

FISH STOCK ASSESSMENT IN INDONESIA: CURRENT STATUS AND FUTURE DIRECTION

Winda Mercedes Mingkid*, Eko Sri Wiyono*, Benny Pinontoan **, Seiichi Watanabe*, Masashi Yokota*

*Tokyo University of Marine Science and Technology, Tokyo-Japan, **Sam Ratulangi University, Manado-Indonesia, **De La Salle University, Manado-Indonesia, Email: Eko_ipb@yahoo.com

ABSTRACT

The aim of fisheries management is to ensure the sustainability of the resource while maximizing economic returns to the community. This paper explained methods of detecting fisheries stock in Indonesia including survey, swept area, acoustic, statistical and tagging. In order to succeed in the future, integrated work between the decision maker and fishermen community needs to be done while data analysis should be completed accurately and respectively.

Keywords: stock, fisheries management, stock assessment.

INTRODUCTION

How big is the Indonesian fish stock? How many percentages of that number can we exploit? These questions come up frequently after the Indonesian government, Department of Marine Science and Fishery (DMF) released the data about Indonesian marine resources. In many occasions, DMF claimed that there is only about 60 % of the total of Indonesian marine resources had been exploited which is not optimal. Based on this result, the Indonesian government encourages people to increase the marine production.

Recently, in one of its national movement program called “Gerbang Mina Bahari” (GMB), DMF again targeted to increase the marine production. The policy was to allow more catch for both foreign boats and domestic boats. This was applied based on the fantastic number about fishery potency, whereas the accuracy of this number is doubtful.

The dispute is not only on the data but also on the policy based on the data. The fact is that, this policy causes losses to the traditional fishermen and fishery firms. This policy may be contradicts to the reality. In many occasions the traditional fishermen complain about the catch that tends to decrease while their operational cost tends to increase, therefore many of fishing boats could not be operated.

Based on the information above, many questions may be asked, “Why there is a gap between the data about the marine potency and the reality?” The next question is then “Is there something wrong with data estimation of Indonesian fish stock?”

Those questions are not easy to answer, because we need to understand well the procedure and methodology to estimate the fish stock and at the same time we need to know the obstacles that may occur during the study or activities on fish stock. The importance is not how to find out the errors made in the estimation of the fish stock but how to compile evaluation and find improvement solution so that the estimation becomes accurate and close to the real condition.

Before we review and consequently find improvement solution to estimate better the fish stock in Indonesia, let us review what is meant with the fish stock.

What is a fish stock?

Numerous definitions persist in some literatures differing in their emphasis. We may have heard the word “stock” in many contexts and with many meanings. Here we are going to describe the concept of “stock” relating to the dynamic of an exploited aquatic resource. A stock is a sub-set of a "species", which is generally considered as the basic taxonomic unit inhabiting a particular geographical area. Smith et.al, 1990 described that “fishery stock” were understood by managers as a group of fish exploited in a specific area or by a specific method. Others defined stock as intraspecific group of randomly mating individuals with temporal and spatial integrity (Ihssen et.al, 1981).

Carvalho and Hauser (1995) have shown a schematic presentation (fig.1) showing some factors that may affect application of stock concept. Stock concept in fisheries is based on an amalgam of ideas that influenced by biological, practical and political considerations.

A prerequisite for the identification of stocks is the ability to distinguish between species. Some difficulties may arise for the identification, such as, the great number of similarities for different species and the fact that fish are dynamic and always migrate to find food or to lay eggs. However, some methods to calculate fish stocks have been introduced.

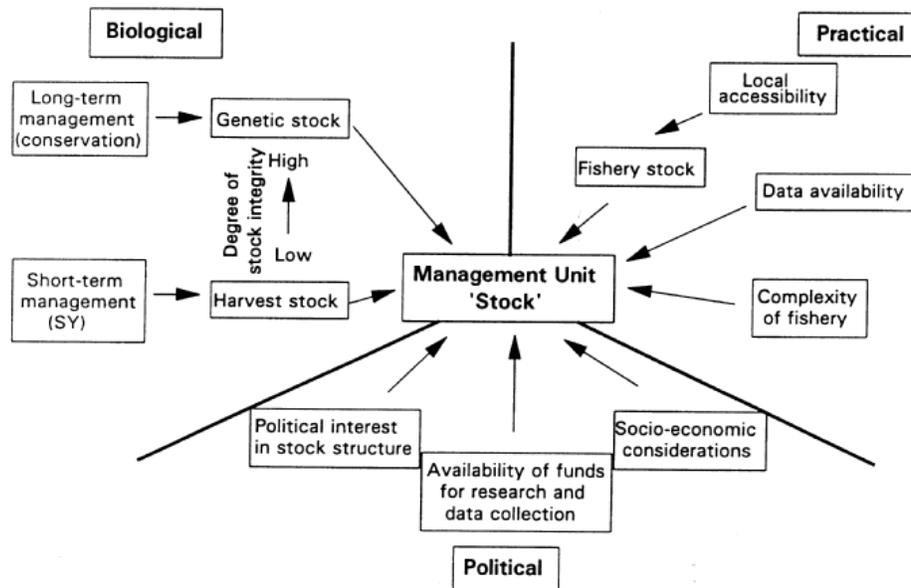


Fig.1. Schematic presentation of factors affecting application of the stock concept.
(Source: Carvalho and Hauser, 1995).

Fish stock assessment methods

The work to estimate fish stock is called fish stock assessment and the method used for this is called stock assessment method. Lleonart (2002) defines stock assessment as an activity to apply Mathematics and Statistics to a collection of data to determine the fish stock quantitatively for the sake of getting an estimation of the fish stock and to set up future policies. Hilborn and Walters (1992) give similar definition, which stated that stock assessment, bond the use of various statistical and mathematical calculations to make quantitative predictions about the reactions of populations to alternative management choices.

In general fish stock assessment can be divided into five main groups:

1. Indirect method consisting of (a) analytic approach, and (b) production model approach;
2. Survey method which is done by site survey using tools like bottom trawl, echo sounder, daily egg production method and direct counting through diving;
3. Marking method which is done by marking to the target fish;
4. Ecological approach which is an extension of the indirect method that involves biological interaction between species (ecology and technology) for multi species fisheries.
5. Molecular genetics tools which divided into (a) protein variation (b) nucleic acid variation.

CURRENT STATUS

Fish Stock Assessment in Indonesia

Although many diverse characteristics and methods have been used to analyze stock structure in exploited species such as ecological, tagging, morphometrics and meristics, calcified structures, molecular genetic tools (Carvalho and Hauser, 1995), it was depend on the country and the availability of equipments. Until now, the National Commission of Sea Fish Stock Assessment does fish stock assessment in Indonesia. According to this Commission (1998), the fish stock assessment in Indonesia is done using 5 approximation methods including census, swept area, acoustics, statistical and tagging.

1. Census method is applied to fish stock that has slow movement, e.g. coral fish and ornamental fish.
2. Swept Area method is used to estimate stock of demersal fish. Trawl is used to sweep the areas.
3. Acoustics method is used to estimate the pelagic fish and demersal fish. The principle of this method is to count the fish stock using echo sounder.
4. Statistical method is used to estimate fish stock using time series data from number of catch and catch effort landing at the fish market.
5. Tagging. Fish is tagged, released and then caught again. This process is called release and recapture where from these data we could measure: population size and fish migration.

Some methods such as trawl and echo sounder are expensive, since these method need special research boats. An example of these kinds of boats in Indonesia is Baruna Jaya IV, which costs about 10,000,000 rupiahs per day (US\$ 1,200 per day). This amount of money is sometimes unaffordable and also will need much more to cover the whole Indonesian waters while the fund provided is always limited.

The statistical method is relative cheaper in compare with the other methods. The key to success of this method is the accuracy of the data used. But this is right the problem, because the data we have sometimes are not so accurate. The data are often manipulated and reported inaccurately for the sake of some government officers. There is a big gap between data required and funding available as well as data accessible. This fact has forced the fish stock assessment activities to make assumptions and rough approximations to produce fish stock data, which is inaccurate and therefore the data is often questioned. But this is not all. There is more than that, namely the impacts caused by this inaccurate data.

Inaccurate of stock estimation

The accuracy of fish stock assessment is one of the main keys to the successful fish resources management. Any error or inaccuracy in the estimation can cause fatal consequences in the existing marine resources. Overestimation will cause overexploitation of fish resources. This will happen when the

government gives permits to big boats, which catch more than the real maximum capacity (over fishing). On the other hand, underestimation will cause superfluous resources. Resources that can be taken profit from for human welfare become unused due to natural mortality. A theory states that when fish resources are not used optimally, there will occur competition among the population for food and territory. As a consequence, the more mature fish group will turn to be predators and will dominate the existing community structure.

If this condition lasts for long period of time and continuously, then the following impacts will follow:

- a) The pyramid structure of age will be up side down, where there will be more mature groups than the younger groups. As a result, there will be more natural mortality than recruitment (the mature fish dies soon but less younger fish are born). This means a negative growth, which will cause decreasing of the fish stock. When the catch is continuously forced to be the same amount, an overfishing will follow.
- b) The second impact of underestimation is the change of the community structure of the population in those waters. Competition over territory and food will stimulate the (other) predators of higher level to dominate the waters. The carnivores of higher level will continuously consume the fish, both those who have laid eggs and those who have not. If the number of predators grows, then the consumption intensity of fish prey will increase. This could lead to the disappearance of a species population, which has been living together with other species populations in that water. The lost of one element of the community chain will cause instability, which in its turn will change the composition of the life chain in that water. This will have impact to the structure of species community in that water.

FUTURE DIRECTION

Fixing Steps

Impacts caused by inaccuracy stock assessment are significant and sometimes difficult to overcome. To avoid these problems in managing fishery resources in Indonesia, DMF should take some steps to fix the problems. Besides, if the Indonesian government seriously wishes to make the fisheries to be the motor of the development in Indonesia, then collecting data and studying the Indonesian fish stock should fill the “first” gate of the GMB. A good and accurate fish stock estimation is the key to the successful development of fishery in the future. One may imagine what would follow to a plan that is based on inaccurate data. To be able to get an accurate data where the fishery management will be based on, the following strategic steps are suggested:

1. Increasing the budget

Fish stock assessment covers quite expensive and continuous activities; therefore, the government should take in account to increase the budget so that there will be enough fund to support the activities. The fish stock assessment should be well programmed, clear and continuously.

2. Improving the budgeting system

Survey activities should not depend on the budgeting year. Some experiences tell us that the duration of the survey sometimes is forced to be limited because the fund is not on time available. This unnecessary limitation sometimes pushes the people in charge to finish the report on time, and so the most time is spend to work on the administration rather than the substance of the activities itself. Even worst is the fact that the fund is just available when the important moment is over. It is extremely concerned. With the GMB, it is hoped that DMF can work out a good budgeting system. The existing system turns out to be one of reasons why the fish stock assessment is not optimal.

3. Improving the human resources.

Beside the budget and budgeting system, the human resources in the Department of Marine and Fisheries need to be improved. Contributions of scientists from university are also important. Many stock assessments are based on secondary data. The quality of data is determined by the values of the data. Data can only be valuable if it is managed professionally. Therefore, people processing the data should be well trained and put on the right functional position, because data processing and analysis need skill and time consuming. Data producing, processing and analysis are complex work and hence the people in these fields should be given appropriate salary. It is quite impossible to require good results of heavy work with less reward.

4. Improving the system of collecting data.

Once the human resources are improved, the next step is the improvement of the system. Most of current systems for collecting data are manual systems. Surveys are done with forms, which are sometimes not uniform over the whole places. Forms are designed accordingly to what the people in each area want. As a consequence, merging the results is sometimes a problem. This indicates a lack of coordination. Therefore, it is essential for the government to form an independent institution such as JAFIC (Japan Fisheries Information Center) that has a special task to handle fishery data which includes designing a method, collecting, processing, and distributing fishery data to the users. With this kind of independent functional institution, it is hoped that the accuracy of data can be assured and in its turn can improve the efficiency and effectiveness of the marine resource management.

5. International cooperation.

Now human resources have improved, the system of collecting data has renewed but still this is not enough. It is always a big problem for Indonesia to conduct researches that need a big amount of money. Government may try to increase budget, but to conduct a research will need more than that. Therefore, international cooperation might be required in order to get additional funding for a better results and effective management. Some fishing ground that shared with other country should be managed cooperatively, so the results will benefit both countries.

CONCLUSION

Some recommendations have already mentioned above, however the actions will be needed soon in order to fulfil the target of accurate fish stock assessment in Indonesia. The situation might also become more complicated by interactions with politic, social and economic factors. However, a better understanding and integrated management will be assets to control any problem occur.

This strategic steps mentioned in fixing steps hopefully could eliminated the gaps and at last this could help us to answer the question “How big is the Indonesian fish resources stock?”

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