Perencanaan dan pengelolaan perikanan di Selat Bali sampai dewasa ini lebih menitikberatkan pada usaha-bersama para pemangku kepentingan. Sementara hal itu secara formal dapat diterima, perkembangan dalam perikanan terakhir membuktikan perlunya keterlibatan secara riil masyarakat pesisir/nelayan dalam proses perencanaan dan pengelolaan sejak awal. Selain itu diperlukan pengkajian sumberdaya perikanan secara partisipatif, dimana metode standard pengkajian ilmiah dimudahkan sedemikian sehingga masyarakat nelayan dapat menganalisis dan mempraktekkan sendiri pada sumberdaya, ekosistem dan kehidupan mereka. Hanya dengan cara demikian dapat diharapkan timbulnya rasa kepemilikan mereka atas sumberdaya dan ekosistem pendukungnya. Hal ini akan memacu kesadaran akan keberlanjutan sumberdaya, yang pada gilirannya akan menentukan nasib usaha perikanan, pendapatan dan kehidupan mereka.

Kata kunci: Rencana Pengelolaan Perikanan, proses partisipatif, kepemilikan, berkelanjutan, perikanan-bertanggungjawab

Abstract

The marine fisheries management of the Bali Strait covers an area of about 2,500km². The Bali Strait is primarily influenced by the relatively deeper Indian Ocean - than the Flores and Bali seas. The Bali Strait fishery is mono-typed (purse seine), clearly targeted (lemuru, Oil Sardine), and technologically advanced. However, the nature of the presence of two provinces for the Bali Strait (and including 4 districts) brings about a rather complicated administration procedures and approach. It can be remarked that the present management put more weight on the collaborative effort among all stakeholders. While it is formally acceptable, recent development in the fishery clearly suggests an increasing need of the involvement of fishing communities in planning and management processes, at its earliest stage. This is particularly vital to be applied in the Bali Strait. In addition there is an urgent need to apply participatory research in the fishery, so that standard scientific fisheries research methodology should be lowered-down one level in order that the fishers can understand and perform simple analysis of their own natural resources, ecosystem and livelihood. Only with these two actions can the fishers be expected to have the ownership and to "help themselves" toward sustainability of marine resources and securing their fishery, improving their welfare and livelihood.

Key words: Fisheries Management Plan, participatory process, ownership, sustainability, responsible fisheries

Introduction

Worldwide interests on the Fisheries Management Plan (FMP) and Fisheries Management Planning had been growing since mid 1990s, when the United Nations/Food and Agriculture Organization (UN/FAO) launched the Code of Conduct for Responsible Fisheries (CCRF). FMP (or Rencana Pengelolaan

Perikanan, RPP) is therefore a new concept to many nations including Indonesia. Although Indonesia's fisheries department and offices had existed in the country since 1945, fisheries and marine affairs usually run on a routine-basis and there has been virtually no fisheries management plan - at least as FAO defines- so far conducted.

At present development, the country had started piloting the FMP in some areas with the technical assistance from international agencies such as The United Nations/Food and Agriculture Organization (UN/FAO). The first agency has piloted the FMP in the Bali Strait since 1999, particularly for the Indian Oil Sardine (*Sardinella lemuru*) fishery, then moved to the Java Sea in 2004 to principally help manage the small pelagic purse seine fishery.

This paper aims to study the FMP/FMPlanning in the Bali Strait. The Bali Strait is selected, as it is representative of the older FAO site, in which more experience in its implementation is likely to be shared. The Java Sea small pelagic fishery is not yet considered appropriate for our purpose, as it was just started in 2004 and there has been consequently insufficient output that can be accounted for sharing. It must be emphasized that the FMP in this areas is in the process of implementation, and consequently the account provided here is more an anticipatory endeavor. In other word, that once such an account can be made, it is expected that relevant experiences and lessons learned can be shared, so that: (i) further improvement can be made, and (ii) avoid similar failure (if any) in the future and/or for other areas wishing to implement the FMP. If these can be achieved, it could be expected that the coming FMPlanning would be more efficient and can be performed more cost-effectively.

Materials and Methods

There were two main sources used for this study: (i) FMP document which was produced by the management of the programs, and (ii) The Process by which the FMP was produced (or can be called FMPlanning). The document used was the final version.

FMP document was obtained from FAO (Food and Agriculture Organization). Some supporting documents, including meeting reports and minutes were collected from the program management/site in Bali and East Java. These documents were then analyzed using Code of Conduct for Responsible Fisheries (CCRF) as reference and experiences from other areas which has similar characteristics.

To analyze the Process of the FMPlanning, several approaches were taken: (i) field observation on the fisheries, (ii) observation on their national and local meetings, (iii) in-depth interview with stakeholders and key players; (iv) in-depth interview with key personnel in the Ministry of Marine Affairs and Fisheries (MMAF) and the FAO. The results from this observations/interviews were then analyzed, again -

using CCRF as reference and experiences from other areas which has similar characteristics.

The FMP document and FMPlanning were discussed, with particular reference to their: (i) administrative coverage; (ii) unit management areas; (iii) types of fisheries; (iv) stakeholders involved in the planning and management process; (v) approach and planning process; (vi) key participators; (vii) state of fish stocks; (viii) major issues being addressed and (ix) major constraints faced by the programs.

Results and Discussion

General accounts

The FMP document obtained clearly suggested that the FMP requires to be regularly checked, so that it can be updated to accommodate the recent fisheries development which is usually dynamic in nature. By addressing potential issues which might emerge in the future, the present case study may take part in filling the potential gaps.

With reference to fisheries management planning, FAO (1995) outlined some major considerations in order to comply with responsible fisheries. These considerations are:

- The role of human being, as either individuals or institutions in ensuring the secure future of marine resources
- Standard principles of conservation and management
- Responsibility of the state and the stakeholders
- The use of best scientific evidence
- Inclusion of local wisdom and knowledge
- Participatory co-, or community-based management
- Openness, and equal opportunity
- Professional and financial support
- Adequate law enforcement

In terms of management process, it is essential that: (i) formulation of the plan should reflect selected (agreed) objectives and constraints; (ii) identification and agreement on the fishery objectives, management measures and plan reviews should be based on consultations with recognized stakeholders (FAO, 1997).

It is necessary to emphasize that the management plan should have the ownerships of fishing and coastal communities, other stakeholders and local government agencies, so that it can be effectively implemented (Kay and Alder, 1999).

A summary of the major components of the FMP applied for the Bali Strait is provided in Table 1. Table 2 outlines the contents of the FMP document in the fishery.

The general significant insight after reviewing the FMP document and the planning process (including discussions with stakeholders involved in the meetings and with the FAO and the DGCF staff) is that: while it is obvious that the FMP is only recently applied in the Bali Strait, and it undeniably gives new experience to the country, there has been lack of inputs regarding lessons learned from previous programs during the planning process. It is worthwhile if such lessons can be learned either from: (i) FMP planning from other countries having similar characteristics, or (ii) previous other marine fisheries programs in Indonesia. The first choice is unlikely to be taken as other countries had experience with FMP planning only during the last few years (i.e. following the adoption of the CCRF in late 1990s). Therefore it is feasible to take the second alternative and to learn something from the country's previous marine fisheries programs.

Administrative coverage

The Bali Strait fishery includes 2 (two) neighbouring provinces, i.e. the provinces East Java in the west and Bali in the east, which include 4 (four) districts and 6 (six) fishing villages. There is only one district in the east coast of East Java whose fishers operating in the Strait, that is Muncar. The Bali part of the Strait includes 3 (three) districts in the west coast of Bali whose fishers operating in the Bali Strait; these are Badung, Tabanan and Jembrana.

Immediate logical concern may be that the involvement of two provinces for the Bali Strait brings about complicated administration procedures and approach. However, it is fortunate that: (i) the East Java Fisheries and Marine Offices has been actively involved in management initiative to overcome the potential long chain bureaucracy, and (ii) the Bali Fisheries and Marine Offices has a typical openness mind in administering the Bali part of the Strait fishery. It is also important to note that the Bali Strait fishery has long been receiving national as well as international interests, in particular regarding studies and research (e.g. Ritterbush, 1975 studying the fisheries biology of the Bali Strait sardine).

Unit management area

Although the Bali Strait has a coastal part, its fisheries management unit is basically a "water body"

unit, that is the Bali Strait. The Strait is located between Java and Bali. It has a funnel shape with a northern opening of about 2.5 km wide and a southern one of 55 km. The Strait covers an area of about 2,500 km². The shelf area extends from north to south with an average depth of 50 m. The Bali 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 ranges from 3.5 to 15 km from the coast. The water mass of the Bali Strait tends to be mainly affected by the water mass of the Indian ocean (FAO, 2001).

Types of fishery

The fishery in the Bali Strait is semi-industrialized typed, using medium to large purse seiners (25-80PK engine powered, 12-20m boat length). It is the major fishery in Indonesia which has a clear target upon the small pelagic, the Bali sardinella (*Sardinella lemuru*). This species normally accounts for about 80% of the total fish landings. The rest of the landings consists of other small pelagic fishes, such as layang (*Decapterus spp*), terbang (*Sardinella fimbriata*), selar bentong (*Selar crumenophthalmus*, *Selar spp*). The fishery has therefore been recognized as having clear fishing target, the lemuru. This feature differs significantly with other fisheries in the country, which generally have multi-species with no clear species dominance (Mathews *et al*, 2001). In the Bali Strait fishery, various facilities are available, including effective ice plants, landing place, fuel station and fish processing plants.

The stakeholders

Careful and thorough identification is vital toward the success of the management (Tulungen *et al*, 2003). Fisheries authority which are involved in the management of the Bali Strait sardine fishery comprises the Central Government through its Directorate General of Capture Fisheries, provincial and district Fisheries Offices in Bali and East Java, the Fisheries Cooperatives (Koperasi Unit Desa, KUD), and fishing communities representative (locally called Himpunan Nelayan Seluruh Indonesia, HNSI) and related fish cannery industries.

It is clear that the management areas have a complicated, dynamic structure. However, it can be remarked that the present management put more weight on the collaborative effort among all stakeholder. Recent development in the fishery clearly indicates an increasing need of the involvement of actual fishing communities in the management process,

Table 1. The main characteristics of EMP of the Bali Strait

Components	Characteristics
Administrative coverage	Two provinces
Unit management area	Coastal area, water body
Type of fisheries	Sardine, purse seine
Stakeholders	Fishers representatives, fish processing industries, HNSI
Approaches and planning process	Co-management
Key participants	Marine Affairs and Fisheries Department, with the support of fishers
Management unit	Fisheries Management body
State of fish stocks	Fully exploited
Major issues addressed	Uncontrolled fishing, fish bombing, cyanide use, coastal pollution and degradation
Major constraint	Law inadequacy Mismanaged fishery
Initiators, implementing agencies	UN/FAO, DGCF/MMAF

in this is particularly vital to be applied in the Bali Strait. Other groups in fishing communities such as fish cake (home) industry fishmill, various fish traders and women should be accounted for in the near future.

Approach and planning process

In general the management of the Bali Strait fishery basically have formalistic, collaborative approach, in which all of the stakeholders are meant to give contribution to the management.

Discussion in the previous sections strongly indicates that central and local government, through the Fisheries and Marine Affairs, tries to work together with fishing and related communities and industries to manage the fisheries. During field observation, it was evident that formal meetings were held in some hotels in Surabaya and Banyuwangi in East Java, each lasting for 2-3 days, during which agreements were achieved among the "participants" on major issues and the way they should be tackled. Although attempt has been made to balance top-down and bottom-up approach in managing their fisheries, this was clearly unfeasible to achieve by this method, resulted in "pseudo-participatory" feature. In this situation it would be difficult to have ownership of the EMP by the fishing community; it rather belongs to the government, industries and upper-level communities. The challenge is in the near future to improve the community participation, which is part of the developing the plan as a continuing process (Kay and Alder, 1999; Filho, 1999). More detailed information is given on participatory research at the end of this paper. Standard (scientific) fish stock assessment method is applied by fisheries scientists of the MMAF

and universities to help assess their fish stocks and ecosystems.

State of fish stocks

A large number of fisher folk has been involved, including those in the fish processing sector. The 1996 statistics indicated that there were about 12,000 fishers in the East Java and 9,000 in Bali sides engaged in the Bali strait fishery. Most of the products are for domestic consumption, whereas the canned products are for inter-island trade.

The lemuru landings clearly show an overall increase, but with marked fluctuations, particularly since mid-1960s. Landings, taken by artisanal fishing gear - 'payang' (a lampara-type) were low prior to 1970s with an average of less than 10,000t per year, but increases sharply since mid-1970s, coincided with purse seiners introduction in 1974, which resulted in marked peak landings in 1977 (approximately 40 tons), 1983 (50 tons), 1991 (59 tons) (Ghofar and Mathews, 1996), and 1998 (over 60 tons). On the other side, sharp decreases in landings we also experienced, with 'minimum' landings in 1986, 1996, 1998 to present. These figures clearly indicate that sharp fluctuations in landings due primarily to environmental variability rather than fishing effort.

Ghofar *et al* (2000) further incorporated ENSO effects on the Bali Strait sardine fishery production models. It was identified that the Southern Oscillation Index (SOI) can be used as powerful climatic variable in the model construction. As a result, instead of a static-conventional single production curve, they obtained a more dynamic multi-yield-curves, where

the yield can be predicted conveniently once SOI and fishing effort are defined. This model was further developed for implementaion in fisheries management practices in the Bali Strait (Ghofar, 2001).

Major issues

During part of its development, there is strong indication that the Bali Strait fishery was mismanaged. There are several indications for this:

- a The small pelagic fish processing industries, which include canneries, fish cake (*gaplek ikan*) and fishmill (*tepung ikan*) had been developed improperly, in which license to build a processing plants uncontrollably exceeded fish production from the Bali Strait. As a result the total lemuru catches from the Bali Strait cannot support the needs for those industries. If it was estimated that average MSY for lemuru is 34,000 tons per year, then it is only about 20% of the required raw materials for the industries, taking into account daily intakes are 50-100 tons/day for canneries, 45-75 tons/day for fish cakes and 240-480 tons/day for fishmill.
- b Use of small meshed (less than 2 inches) and excessively long(over 400m) purse seine, which is against law (referring to Surat Keputusan Bersama Gubernur Bali/Jawa Timur No. 238 and No. 674, 1992) and provide threat to lemuru stock.
- c Use of cyanide for fishing in the reef areas, which is not only hazardous to small fishes, but also to their habitats and supporting ecosystems. Illegal fishing using cyanide has escalated recently in the reef area of East Java coast, and fishers believe that it had bad impact on the young lemuru that are commonly found in shallow waters
- d Fishery and community's originated pollutants which give further threat to the fish stocks, especially for their recruitment processes.

Major constraints faced by the fishery

During its development, the management of fisheries in the Bali Strait faces difficulties in monitoring the operation of fishing vessels and purse seines. Information and data about the number of purse seiners are likely to be misleading, as although the number is constant, it may not be so for the fishing capacity due to, for example, the use of increasing engine power (from 15-20PK in 1970s to >80PK since 1990s) and net size (length and depth). Furthermore, poor coordination between institutions in the fishing ports lead to possible fishing activities by non-licensed

fishing vessels. Also its is not readily clear, and uneasy for the artisanal fishers of the definition of the fishing borders that they are supposed to consider. This constraint is added to the current national policy of launching the Local Autonomy which separate the authority of the central and local government in the sea using a certain bordered management area. These resulted in a confusion among fishers of both provinces, and often raised a physical conflict. An effort has been therefore attempted to reduce the tension by establishing a forum where all components of the fishery may interact. This effort was initiated by the personnel of the Provincial Fisheries Offices in East Java and Bali, and independent personnel from the Universities and the FAO.

FMP document

The contents of the FMP of the Bali Strait Fishery is summarized in Table 2.

Table 2. Major content of the FMP of the Bali Strait fishery

Section	Major Content
1	Description of the fishery
2	Jurisdiction and legislation
3	Objectives of the plan
4	Operational management
5	Research and fish stock assessment
6	Monitoring, control and surveillance
7	Consultation with stakeholders and extension
8	Post harvest sector
9	Review of the plan

This (Table 2) obviously is a standard content of an FMP as referred to FAO (1995), which is designed to be clear and concise. Understandably, therefore, the Bali Strait FMP is a short document, and each section contains only the important information with practical short example as necessary. Two of the vital sections are "Objectives of the Plan" (Section 3) and "Review of the Plan" (Section 9), which may be worth underlined.

Although a General Objective is given in the FMP, Section 3 outlines that the plan has several objectives: (i) biological, (ii) ecological, (iii) social, (iv) economic, (v) extension and (vi) compliance. The presentation of objectives like this is likely to puzzle the program implementer(s), and obviously fishers. For example: achieving economic and ecological objectives, which are usually uneasy. It may be useful and understandable to have moving, dynamic objective

Table 3. An example of the lessons learned from previous Marine Fisheries programs in the country

Case of failures	Reason(s)	Root(s) of problems
Abandoned landing places/stations (PEI, PEI).	<ul style="list-style-type: none"> • Difficult to be accessed by fishers • Do not match with local needs 	<ul style="list-style-type: none"> • Lack of community involvement in planning process • Ad-hoc management intervention ("project"-oriented)
Abandoned facilities (ice plant, fish mill machine etc)	<ul style="list-style-type: none"> • Fishers have insufficient technical capacity to operate and maintain 	<ul style="list-style-type: none"> • Lack of community involvement in planning process • Ad-hoc management intervention ("project"-oriented)
Abandoned fishing boats	<ul style="list-style-type: none"> • Do not match with local needs • Fishers have insufficient technical capacity to operate and maintain 	<ul style="list-style-type: none"> • Lack of community involvement in planning process • Ad-hoc management intervention ("project"-oriented)
There had been many programs aiming at improving economic capacity and welfare of the fishers since 1980s, but there has been actually no significant improvement so far	<ul style="list-style-type: none"> • Do not match with local needs • Insufficient capacity to actually improve their economy and welfare 	<ul style="list-style-type: none"> • Lack of community involvement in planning process • Ad-hoc management intervention ("project"-oriented)

such as: "sustaining fish resources in order to secure the fisheries and increase fishers' income and welfare". This statement of objective will at the same time educate every body in the area about the interdependency of all components in marine and coastal zone (Bali Strait).

Section 9 clearly suggests the spirit of dynamics. With this section, the designer(s) of the plan fully understood, that the Bali Strait FMP will not be a "holy" document; it will be subject to continuous changes and reviews following the dynamics of, and changes in, the fishery.

It should be further considered to present the Bali Strait FMP as an easy-read document for everybody, and particularly fishers, wanting the clearness of what they are supposed to contribute in the management. Up to the present, there seems to be no Indonesian version of the FMP. If the present English version can be translated, it will help much to fishers and other stakeholders. This assignment is easy in practicality, but need to be performed shortly.

It is also indicated in Section 9 that in the near future the incorporation of "lessons learned" (as previously mentioned) is feasible, and this should not be placed merely in the document as per formality, but also applied for further planning processes. If this can be met, then the objective of putting Section 9 in the FMP will be meaningful, and FMP as a whole prove its consistency.

The following section tries to address some of the major lessons that can be learned from the

previous fisheries programs in the country. Expectation is that the FMP planning may not repeat - and therefore create - the same failure in the future.

What can be learned from previous fisheries program?

There have been many cases throughout the country in which the outputs from a given program/activity had been meaningless for the poor fishing communities (but unfortunately had been highly costing and inefficient), as shown in Table 3. From the features and reasons (column 1 and 2, respectively), it may be taken the root (major causes) of all these failures as shown in column 3.

It is obvious that beyond the above listed items (Table 3), there are problems of low-leveled education, lack of awareness and top-downward approach, but taken as a whole, the main root of all problems (roots) is likely to be lack of awareness at all levels. The general statement of this term has been usually: "lack of public awareness". It may be further thought that the basic principle of dealing with this is that: "one cannot expect (and ask) anybody to be aware of something, unless he/she already is. One cannot give anything, unless he/she has one".

In the spirit of improving the management of the Bali Strait fishery, it is suggested that further planning process will need to consider:

- *More fishing community-involvement in planning process and management implementation.*

There is widespread understanding that by nature, fishing and other coastal communities may not give their contribution unless they are told clearly why they need it and how to do so. To address this situation, the management will have to take initiative in actually involving the fishing community, including fishers and their families, right from the beginning of planning, and throughout the management processes. Fishers and their families means anyone who are dependent upon the marine resources (fishers, fish-farmers, charcoal makers, mangrove cutter, fish processors and fish traders)

Marine fishery resources management based on local community-involvement usually have an advantage (Zemer, 1993), in that it is:

- Inexpensive: operated by local people who are on the seas and coasts as part of their daily work;
- Efficient: local people, who obtain their living from the sea, have a high incentive to obey the rules themselves and to enforce the rules against other violators within and without the community;
- Environmentally appropriate, as the marine organisms under regulation is usually high priced or importantly valued by the community, so that they have a high incentive to regulate;
- Modifiable, as it is resulted from active communication with all local communities/groups;
- Secure, due to the absence of local community alienation;
- Directly related to conservation and sustainable management, because local community have the ownership upon the management plan.

Application of participatory research

There has been an increasing need of management research in coastal and marine resource management in the last few years. Of this, relatively limited attention is paid to participatory research. In this respect, participatory research may be simply understood as research which is carried out by community and/or other stakeholders to address some of the problems and allied subjects that they face. The significant of participatory research in this area has been outlined by some authors (Tulungen *et al*, 2003; Kay and Alder, 1999; Filho, 1999).

An example is, that the standard (scientific) fish stock and economic assessment method has been applied by fisheries scientists at the Ministry of Marine Affairs and Fisheries (MMAF) and universities to help assess their fish stocks and ecosystems. Although attempt has been made to balance top-down and bottom-up approach in managing their fisheries, this was clearly difficult to achieve by this method, resulted in "pseudo-participatory" manner. It is actually feasible to apply participatory research in order to help the fishing community understand and experience what is happening in their fish stocks and their economy, their habitats and supporting ecosystems. In this instance, the planning process include 6-8 steps, one of which is the participatory research.

To perform it, for example, the standard (scientific) fish stock assessment method is "lowered-down" to a certain level of ease, and be "stock assessment made-easy" kind, so that it can be understood and practiced by the fishing communities. Questions like: where you fish now, and 10 years ago, and 20 years ago? How fish catches vary in species at those consecutive times? How big is the individual size? How to secure their fish, etc., had proved to be more attractive to fishers, if these were raised at the right time and in the right manner. This example clearly shows a more bottom-upward approach in fisheries management, which can further be expected to secure: (1) the ownerships of marine resources, ecosystem and their management; (2) the sustainability of the marine resources, and therefore their fisheries and livelihood.

Conclusions

Nation-wide discussions reveal that most of the marine fisheries programs-and most likely others as well-do not actually empower the coastal communities. Some of these even weaken the capacity of the communities to develop their survival and to secure their resources in order to support their livelihood. As a result, they ask for more 'projects' from time to time, with very little - if any, intention of essential improvement.

The marine fisheries development program is ideally aiming to help fishers better manage their natural resources, in order to guarantee sustainable economic activity and welfare for them. The program should therefore encourage responsible use of their coastal and marine resources, including fishes and

other biota and their supporting ecosystems, such as mangrove forests, coral reefs and sea-grasses.

Sustainable coastal and marine resource use, improvement in marketing networks and use of safe appropriate technology are needed to ensure fishers and their children can continue to make their living from their seas and coasts. Equally important is the efforts to involve local knowledge and regulation to secure their coastal and marine resources in sustainable way.

In all these activities the program is required to work with fishers and their families who frequently are not fully involved in community development programs and suffer from marginalization and poverty. In this context fishers and their families means anyone who is dependent on the marine resources (fishers, fish-farmers, charcoal makers, mangrove cutter, fish processors and traders)

To implement the marine fisheries development program, good cooperation between all stakeholders in the coastal areas is of vital importance, and should be performed in participatory manner throughout its processes. The program requires good cooperation between fishers, village government, local district and sub-district governments, local businesses and any other relevant organizations

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References

- FAO. 1995. Code of conduct for responsible fisheries. Food and Agriculture Organization. Rome. 41p.
- FAO. 1997. Fisheries management. FAO Technical guidelines for responsible fisheries. No. 4. FAO. Rome. 87p.
- FAO. 2001. Report on a workshop to refine the draft Fisheries Management Plan for the Bali Strait Sardine (*Lemuru*) fishery. FAO-GCP/INT/648/NOR Field Report F-18 (En). 33p.
- Filho, W.L. 1999. Getting people involved. *In:* Hatfield S.B. and S. Percy. Constructing local environmental agendas. Rotledge, London and New York. 202p.
- Ghofar, A. 2001. The use of environmentally sensitive model in the management of the Bali Strait sardine fishery. Proceeding of the FAO/DGF Workshop on the Management of Oil Sardine fishery in the Bali Strait. Banyuwangi. GCP/INT/NOR Field Report F-3 Suppl. (En).
- Ghofar, A. and C.P. Mathews. 1996. The Bali Strait lemuru fishery: the impacts of natural environmental changes on resources. *In:* The fish resources of Western Indonesia. (D. Pauly & P. Martosubroto, eds.). ICLARM Contribution No. 1309. ICLARM. Manila.
- Ghofar, A., C.P. Mathews, G.S. Merta and S. Salim. 2000. Incorporating the Southern Oscillation Indices to the management model of the Bali Strait Sardinella fishery. Proceeding of the FAO/DGF Workshop on the Management of Oil Sardine fishery in the Bali Strait. Bali, 5-8 April 1999. 43-52pp.
- Kay, R. and J. Alder. 1999. Coastal planning and management. E & FN Spons. London. 375p.
- Mathews, C.P., A. Ghofar, I.G.S. Merta, N.Hendiarti, D.Arief and H. Listiana. 2001. Effects of frontal systems, upwelling and El-Nino on the small pelagic fisheries of the Lesser Sunda Islands, Indonesia. Proc. First International Symposium on Geographic Information Systems (GIS) in Fishery Science. T. Nishida, P.J. Kailola and C.E. Hollingworth (Eds.). Seattle, Washington, 2-4 March 1999. 65-88pp.
- Ritterbush, S. W. 1975. An assessment of the population biology of the Bali Strait lemuru fishery. Laporan Penelitian Perikanan Laut No. 1/75-PL. 051/75: 112pp.
- Tulungen, J.J., M. Kasmidi, C. Rotinsulu, M. Dimpudus, N. Tangkilisan. 2003. Panduan pengelolaan sumberdaya wilayah pesisir berbasis masyarakat, Dalam: M. Knight and S. Tighe. Koleksi dokumen Proyek Pesisir 1997-2003. CRC-URI. USA. 103p.
- Zerner, C. 1993. Community management of marine resources in the Maluku Islands. FAO/Japan Expert consultation on the development of community-based coastal fishery management systems for Asia and the Pacific. FAO Fish. Rep. No. 474 Suppl. FIDP/R474. (1): 127-142p.