

**DIRECTORATE GENERAL OF FISHERIES**

**IN COOPERATION WITH**

**FOOD AND AGRICULTURE ORGANIZATION  
OF THE UNITED NATIONS**

**WORKSHOP ON STRENGTHENING  
MARINE RESOURCE MANAGEMENT  
IN INDONESIA**

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**MARINE FISHERIES RESOURCES AND MANAGEMENT IN INDONESIA  
WITH EMPHASIS ON THE EXTENDED ECONOMIC ZONE**

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# **Marine Fisheries Resources and Management in Indonesia with Emphasis on the Extended Economic Zone**

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## 1. Fisheries Resources

The marine fisheries resources of the vast Indonesian area are comprised of a large number of species, with the fish fauna of the country generally recognized to be taxonomically the most diverse in the world. For large-scale stock assessment purposes the marine resources are usually grouped in seven or less categories: shrimp, small pelagic fish, demersal fish, skipjack, other large tuna, squid, and fish associated with coral reefs. Various attempts have been made recently to determine the magnitude of these resources.

In the late 1980s a cooperative project between the Directorate General of Fisheries (DGF) and the Central Research Institute for Fisheries (CRIFI) reviewed Indonesia's marine resource potential. This resulted in a publication (Martosubroto et al., 1991) which is still used extensively today. In 1994 the DGF did further work on these estimates which culminated in an approximation of the number of vessels required to fully exploit the remaining potential. In early 1995 the Indonesia/FAO/DANIDA Workshop on the Assessment of the Potential of the Marine Fishery Resources in Indonesia reviewed all available information and, with input from 28 Indonesian and overseas researchers, produced new assessments (Venema 1996).

During the research for the present project, which focuses to some degree on the resources of the extended economic zone (EEZ), it became apparent that the DGF makes use of EEZ resource estimates from the early 1980s (Anon 1983). The potential estimates presently used for management by DGF appear to be a combination of the 1981 report and that produced in 1991.

Although it is recognized that many individuals had input into the various assessments above, for the purpose of simplicity and clarity the Martosubroto et al. (1991), Anon (1983), Indonesia/FAO/DANIDA estimates are referred to in the present report as Martosubroto, DGF 1995, and FAO 1995.

It is not possible to make a strict comparison of the results of the various assessments because the species groups, boundaries, and areas included are not uniform. Although it is not the intention of the present study to dwell on the differences, it should be pointed out there are major discrepancies in the estimates for small pelagics and demersal fish. These are shown in Figure 1.

As part of the work programme of the present project, an Indonesian stock assessment specialist with a long historical involvement in fisheries research in the country scrutinized the above estimates. The resulting paper (Badrudin 1996) essentially supports the assessments made during the 1995 FAO workshop. Because the workshop built on previous work, corrected weakness, and considered new data, unless there is strong scientific rationale to the contrary, it is recommended that DGF should use the 1995 FAO estimates.

Figure 1 A

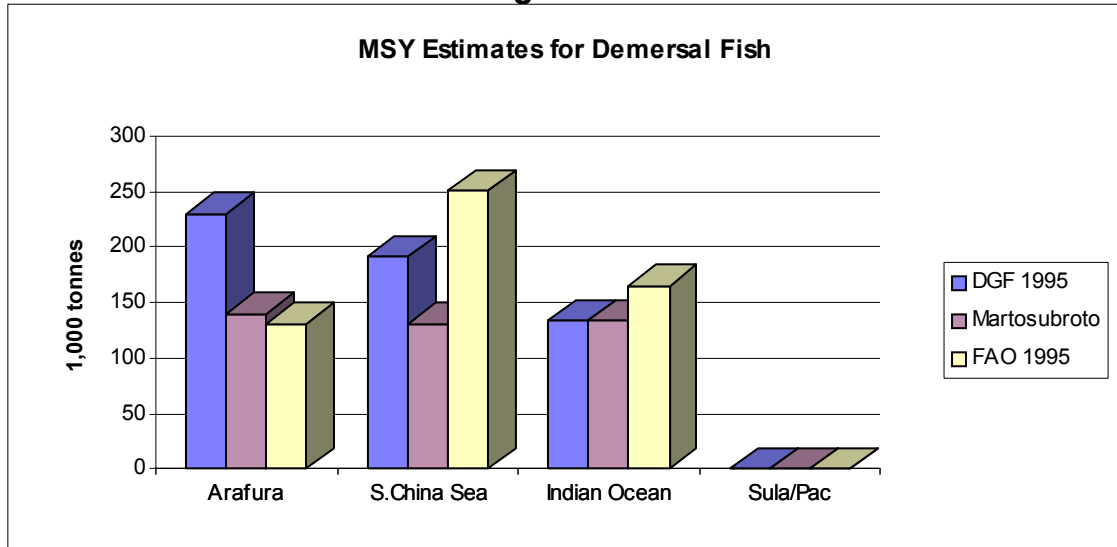
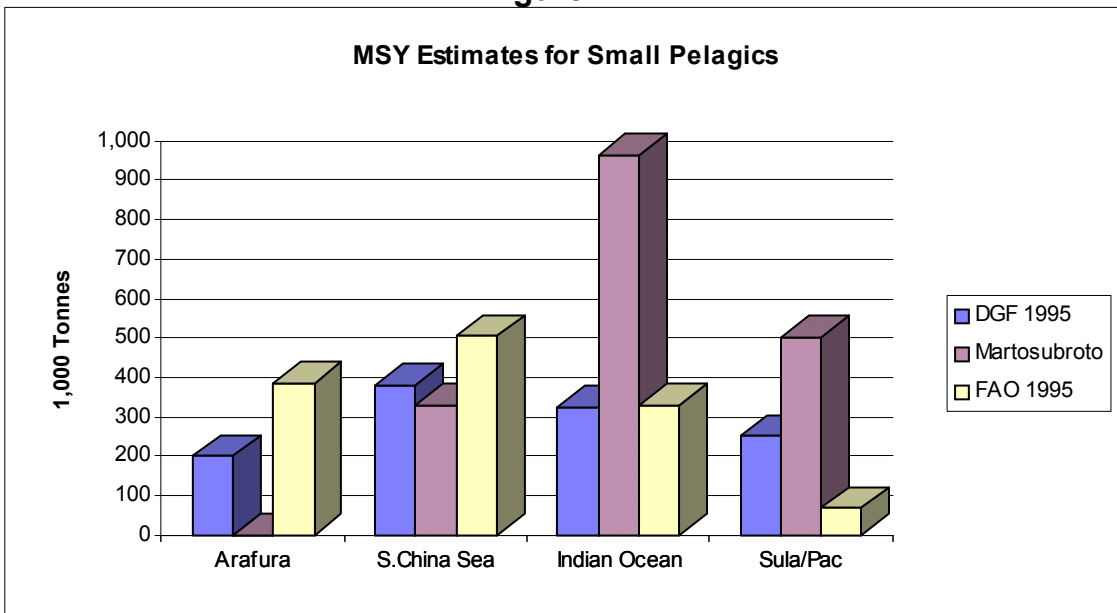


Figure 1 B



## 2. The EEZ Situation

### 2.1 Historical Perspective of Fisheries Management in the EEZ

Indonesia acquired an exclusive economic zone (EEZ) in March 1980 by a government declaration which was subsequently replaced by Law No.5 of 1983 on the Indonesian Exclusive Economic Zone. The EEZ is defined as the area extending 200 miles offshore from the territorial waters except in the case where it overlaps that of neighbouring countries in which case the boundary is to be fixed by international treaty. The main Indonesian EEZ areas are the Arafura Sea, Indian Ocean, Pacific Ocean, Sulawesi Sea, and the South China Sea<sup>1</sup>.

<sup>1</sup> Although the Straits of Malaka is sometimes considered along with the main EEZ areas, it is not specifically dealt with in the report due to its small size and absence of authorized foreign fishing.

A large number of vessels from mainly Taiwan, Thailand, and the Philippines exploit several categories of marine resources using four general types of gear. Figure 2 summarises the EEZ fleet operations in the past decade. In general terms it can be seen that:

- The change in size of the fleet in recent years is due largely to fluctuations in the numbers of Indonesian vessels rather than foreign vessels
- Progress has been slow in the localisation of the EEZ fisheries
- The size of the Indonesian fleet peaked in 1993/94
- The foreign fleet's largest component is longliners whose numbers increased remarkably in the late 1980s
- Much of the foreign fleet activity is in the Indian Ocean
- There has been considerable variability in the foreign fishing in the South China Sea

In many cases, foreign fishing in Indonesia represents the export of excess fishing capacity from the flag state of the vessel (e.g. Thai trawlers or Filipino purse seiners). Alternatively, some types of vessels are attracted to Indonesia by the relatively cheap labour as in the longline fisheries. Other vessels are in the zone because of diminishing opportunities in other areas, such as the Australian portion of the Arafura Sea being closed to foreign fishing vessels since 1990. There is also the possibility that some vessels are now based in Indonesia after being banned in most other areas (e.g. drift net vessels).

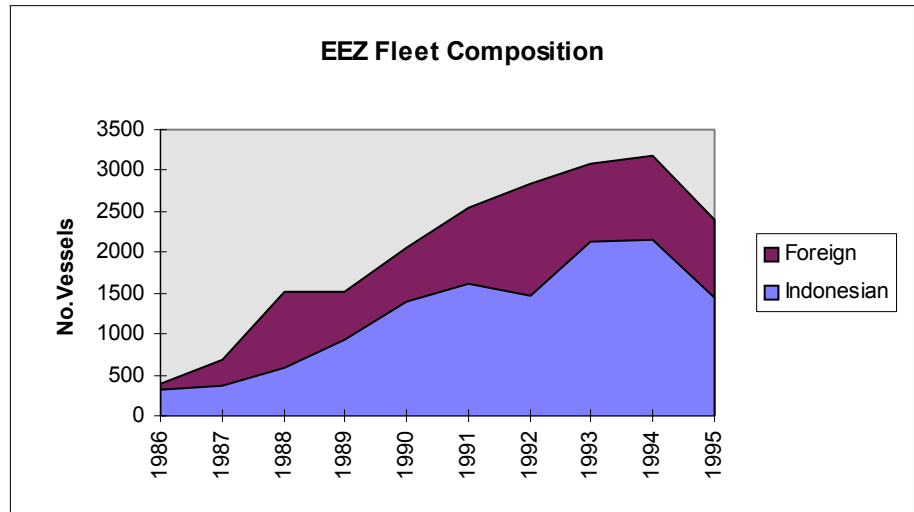
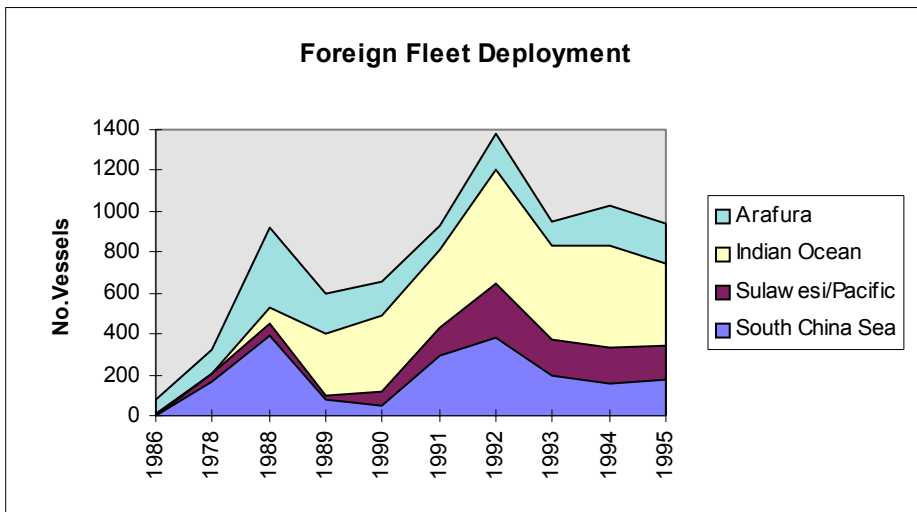
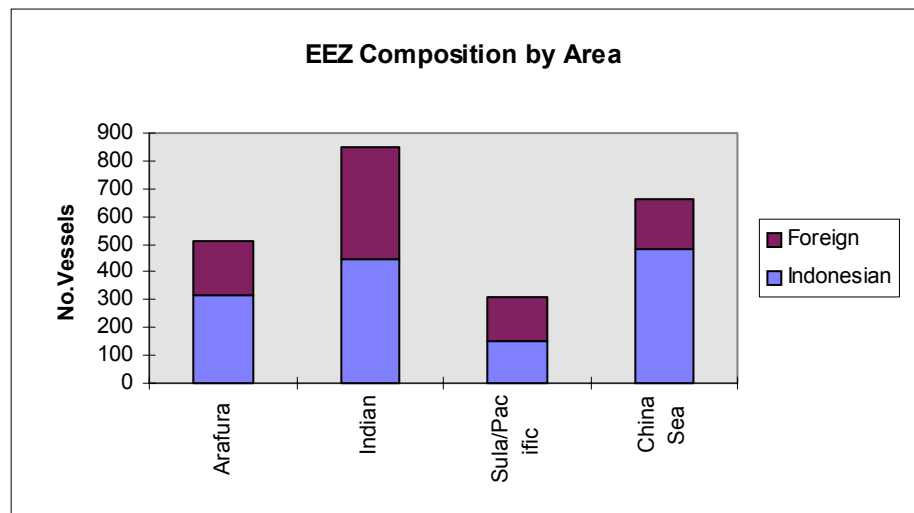
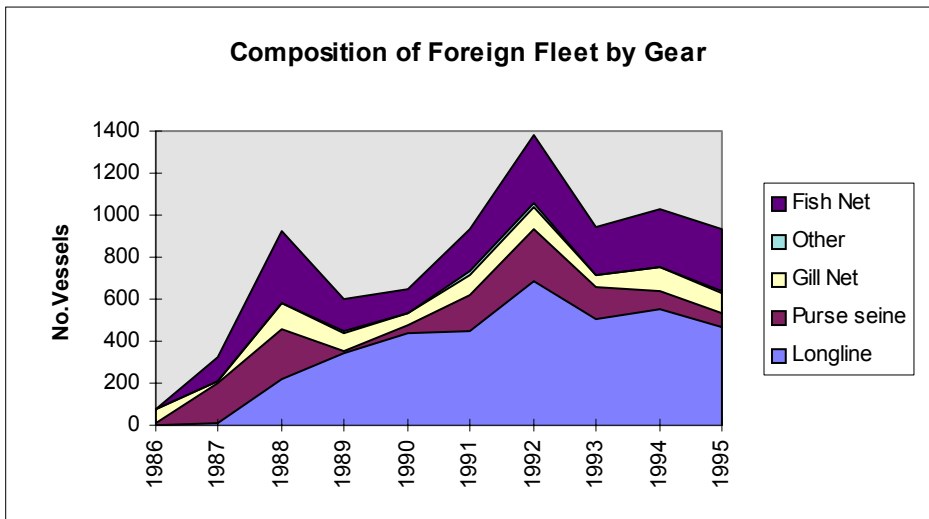


Figure 2



## 2.2 The Present Situation

In October 1995 details of the vessels licensed to fish in the EEZ are as follows:

**Table 1**  
**Details Of The Vessels Licensed To Fish In The EEZ**

|                        | <b>Pole and Line</b> | <b>Long-line</b> | <b>Purse Seine</b> | <b>Gill Net</b> | <b>Fish Net</b> | <b>Shrimp Net</b> | <b>Other Gear</b> | <b>Total</b> |
|------------------------|----------------------|------------------|--------------------|-----------------|-----------------|-------------------|-------------------|--------------|
| <b>Local Vessels</b>   | 61                   | 447              | 185                | 86              | 497             | 50                | 124               | 1450         |
| <b>Foreign Vessels</b> | 0                    | 471              | 67                 | 91              | 303             | 0                 | 5                 | 937          |
| <b>Total</b>           | 61                   | 918              | 252                | 177             | 800             | 50                | 129               | 2387         |

Source: DGF unpublished data

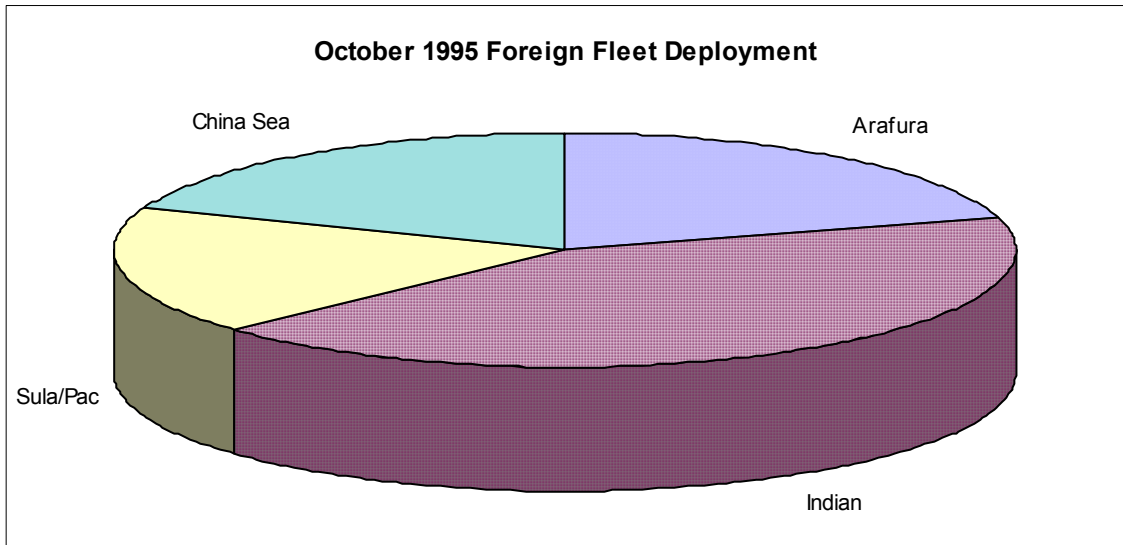
Information on the composition and location of the foreign fleet from October 1995 is summarised graphically in Figure 3. About 61% of all licensed vessels in the EEZ are Indonesian. Longliners operating in the Indian Ocean make up a large portion of the foreign fleet.

In recent years the revenue from licensing foreign fishing has averaged about 14.6 billion Rupiah per year or just over US\$5 million. According to Government Regulation 15 of 1990 on Regulation of Fishing, these foreign fishing fees are to be used for fisheries development, 70% for central government and 30% for provincial governments.

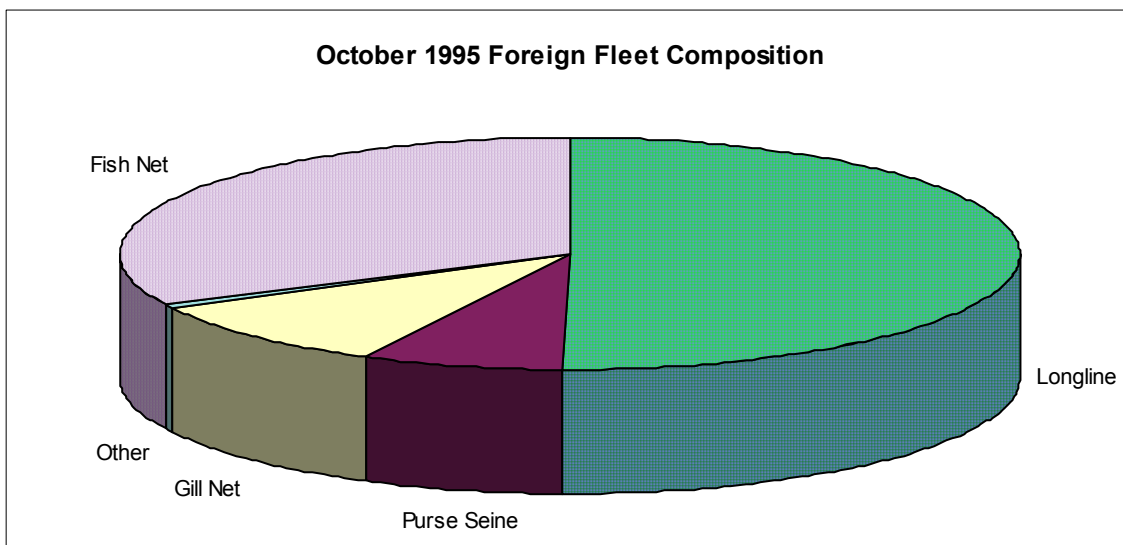
## 2.3 Catches in the EEZ

The Fisheries Management Sub-Directorate uses estimates which show that 559,709 tonnes of fish are caught in the EEZ by licensed Indonesian and foreign vessels. Agrodev (1994) using "potential fishing power" estimated the foreign catch at about 140,000 tonnes. The TCP project, using "expected catches" (Section 3.2), has calculated the licensed EEZ catches to be about 424,000 tonnes for Indonesian vessels and 419,000 tonnes for foreign vessels.

Substantial unauthorized foreign fishing in the EEZ is thought to occur. A number of attempts have been made to calculate the amount or value of this illegal activity by various observers. Estimates have ranged up to US\$100 million per year. In reality, this is extremely difficult to calculate and attempts to do so are probably little more than guesswork. Due to the proximity to Thailand and the Philippines, it is likely that



**Figure 3**  
**Details of the Foreign EEZ Fleet in October 1995**  
**By Number of Vessels**  
Source: DGF unpublished data



much of the illegal foreign fishing activity occurs in the South China Sea and the Sulawesi Sea.

### 3. Considerations on Allocation of Access and Licenses Among Fleets in the EEZ According to Resource Distribution

#### 3.1 The Present System

Discussions with DGF officials indicate that the present system for allocating licenses for EEZ fishing consists of the general notion of dividing the MSY for the fishery by the expected annual catch of individual vessels to obtain the number of vessels to be licensed. Apparently, a similar system is used to determine future vessel requirements to fully exploit the resources of the EEZ.

The allocation of licenses is covered by numerous legislation. These include:

- Law No.5 of 1983 on the Indonesian Exclusive Economic Zone states that the Government of the Republic of Indonesia shall license foreigners to exploit a living natural resource in a definite area within the EEZ, provided that the allowable catch for that type of fish exceeds the Indonesian capacity for utilization
- Article 4 of Law No.9 of 1985 on Fisheries states that the Minister shall make regulations on the fishing grounds, fishing areas, seasons, as well as the volume and type of catch, and the size of the allowable catch
- Article 10 of Law No.9 of 1985 on Fisheries requires that an individual or body corporate engaging in fishery activities shall obtain a license
- Government Regulation No.15 of 1984 indicates that the Minister shall determine the allowable catch for fish resources in the EEZ, that the allowable catch shall be determined in the light of the findings of research, surveys, and evaluation of fishing activities, and that the Minister shall determine the number of fishing vessels bearing in mind the allowable catch
- Ministerial Decree<sup>2</sup> No.473 of 1985 gives the potential and total allowable catch for small pelagics, skipjack, large tunas, and demersal fish. It also states that the number of vessels allowed to operate in the EEZ will be established on the basis of productivity of the gear in relation to the allowable catch and that the allowable catch is subject to modification based on research, surveys, and/or evaluation of fishing activities
- Ministerial Decree No.475 of 1985 states that licenses are to be approved or denied to foreign flag vessels based on determination of total allowable catch and state of utilization of Indonesian fishing companies
- Government Regulation No.15 of 1990 gives authority to the governors of provinces to license Indonesian vessels of up to 30 gross tonnes

To determine the annual catches for the purpose of license allocation, the DGF uses a table prepared by the Capture Fisheries Sub-Directorate. That table gives average annual catches in tonnes for seven sizes of vessels and six gear types:

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<sup>2</sup>In this report "ministerial decrees" refer to Ministry of Agriculture decrees

**Table 2 Average Annual Catches By Type and Size of Vessel**

| Tonnage          | Gill Net | Fish Net | Longline | Single Purse Seine | Multi-Purse Seine | Squid Jigging |
|------------------|----------|----------|----------|--------------------|-------------------|---------------|
| <b>60 - 100</b>  | 133      | 511      | 70       | 153                | 225               | 32            |
| <b>100 - 150</b> | 220      | 836      | 125      | 244                | 440               | 41            |
| <b>150 - 200</b> | 312      | 1116     | 160      | 359                | 460               | 50            |
| <b>200 - 300</b> | 520      | 1797     | 220      | 598                | 705               | 63            |
| <b>300 - 400</b> | 757      | 2364     | 301      | 871                | 968               | 90            |
| <b>400 - 600</b> | 788      | 3264     | 376      | 906                | 1430              | 121           |
| <b>600 - 800</b> | 868      | 4243     | 448      | 998                | 1710              | 186           |

Units: tonnes per year

The MSY figures presently used for allocating fishing effort in the EEZ are:

**Table 3 MSY Figures Presently Used For Allocating Fishing Effort**

| Species Group         | Arafura                       | S.China Sea | Sula/Pac | Indian Ocean |
|-----------------------|-------------------------------|-------------|----------|--------------|
| <b>Small Pelagics</b> | 200,000                       | 382,031     | 251,000  | 326,700      |
| <b>Demersal</b>       | 230,400                       | 191,731     | 0        | 134          |
| <b>Skipjack</b>       | 160,000<br>(includes tongkol) | 0           | 73,584   | 15,300       |
| <b>Tuna</b>           | 0                             | 0           | 43,915   | 32,000       |
| <b>Shrimp</b>         | 14,000                        | 0           | 0        | 0            |

unit=tonne

### 3.2 Observations on the Present System

To determine the relationship in the present system between licensing and resource distribution, an attempt was made by the TCP project to compare likely annual catches of the fleets to the DGF MSY in the various EEZ areas. To do so, the numbers of the various types of vessels licensed categorized by gear type, by vessel size, and by EEZ area was obtained from the Industrial Fisheries Sub-Directorate. These DGF license numbers were multiplied by the above DGF estimates of annual catches<sup>3</sup> to obtain "expected catches" which were then compared to the DGF MSY levels. The results are given in Table 4.

Leaving aside temporarily the question of the validity of the DGF assumptions (MSY, annual catches), a number of features are apparent from the table. These include:

- Demersal fish: expected catches substantially over the MSY in the Arafura (Figure 4)
- Small pelagics: substantial biological potential for expansion of catches in most EEZ areas (Figure 4)
- Large tunas: in some areas expected catches exceed MSY, in other areas the reverse occurs
- Skipjack: expected catches are less than the 1995 DGF MSY in all areas

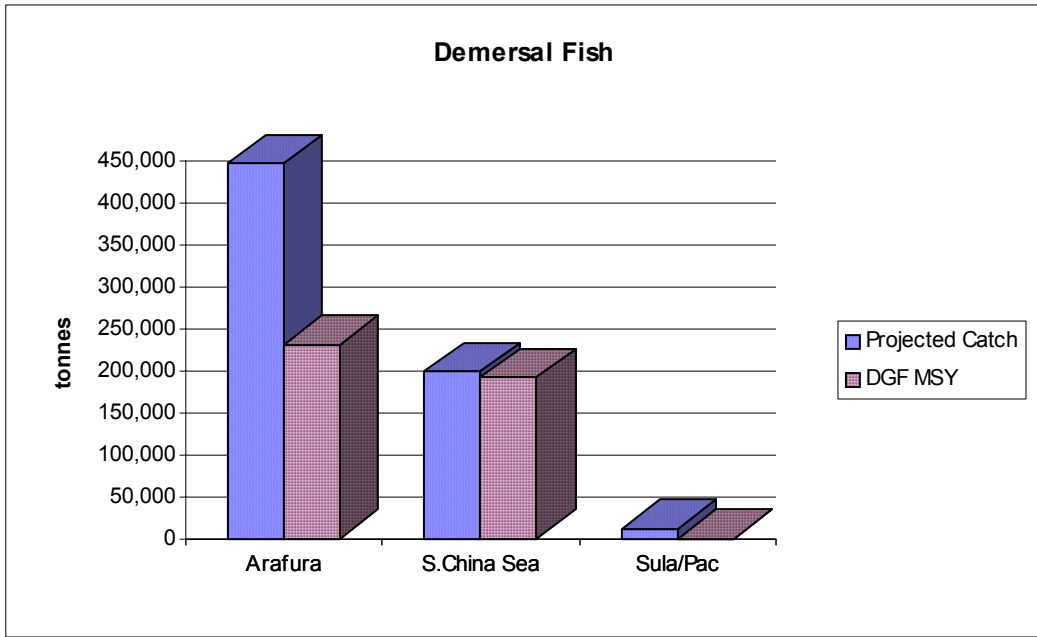
<sup>3</sup> A number of estimations had to be made including catches of vessels in the 30 to 60 tonnes class, catches of shrimp net vessels, and catches of pole/line vessels

**Table 4 Comparison of Expected Catches and MSY**

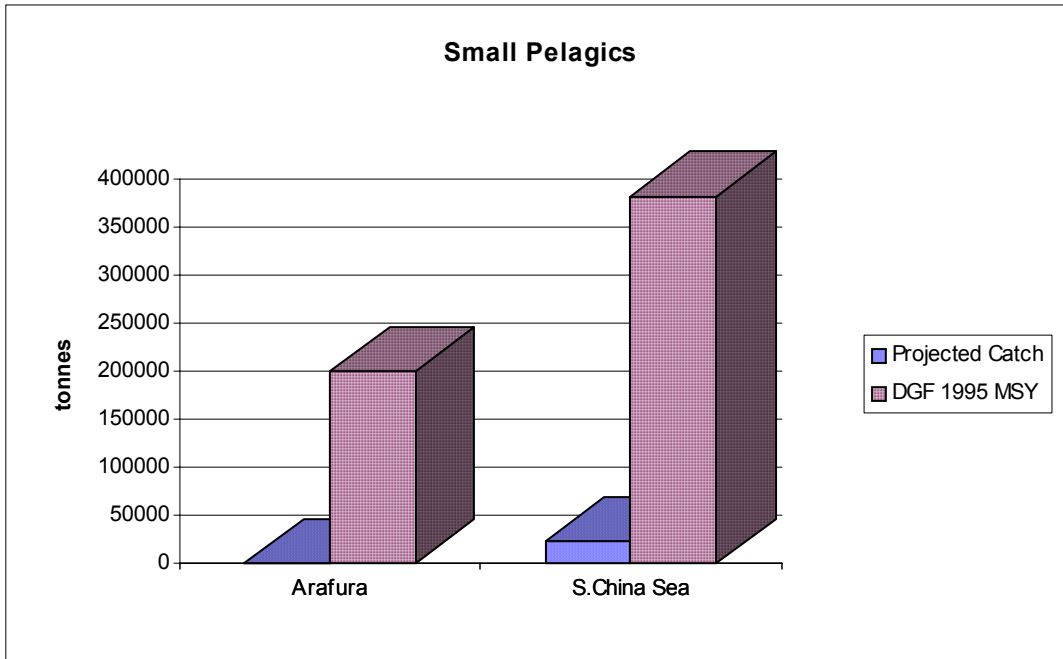
Expected catch = (No. Licensed vessels in each size category) X (expected annual catch)

|                         |  | <b>Expected Indonesian EEZ Fleet Catch</b> | <b>Expected Authorised Foreign EEZ Fleet Catch</b> | <b>Expected Total EEZ Fleet Catch</b>                   | <b>DGF MSY</b>         |
|-------------------------|--|--|--|---|------------------------|
| <b>Arafura</b>          | Pole/Line  | 0  | 0  | 0   | (see gill net below)   |
|                         | Longline   | 0  | 0  | 0   | 0                      |
|                         | Purse Seine (small pelagics)                     | 0  | 0  | 0   | 200,000                |
|                         | Gill Net (large pelagics)                        | 21,661                                     | 4,588  | 26,249  | 160,000 (SJ,tongkol)   |
|                         | Fish Net (demersal fish)                         | 146,868                                    | 299,603  | 446,471   | 230,400                |
|                         | Shrimp Net                                       | 938 (only shrimp vessels)                  | 0  | 938 (only shrimp vessels)                               | 14,000                 |
| <b>Sulawesi Pacific</b> | Pole/Line (skipjack, some juvenile large tuna)   | 26,300                                     | 0  | 26,300  | see purse seine below  |
|                         | Longline (large tuna)                            | 2,215                                      | 7,288  | 9,503   | 43,915                 |
|                         | Purse Seine (skipjack, some juvenile large tuna) | 10,717                                     | 15,026   | 25,743 (plus 26,300 pole/line catch from above) =52,043 | 73,584 skipjack        |
|                         | Purse seine (small pelagics)                     | 0  | 0  | 0   | 0                      |
|                         | Gill Net   | 1,346                                      | 2,577  | 3,923   | ?                      |
|                         | Fish Net (demersal fish)                         | 0  | 11,217   | 11,217  | 0                      |
| <b>Indian Ocean</b>     | Pole/Line  | 0  | 0  | 0   | (see p/s below)        |
|                         | Longline   | 37,900                                     | 19,645   | 57,545  | 32,000                 |
|                         | Purse Seine (skipjack, some juvenile large tuna) | 859  | 2,392  | 3,251   | 15,300 skipjack        |
|                         | Purse seine (small pelagics)                     | 0  | 0  | 0   | 326,700                |
|                         | Gill Net   | 480  | 3,120  | 3,600   | ?                      |
|                         | Fish Net (demersal fish)                         | 0  | 0  | 0   | 134,000                |
|                         | Shrimp Net                                       | 0  | 0  | 0   | 0                      |
| <b>S. China Sea</b>     | Pole/Line  | 0  | 0  | 0   | 0                      |
|                         | Longline   | 50   | 0  | 50  | 0                      |
|                         | Purse Seine (small pelagics)                     | 22,174                                     | 1,565  | 23,739  | 382,031 small pelagics |
|                         | Gill Net   | 3,837                                      | 2,527  | 6,364   | ?                      |
|                         | Fish Net (demersal fish)                         | 148,787                                    | 49,784   | 198,571   | 191,731                |
|                         | Shrimp Net                                       | 0  | 0  | 0   | 0                      |
| <b>Total</b>            |  | 424,132                                    | 419,332  |   |                        |

Units: tonnes



**Figure 4**  
**Comparison of Expected Catches with MSY**



The above examination of the DGF system for licensing vessels for EEZ fishing suggests that additional attention should be paid to the resource situation to safeguard its sustainability. Although the system is nominatively based on resource availability, the outcome is somewhat different.

Certain aspects of the above methodology deserve closer attention. It should be noted that for the critical demersal fisheries in the Arafura and South China Sea, the excess of the expected catch over MSY would increase significantly if the more recent Martosubroto or 1995 FAO estimates of MSY were used<sup>4</sup>. The total amount of expected catch over MSY further increases due to any unauthorized foreign and Indonesian fishing and any fishing in the EEZ by vessels smaller than 30 GT which are licensed by the provinces.

The table of annual catches is an important component of the license allocation system. It is a useful tool that could be even more useful if improvements are made to correct certain deficiencies. These include:

- Although there were 1250 vessels in the 30 to 60 GT category licensed to fish in 1995, this size category is not covered by the table.
- The accuracy of the table is critical but it was not possible to gauge this aspect during the TCP project. A very limited amount of anecdotal information, however, suggests that for at least one gear type (group tuna purse seiners) there is a substantial under-estimate of the average annual catch.
- The catches of shrimp net vessels and pole/line vessels are not covered.
- It may not be reasonable that a single estimate would be accurate in all the EEZ areas of Indonesia. For example, the annual catches of a 200 GT gill net vessel may vary considerably between the South Pacific and the Arafura.
- A particular gear type may make large catches of non-target species groups which is not readily apparent from the table. For example, it appears as though fish net vessels actually catch more shrimp than shrimp net vessels.
- The “gill net” category may cover more than one type of gear, for example both bottom set nets and driftnets.
- The estimated annual catches are likely to be much greater during a phase of low exploitation than when MSY is being approached.

### 3.3 Suggestions for Improvement of the Present System

It may be possible to overcome some of the difficulties in the present EEZ license allocation system by instituting changes in four areas:

1. The MSY applied to the fishery should be derived from the best scientific evidence available (Section 1). Where there is considerable uncertainty over the resource situation, a conservative MSY should be adopted. Discussions at DGF concerning the altering of the level of MSY should include scientists who have researched the fishery.
2. Considering *inter alia* the large amount of unauthorized and unaccounted fishing likely to be occurring in some of the EEZ areas, the total allowable catch should be set accordingly below the MSY

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<sup>4</sup> It should be noted, however, that the areas covered by the estimates are not the same.

3. The table of annual catches should be enhanced. Information from the fishery, observers (Section 6.1), gear technologists, verified landings, and other sources should be used to overcome the deficiencies cited above. The table should be updated regularly and independently checked for accuracy.
4. A procedural mechanism should be instituted so that when the expected catch for a fishery reaches the level of the total allowable catch, additional licensing for that fishery legally ceases.

### 3.4 General Comments on Allocation of Licenses with Respect to Resources

Taking into consideration data from the present license system, more recent resource estimates, information from industry, and limited observations on the fishery, some general comments on license allocation for the important species groups can be made.

#### 3.4.1 Demersal fish

Even using the relatively generous DGF 1995 MSY, these fish appear to offer no opportunity for fleet expansion in the important fishing grounds of the Arafura Sea and South China Sea. Presently, the expected catch of the Indonesian fish net fleet is about equal to the recent FAO 1995 MSY and that of the authorized foreign fleet is about double that MSY. For the South China Sea, the catches by the authorized vessels is close to the DGF 1995 MSY, but the proximity of the area to the trawl fleets of Thailand suggests substantial unauthorized foreign fishing. Reports of falling catch rates from industry in both areas give support to the contention of over-exploitation. For the Indian Ocean EEZ the situation is less clear, but as the shelf is relatively narrow, it is likely that the demersal resources are largely inshore of the EEZ. If so, significant offshore fleet expansion from the present absence of licensed vessels is unlikely.

In summary, fleet expansion based on demersal resource in the EEZ does not appear possible, but rather a fleet reduction by removal of foreign vessels should occur. The international obligation to license vessels where Indonesian capability is lacking should not be considered applicable to the fishery. It should be noted that Australia ceased licensing foreign fishing vessels to fish in their sector of the Arafura Sea in 1990.

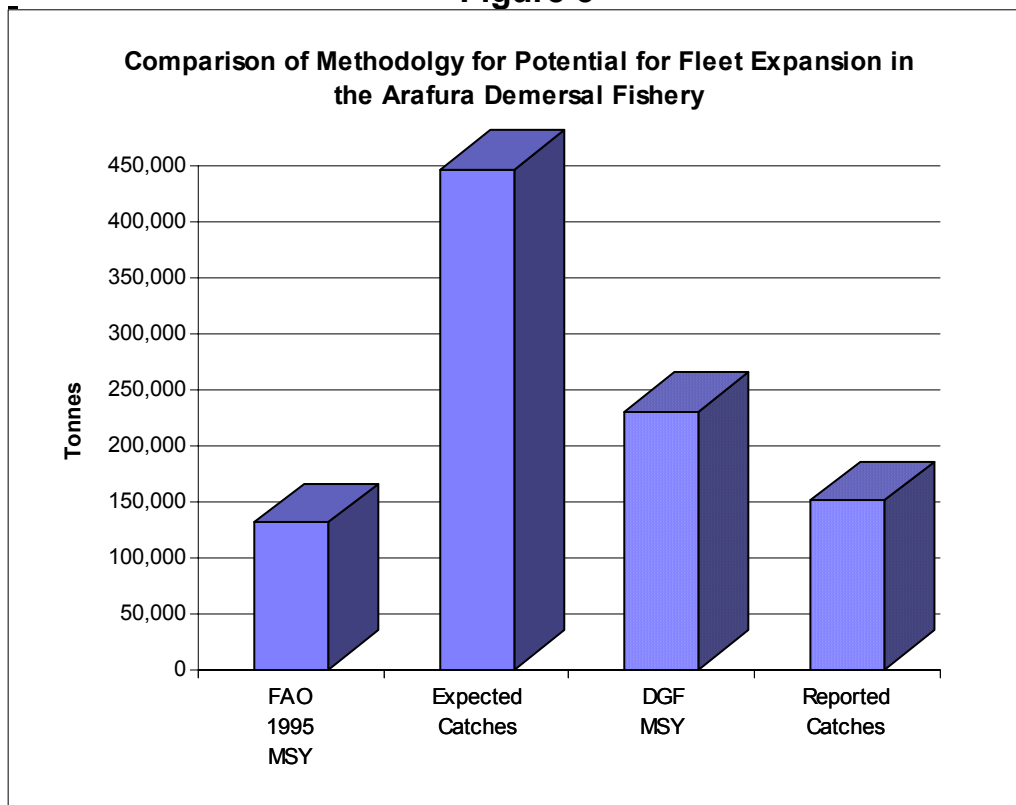
The present tentative plans of the DGF are for a fleet expansion of 95 and 19 fish net vessels in the Arafura and South China Sea areas respectively<sup>5</sup>. These plans are based on the differences between generous MSY estimates and *reported*<sup>6</sup> landings. In addition, they appear not to consider the amount of unauthorized fishing or any precautionary margin below the MSY. The basic difference in allocation methodologies between that presently used by DGF and that use by the TCP project can be seen graphically in Figure 5.

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<sup>5</sup>The fleet expansion plans are contained in an unpublished document of the Directorate of Resources Management

<sup>6</sup> For example, the reported landings of demersal fish in the Arafura Sea EEZ are given as 170,747 tonnes while the expected catch of the fish net vessels licensed to fish in the Arafura is 446,471 tonnes.

Figure 5



### 3.4.2 Small Pelagics

Large scale harvesting of small pelagics in the EEZ presently only occurs in the South China Sea where 132 Indonesian and 13 foreign purse seiners were licensed in 1995. All three MSY estimates of the pelagic resources in the EEZ areas show substantial quantities. The main point of difference in the estimates appears to be for EEZ areas off the shelf, especially in the Indian Ocean and to a lesser degree in the Sulawesi/Pacific area (Figure 1). The assumption that the density in offshore areas is large is probably invalid and therefore the MSY figures associated with that methodology should be discounted. Both the FAO 1995 MSY estimate (covers both EEZ plus inshore areas) and DGF 1995 MSY estimate (only EEZ area) show a total potential of about 1,200,000 tonnes:

**Table 5 Information on Small Pelagics**

Units: tonnes

|                     | FAO 1995 MSY (EEZ+inshore) | DGF MSY (EEZ) | 1995 DGF Estimates of EEZ Catches (only EEZ) | Reported 1993 Catch (EEZ+inshore) |
|---------------------|----------------------------|---------------|--|-----------------------------------|
| <b>Arafura</b>      | 386,000                    | 200,000       | 21,006                                       | 21,000                            |
| <b>S.China Sea</b>  | 504,000                    | 382,031       | 45,719                                       | 113,000                           |
| <b>Indian Ocean</b> | 330,000                    | 326,700       | 2,950  | 297,00                            |
| <b>Sula/Pac</b>     | 69,000                     | 251,000       | 14,788                                       | 48,000                            |
| <b>Total</b>        | 1,289,000                  | 1,159,731     | 84,463                                       | 479,000                           |

The above table suggests that there is considerable potential in the Arafura Sea and South China Sea. It should be noted, however, that because of the proximity of the South China Sea to Thailand, considerable unauthorized fishing is likely, resulting in less potential. The table also implies that much of the potential of small pelagics in the Indian Ocean area is inshore of the EEZ and that this is being exploited.

The tentative fleet expansion plans of the DGF call for an additional 1,705 purse seiners, 979 gill netters, and 78 fish net vessels to fully exploit the potential of small pelagic fish resources in the EEZ. These plans raise the following issues:

- Although substantial biological potential of small pelagics in some areas is not disputed, the economic feasibility of such a fishery is not clear. It appears to be a case of relatively low-value species caught at considerable distance from market opportunities. Accordingly, it may not be a realistic exercise to allocate vessels to what may be non-economic fisheries. The viability situation may, however, change in the future.
- It should be stressed that, if the present situation is not economically viable, that the conditions will be even less favourable as the point of maximum sustainable yield is reached due to falling CPUE.
- Plans to acquire fairly large gill net vessels may be in conflict with the international moratorium on drift nets (Section 6.3).
- Movement of vessels from over-exploited small pelagic fisheries in other areas of Indonesia to the EEZ may be more desirable than the construction of new vessels.

In summary, it appears as though a substantial amount of small pelagics could be caught annually in the EEZ and that the present catch is quite small, at least in the Arafura Sea. Depending on the economics of the fishery, fleet expansion plans may be premature.

### 3.4.3 Skipjack and Other Large Tuna

In many respects allocation of EEZ licences for tuna fisheries is the most complex of the species groups: Insufficient knowledge of the resource, poor statistics on landings, the fact that the fisheries interact with those in both the inshore area and in other countries, and an unknown but probably large amount of unauthorized foreign fishing.

Presently the DGF uses the following estimates for MSY:

**Table 6 MSY Information on Tuna**

|                     | <b>Skipjack</b>               | <b>Other Large Tunas</b> |
|---------------------|-------------------------------|--------------------------|
| <b>Arafura</b>      | 160,000<br>(includes tongkol) | 0                        |
| <b>Sula/Pac</b>     | 73,584                        | 45,915                   |
| <b>Indian Ocean</b> | 15,300                        | 32,000                   |
| <b>S.China Sea</b>  | 0                             | 0                        |
| <b>Total</b>        | 88,884                        | 77,915                   |

Units: tonnes

Various attempts have been made on assessing this valuable resource. Although Martosubroto gives a potential of 294,800 and 186,000 tonnes for skipjack and

yellowfin respectively<sup>7</sup>, the report of the IND/FAO/DANIDA workshop states “there is a consensus among tuna specialists that at this state of knowledge of these resources nobody can make reasonable predictions of the potentials of these species”.

In very general terms, some data and anecdotal reports from fishermen indicate declining CPUE from the various fisheries within the Indonesian Archipelago. However, from a larger perspective, extensive research throughout the western Pacific suggests considerable interaction with Indonesian fisheries. In this vast area there are indications of potential for increased skipjack catches and somewhat less increases for yellowfin. Historical trends from the eastern Indian Ocean suggest that the longline fishery for the tuna is mature and large increases in production are not expected. Eastern Indian Ocean skipjack does not appear to be heavily exploited.

Given this somewhat contradictory information on the state of resources, it is not possible to realistically allocate licenses according to resource distribution nor to prudently formulate resource-based fleet expansion plans<sup>8</sup>. At this stage the best that can be done is, in areas where potential is deemed likely, to carry out an incremental fleet expansion programme in accordance with careful monitoring of CPUE of that and adjacent tuna fisheries. The present practice of DGF of using the difference between a very uncertain MSY and probably inaccurate estimates of present catches to determine “remaining potential” for fleet expansion and subsequent numbers of vessels requires reconsideration. Thought should also be given to how tuna fleet expansion plans of neighboring countries are to be accommodated.

It is important to note that in October 1995, 50% of all foreign vessels authorized to operate in Indonesia were tuna longliners. The replacement of this fleet (471 longliners) by Indonesian vessels does represent a real opportunity which can be planned for. Filipino purse seiners (50 licensed in October 1995 in the Sulawesi/Pacific area), although utilizing a somewhat higher technology than longliners, could also eventually be targeted for localization.

#### 3.4.4 Shrimp

The only EEZ area where shrimp vessels are licensed to fish is the Arafura Sea where the expected catch of 50 mainly small vessels is 938 tonnes per year. The MSY used by the DGF, 14,000 tonnes, is about the same as that suggested in the 1995 FAO estimates. This alludes to the reality that most shrimp in that area is caught by fish net vessels, probably in contravention to gear regulations.

There is general recognition that the shrimp fishery in the Arafura is over-exploited. Effort reduction plans of 50% of that of 1995 have been suggested by biologists. The potential for expansion of the fishery is therefore non-existent.

### 3.5 Summary of Considerations on Allocations

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<sup>7</sup> For all waters under Indonesian jurisdiction

<sup>8</sup> For example, the management of a tuna cannery in Bitung which is experiencing major difficulties in obtaining adequate supplies of raw tuna attributes the predicament to overly-optimistic stock assessments obtained during the period when feasibility studies were undertaken for the investment.

Demersal fish and shrimp resources are not considered capable of supporting further fleet development in any EEZ area. The small pelagic resources are likely to be able to withstand substantial additional fishing effort, but the economics of the situation may make placing actual numbers of additional vessels an irrelevant exercise. There is some possibility that skipjack and other large tunas may be able to support increased catches. Rather than formulate long-range expansion plans on this possibility, it is recommended that incremental expansion be carried with close monitoring of the effect. The replacement of the large foreign tuna fleet, especially the longliners, is seen as perhaps the only clear possibility for expansion of the Indonesian EEZ fleet.

It should be noted that this opinion is considerably different than the present tentative plans of DGF which call for an extra 285 longliners, 1775 purse seiners, 1136 gill netters, and 250 fish net vessels.

#### 4. Problems and Constraints of the Present Licensing System for Foreign Fleets

##### 4.1 Localization of the EEZ Fleet

The major issue with respect to licensing policy for foreign fleets is the mechanism used for achieving the objective of replacing foreign fishing activity with Indonesian operations. In 1990 the system of licensing foreign fishing vessels to fish in the EEZ of Indonesia was replaced by a scheme in which foreign vessels are only allowed in the zone if they have been chartered to an Indonesian company. This policy is an attempt to encourage a transfer of technology, provide additional employment (at least 30% of the crew must be Indonesian), and increase the supply of fish (all the catch must be landed in an Indonesian port). The policy of localization of EEZ fishing activity is considerably affected by the Letter of Instruction from Minister of Research and Technology 557 of 1985 in which the purchase of fishing vessels from overseas was prohibited.

The localization scheme has met with mixed success. Although it potentially could result in greater benefits to Indonesia, there are three major problems:

- The government is in a position of attempting to reconcile localization in EEZ fishing with localization in the shipbuilding industry and these objectives are sometimes incompatible.
- Many of the companies presently involved in chartering foreign vessels are not bonafide fishing companies and therefore have limited interest in the transfer of technology or maximizing employment and supply of fish.
- Enforcement of the legal requirements has been weak.

The reality of the situation is that between 1990 when the present policy began and the end of 1995 the number of Indonesian vessels licensed to fish the EEZ is about the same (Figure 2). The major factor thought to constrain the expansion of the local fleet are the costs associated with purchasing domestically constructed vessels (cost of vessel, cost of available financing, production time). The industry can use foreign chartered vessels but cannot purchase and operate these as Indonesian vessels.

Because of this, the number of foreign vessels licensed to operate in the EEZ actually increased 43% in the 1990-1995 period.

To achieve the objective of localization of the EEZ fleet, government policies must be modified. This may be done by either allowing the purchase of foreign vessels for certain fisheries or positive incentives to purchase locally constructed vessels. If some limited purchase of foreign vessels is to be allowed, it is important that the fishery resource/exploitation situation be considered (Section 3.5) in the decision. Accordingly, the tuna fisheries deserve consideration for targeting. Alternatively, if the purchasing of local vessels is to be promoted, measures such as Presidential Decree No.4 of 1996 (reducing the value added taxation on certain materials for vessel construction) should be complemented by further measures.

One of the major objectives of the chartering system instituted in 1990 was a transfer of technology from foreign companies to the local chartering company. That transfer can only realistically take place if the local company has an interest in fishing. Unfortunately, many of the Indonesian firms to which vessels were chartered to are not involved in the fishing business and have no strong desire in acquiring new fishing technology, but rather are passive recipients of money from being associated with foreign vessels. As the license fees for foreign vessels are lower under the chartering scheme than formerly, the net result in many cases appears to be a transfer of income from the government to private Indonesian chartering firms. To rectify this situation, a policy should be instituted so that only bonafide Indonesian fishing companies with historical involvement in the fishery concerned are permitted to be foreign vessel charterers.

#### 4.2 Considerations on the Fee Level

The government levy on foreign fishing vessel chartering is based on the concept that this revenue should be 5% of the landed value of the catch and that landed value can be related to fish hold volume. Ministerial Decree No.816 of 1990 specifies the following fees levels:

- Longline: US\$71 for each cubic meter of fish hold volume
- Pole/line: : US\$85 for each cubic meter of fish hold volume
- Purse seine: US\$89 for each cubic meter of fish hold volume
- Fish net: US\$173 for each cubic meter of fish hold volume
- Gillnet and other misc. gear except trawl: US\$46 for each cubic meter of fish hold volume

Although a thorough evaluation of this scheme is beyond the scope of the TCP project, the fee system is currently being reviewed, and therefore some comment is appropriate. There have been three recent estimates of the catch by authorized foreign vessels in the EEZ:

**Table 7 Fees as Percentage of Landed Value**

| <b>Source of Estimate</b>                              | <b>Actual Estimate</b>  | <b>Approximate Foreign Component of Estimate</b> | <b>Value at US\$1500 per tonne</b> | <b>License Fee<sup>9</sup> as Percentage of Landed Value</b> |
|--|---|--|------------------------------------|--|
| <b>DGF (1995)</b>                                      | 559,709 tonnes of fish are caught in the EEZ by licensed Indonesian and foreign vessels | 275,000 tonnes                                   | \$412,500,000                      | <b>1.9%</b>  |
| <b>Agrodev (1994)</b>                                  | foreign catch of about 140,000 metric tonnes  | 140,000 tonnes                                   | \$210,000,000                      | <b>3.7%</b>  |
| <b>Present study ("expected catches", Section 3.2)</b> | 419,000 tonnes for foreign vessels  | 419,000 tonnes                                   | \$628,500,000                      | <b>1.2%</b>  |

The above table should be considered a crude approximation: the landed value may require considerable adjustment and the time frame for the three studies are not the same. A more careful analysis should therefore be undertaken with more complete data. Nevertheless, the preliminary conclusion is that the government expectation of obtaining 5% of the landed value of the catch is not being realized.

#### 4.3 Administration of the Licensing System

The capability and authority of the unit of DGF responsible for licensing appears to be inadequate. This unit, the Industrial Fisheries Sub-Directorate, appears to have insufficient knowledge of the fisheries they are licensing which results in inability to judge the reliability of the information they are required to handle. Although the unit handles large amounts of data and is frequently required to produce summary reports, much of this must be done manually as there appears to be only limited amount of computerization. The limited amount of interaction with other units of DGF also seems to detract from its efficiency. This results in the inability of the licensing unit to correct obvious difficulties as they arise due to its compartmentalized nature. For example, it appears to be common knowledge in the unit that many of the foreign fleets are sharing licenses, but there is the perception that the licensing unit is not able to improve the situation. Similarly, non-compliance with data provision requirements of licensing continues.

Experience in other regions of the world have shown that a licensing unit can be an effective agent of enforcement due to its ability to refuse a license. It is generally acknowledged that the enforcement of EEZ fishing legislation is very weak in Indonesia. Some of this deficiency, however, could be circumvented by the licensing unit assuming a much more prominent role. This is discussed in Section 5 on enforcement. In short, the ability to refuse a license could be an effective enforcement tool.

It should be noted that the amount of revenue lost through not having a capable lead unit in the licensing scheme is likely to be substantial. For example, the Filipino group

<sup>9</sup> According to the Industrial Fisheries Sub-Directorate, fiscal year 1994/1995 produced total license revenue of 19,142,255,281 Rp (US\$ 8,507,669) for 1032 vessels. About US\$7,724,500 should therefore be generated by the 937 foreign vessels licensed in 1995.

purse seine fishing based in Bitung generated US\$309,809 in revenue last year. Industry sources indicate that perhaps 36,000 tonnes of tuna valued at US\$ 27 million is being captured by these vessels. Considering the expectation of receiving 5% of the landed value of the catch as a license fee, through inadequate licensing capability perhaps a million dollars per year is being lost from *authorized* operations at *one* port.

### 5. Comments on Enforcement in the EEZ

A key weakness in the Government's EEZ policy is the enforcement of existing regulations. Many of the problems in the management of fisheries Indonesia relate to enforcement difficulties and improvements in other aspects of fisheries management will have little positive effect unless this weak link in the system is improved.

As the Navy has a leading role in enforcement of the EEZ regulations, many previous reports have suggested that improvements will happen by increased coordination between DGF and the Navy. While this should certainly be pursued, the reality of the situation is that fisheries do not rank very high in the Navy's priorities, the Navy may have some conflict of interest in enforcing EEZ regulations, and the Navy lacks technical capability in many fisheries matters. Accordingly, DGF should give consideration to simultaneously developing enforcement initiatives which are independent of the Navy through the power of the licensing unit to refuse a license. Examples of this are:

- Strengthening the licensing unit at DGF to enable enforcement of data requirements by licensing. The lack of data is a serious and persistent problem which could be at least partially resolved in the EEZ fisheries by the licensing unit having a policy of requiring proof of having submitted catch data during the previous period (a "no data, no license" policy)<sup>10</sup>.
- If the licensing unit were to have additional technical capability, vetting the data for accuracy would be possible. Improper reporting would disqualify the vessel from a license renewal
- The licensing unit could make substantial progress in enforcing the vessel marking requirement (Ministerial Decree No. 144 of 1993, see below). Although having vessels which are easily identified is basic to effective surveillance, there appears to be little interest on the part of officials in the field in enforcing the existing legislation dealing with marking of vessels. The licensing unit could rectify the problem by requiring on the license application a picture of the vessel properly marked.
- The requirement that all fish caught in the Indonesia EEZ be landed in an Indonesian port could be at least partially enforced by the licensing unit refusing to renew licenses from vessels which have landed in Indonesia a suspiciously small amount of catch in the previous year.

With regards to the earlier recommended increased cooperation with the military, it appears as though many officials in the DGF and the provincial fisheries office are uncertain about the role, procedures, capability, limitations, and hardware available for enforcement of the EEZ. Conversely, the military is likely to be unsure of licensing

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<sup>10</sup>Some licenses refusals on the basis not providing data may have occurred, but the "no data, no license" policy referred to is a strict regime in which no license is granted without the required data having been furnished in the previous licensing period.

procedures, fishing patterns, recent innovations in fishing gear, and trends in fleet deployment. An increased understanding of each other's roles is likely to contribute to the desired increased cooperation between DGF and the Navy. It is therefore suggested that a enforcement/fisheries profile for Indonesia be prepared which includes items for the benefit of both parties: fishing areas, fleets, areas where unauthorized foreign fishing is likely, topics of concern, surveillance/enforcement hardware, standard procedures, case studies and responsibilities/jurisdiction of the various agencies.

Also with respect to increased coordination with the Navy, the 1993 FAO project on MCS in Indonesia (TCP/INS/2252) recommended that a "fisheries coordination board" be set up within BAKORKAMLA, the government entity charged with enforcement in the EEZ and other Indonesian waters. This and other initiatives to improve coordination with the Navy should be supported.

The violations of Indonesian fisheries regulations in 1992 and 1993 are:

**Table 8 Violations Of Indonesian Fisheries Regulations**

| Type of Violation              | Total No. Violations 1992 | No. Indonesian Violations 1992 | No. Foreign Violations 1992 | Total No. Violations 1993 | No. Indonesian Violations 1993 | No. Foreign Violations 1993 |
|--------------------------------|---------------------------|--------------------------------|-----------------------------|---------------------------|--------------------------------|-----------------------------|
| Outside specified fishing area | 11                        | 3                              | 0                           | 38                        | 3                              | 35                          |
| Unspecified fishing gear       | 33                        | 33                             | -                           | 213                       | 25                             | 100                         |
| Using explosives               | 25                        | 25                             | -                           | 15                        | 15                             | -                           |
| Using Cyanide, chemicals       | 12                        | 12                             | -                           | 57                        | 17                             | 40                          |
| Using trawl gear               | 65                        | 3                              | 62                          | 142                       | 45                             | 97                          |
| Insufficient local crew        | -                         | -                              | -                           | 10                        | -                              | 10                          |
| Destruction of coral reef      | 36                        | 36                             | -                           | 50                        | 50                             | -                           |
| Fishing w/o license            | 142                       | 10                             | 132                         | 500                       | 30                             | 470                         |
| Improper design/size of vessel | -                         | -                              | -                           | -                         | -                              | -                           |
| Other                          | 177                       | 36                             | 141                         | 103                       | 41                             | 62                          |
| <b>Total</b>                   | <b>501</b>                | <b>150</b>                     | <b>343</b>                  | <b>1136</b>               | <b>234</b>                     | <b>902</b>                  |

Source: Unpub. data, Directorate of Resource Management, DGF

From the above it can be seen that the most common type of violation by foreign vessels is fishing without a license. Consideration should therefore be given to taking steps to make unlicensed fishing easier to detect. Although the identification of vessels is basic to a surveillance programme, one notable feature of the foreign fleets observed during the TCP Project was the absence of the legally required vessels markings. It should also be noted that the regulations themselves (Ministerial Decree No. 144 of 1993) are somewhat unclear. It is recommended that Indonesia modify the vessel marking requirements to international standards. All vessels should

be marked with their International Telecommunication Radio Call Sign (IRCS) in accordance with the 1989 FAO standard specifications for identification and marking of fishing vessels, which for example, requires letters/numbers of at least 600 mm in height for vessels between 15 and 20 metres in length. More complete information on this subject is available in FAO Fisheries Technical Paper No.338.

Ministerial Decree No.144 of 1993 states that a foreign fishing vessel must use a designated port as a base for operation and that the vessel is to be checked by a government official before a trip for compliance with license, gear, marking, crew, and logbook requirements (the "check point" system). Although this appears to be sensible, straightforward, and relatively easy to enforce, the implementation of the decree has been slow. For example, not a single foreign fishing vessel observed in Benoa during the TCP Project had the required identification markings. It is recommended that this basic system be fully implemented before the DGF attempts more sophisticated enforcement of EEZ.

In 1993 FAO implemented a project on the development of monitoring, control, and surveillance of fishing operations in Indonesia (TCP/INS/2252). Because the origin of the request involved the application of advanced technology to MCS, there was a strong focus in the project on the use of satellites. Of relevance to the enforcement of EEZ regulations, the report comments *inter alia* on annual income loss due to insufficient MCS (US\$30 million), costs of various types of surveillance (vessel, aircraft, satellite), the low level of maximum fine (US\$ 50,000), need for publicity for fisheries-related arrests, need for simplicity in regulations to reduce costs, desirability of international vessel marking, need for requirement that vessel captains record catches in logbooks as soon as they are brought aboard, cost reduction in MCS through regional cooperation (e.g. ASEAN), need for cross-checking to prevent bribery, undesirability of reliance on a single technique for MCS, advantages in regional standardization of logbooks, the possibility of posting a bond prior to fishing, the possibility of regional blacklisting, and "hot pursuit" into the waters of neighboring countries.

Although the decision of whether satellite technology should be a part of MCS in Indonesia involves considerations beyond the scope of the present TCP Project, some comment is appropriate. As noted above, there has been a fairly slow implementation of the relatively simple checkpoint system. Accordingly, there may be advantages of first upgrading the MCS capability of DGF to be able to cope with the present system, before considering a much more complex scheme. It also should be recognized that much testing of the various vessel monitoring systems has taken place in the neighboring South Pacific region by the Forum Fisheries Agency. These tests have included a detailed analysis of the costs and benefits of ARGOS, Inmarsat and HF radio. The preliminary conclusion from those tests (which may or may not be applicable to Indonesia), is that Inmarsat-C is the most favourable option until a new generation of low orbital satellites and ground stations are functional.

The major enforcement concerns in the EEZ are unauthorized fishing, and non-compliance with the data, gear, crew, and catch disposal requirements. In general terms, the legal framework, technical skills, and physical capability for enforcement is not lacking. The major constraints to effective enforcement appear to involve administration, priorities, jurisdiction, and institutional relationships. Political will to

improve the situation seems to be lacking. In other countries sufficient political will has been generated through a realization of the revenue lost by ineffective systems.

## 6. Other Issues in EEZ Management

### 6.1 Observer Programmes

Due to the difficulty of monitoring fishing vessel activity in the EEZ, an observer programme is often considered an important component of EEZ fisheries management. An observer programme is the placement of individuals aboard vessels to watch the actual fishing activity and record data, especially that which cannot be obtained at the unloading point. Programmes in which Indonesian government observers are placed aboard foreign fishing vessels would facilitate:

- Learning more about the various fishing operations
- Upgrading the capability of DGF by practical field experience
- Improving the quality of the data from fishing vessels
- Greater compliance by foreign fishing vessels with EEZ regulations
- Creation of a consciousness in the fleet that the government is serious about monitoring fishing activity
- Research in support of stock assessment

It appears as though fisheries observers have rarely been used in Indonesia. During the TCP project the desirability of an observers programme was discussed with numerous individuals in DGF and provincial fisheries services and there was virtually unanimous support for having such a programme. Concern was raised, however, on whether vessel operators would allow observers aboard. It should be noted the government does have the power to place observers:

- Article 14 of Government Decree No.15 of 1984 on Fisheries Management in the EEZ states that in the course of activity in the EEZ any foreign fishing shall take on board any inspector appointed by the Minister and allow them to inspect the vessel
- Article 9 of the Ministerial Decree No.475 of 1985 on Rules Governing Permits for Foreign Fishing in the EEZ stipulates that the master of a vessel for which a fishing license has been obtained shall accept on board an inspector to monitor fishing activities

Some modification of the above legislation would facilitate observer work in Indonesia. This includes provisions stipulating that:

- The costs of supporting the observer while on board are the responsibility of the foreign vessel
- The rights of observers and protection of observers from harassment while on board are protected
- The standard of accommodation on board should be the same as for ship's officers

Observer work in Indonesia should begin with pilot work in a priority area. Due to logistics, concern, and lack of information, the Filipino group purse seiners based in Bitung may be an appropriate starting point. The first observer trips should be undertaken by individuals in a position to carry out training for others and possibly to supervise future observers.

Well-trained observers are an essential component of an effective observer programme. There is the possibility that the initial observers may be able to take advantage of existing observer training opportunities overseas. During the TCP Project, the Forum Fisheries Agency (FFA) indicated a willingness to accept Indonesians in their future observer training workshops.

Two useful reference documents for observer training are:

- FFA (1993). Treaty on Fisheries with the USA Observers' Manual
- FAO (1994). A Introduction to Monitoring, Control, and Surveillance Systems for Capture Fisheries. FAO Fisheries Technical Paper 338.

The latter reference contains core components of an observer training programme: the role of an observer, introduction to the fisheries to be observed, introduction to fisheries laws, catch estimation, verification techniques, conversion factors, gear types, introduction to navigation, biological sampling, species identification, sampling techniques, logbooks, documentation of irregularities, and the observer trip report.

The observer programme should commence with a small number of objectives, perhaps verification of data and obtaining knowledge on the fishery, and then expand as competence is acquired. It should be decided fairly early in the planning process if one of the objectives should be onboard enforcement. If so, close liaison with the Navy is essential.

Initial observer trips should be guided by the concept that it is more desirable to collect a small amounts of high quality data than vast quantities of less useful information. In this respect, the first observers should perhaps attempt only to (1) maintain a log similar to that which the vessel is legally required to keep and (2) produce a narrative account of the fishing trip having sections on: the vessel, crew, gear, trip event, fishing, reasons why trip was typical or atypical, catch, catch handling/disposal, and fishing areas/seasons. These narrative reports should be made available to researchers and to staff at DGF responsible for licensing, management, and other units where operational knowledge of the fisheries is lacking.

Eventually mechanisms must be devised for relating observer-collected information with that received by DGF from the fishing companies. Verification of observer-collected data by random checking of catches in port and by observations from patrol vessels will be important in discouraging the compromising of observers.

## 6.2 Data

Virtually all missions visiting Indonesia in the past decade to review marine fisheries resources, stock assessment, or fisheries management have concluded that there is an urgent need for better data from the existing fisheries. The situation is especially acute in the EEZ. The data predicament in the tuna fisheries demonstrates the severity of the problem: The report of the Indonesia/FAO/DANIDA Workshop on the Assessment of the Potential of the Marine Fishery Resources in Indonesia states: "It is not clear how the BPPL/DGF group has been able to produce estimates of the potential of skipjack and other large tunas. There is a consensus among tuna specialists that at this state of knowledge of these resources nobody can make

reasonable predictions of the potential of these resources. The only source of information is the performance of the present fisheries and it appears that good information on that performance is very difficult to obtain". Even though tuna is the second most important fishery commodity exported from Indonesia, due to lack of data it is not possible to make reasonable fleet expansion plans (Section 3.4.3), address crucial questions raised by artisanal fishermen concerning falling catch rates, or effectively cooperate internationally with countries that share the resource.

Although there are adequate legal and institutional mechanisms for obtaining this data, the required data is not being collected on a number of fisheries and there does not appear to be a concerted effort to improve the situation. Despite it being widely recognized that the lack of such data is a major constraint to the effective development and management of the EEZ fisheries, enforcement of the legal data requirements is weak. A list of violations related to the fisheries laws prepared by DGF recently (Table 8 above) has ten categories for various types of violations but no category specific for non-compliance with the reporting requirements.

The EEZ data problems are not confined to the foreign fleet, but also involve Indonesian vessels. In at least one recent review of the EEZ fisheries situation it was suggested that once the EEZ fleet is localized, data problems will diminish. The opposite may, however, be the case as local vessels may have more ability to resist enforcement.

It also should be mentioned that, even for the fleets that provide data, verification of the accuracy of that information appears to be lacking. In Merauke the TCP Project observed that even though data was provided by the fishing companies to the Provincial Fisheries Service, it is unverified. Because of the tax on the exported catch, there is an incentive to under-report and the result has been confirmed by industry representatives.

The improvement of the situation will not be an easy task. Over 2,000 vessels are licensed to fish the EEZ and offload at a large number of ports. Nevertheless, considering the long history of recommendations on the subject which the TCP Project considers as valid, DGF must attach a much greater importance to the issue than in the past. Suggestions to assist in improving the data situation alluded to earlier in this report include:

- Full implementation of the data-related requirements of the checkpoint system (Section 5), including verification, should be given top priority by DGF.
- Immediate adoption of a "no data, no license" policy
- Use of observer information to gauge the accuracy of reported data

### 6.3 Gear

The terms of reference for the TCP Project specify that attention should be given to specific conservation measures, including that involving gear. A different approach is, however, suggested: to achieve conservation objectives, any available resources should be channelled into creating more effective enforcement of existing gear legislation rather than devising additional regulations. Nevertheless, some comment on gear may be appropriate.

In this regard, the “fish net” vessels, especially those in the Arafura deserve scrutiny. Trawling was banned in most of Indonesia by Presidential Decree No.39 of 1980 and subsequently implemented incrementally by a variety of ministerial decrees and presidential instructions/decrees. Although there is much confusion over the term, it appears as though “fish net” (“pukat ikan”) is a euphemism for trawl gear or gear that would function similarly. The reality of the situation is that 36% of all foreign fishing vessels licensed to fish in Indonesian waters in October 1995 were using “fish nets”. As a matter of priority DGF should regularize the situation:

- The term “fish net” should be replaced by the correct technical name of the gear
- The relationship of fish net gear to the trawl ban should be clarified
- The relationship of fish net gear to shrimp net gear should be clarified

According to the Capture Fisheries Sub-Directorate, the present regulations specify a minimum cod-end mesh size of 2.5 cm for both fish nets and shrimp nets. Two points related to this regulation are noteworthy. Fish trawl vessel operating in the Australian sector of the Arafura are governed by a 9 cm minimum size regulation. Fish net vessels observed at the dock at Merauke had trawl nets on deck with cod-end mesh considerably smaller than 2.5 cm. In this context, it is easy to understand why “fish net” vessels actually catch more shrimp than “shrimp net” vessels.

Another issue concerns the use of large gill nets. In October 1995 a total of 279 Indonesian and foreign gill net vessels over 100 GT were licensed to fish in the EEZ. This situation may be in conflict with United Nations General Assembly Resolution 44/225. If Indonesia permits its vessels to fish with pelagic driftnets in excess of 2.5 km in length it will be a contravention of the internationally agreed moratorium.

#### 6.4 International Cooperation

In at least two situations, the tuna fisheries in the northeast of Indonesia and the Arafura demersal fisheries, international cooperation is required for effective management. Extensive research in the western Pacific shows that there is considerable interaction between the large tuna fisheries in that area<sup>11</sup> and Indonesia. In the Arafura demersal fishery some of the productive fishing grounds appear to be bisected by the Indonesian/Australian EEZ boundary.

From the overseas perspective, Australia is concerned about the Indonesian capacity to apply management measures while countries of the Western Pacific are concerned about lack of information on the status of tuna stocks in Indonesia. Of practical concern to Indonesia is that it will not be possible to effectively plan investment for tuna fleet expansion without some sort of mechanism for accommodating the future plans of those countries which share the same stock.

Because of the above, thought must be given to the international dimension of fisheries management. Expertise in dealing with foreign countries must be developed within the management unit of DGF. Regional agreements for

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<sup>11</sup> The tuna catch in the EEZ areas of Pacific Island Countries is presently about one million tonnes per year.

cooperation in fisheries development should evolve into regional agreements for cooperation in management.

### 6.5 Leniency with Foreign Fishing

Is Indonesia too lenient with foreign fishing? To determine this often-asked question, it may be useful to compare conditions of access between the actual situation in Indonesia and prevailing conditions in some neighboring countries.

From Section 4.2 it can be seen that the Indonesian government is likely to be obtaining less than 2% of the landed value of fish as a license fee. There are no burdens placed on the foreign vessels by observer programmes, catch reporting requirement are not rigidly enforced, there are no radio reporting requirements, vessels are able to disregard any marking requirements, and (at least for the fish net fleet) the gear regulations appear to be unenforced. Even if a successful prosecution occurs the maximum monetary fine stipulated by the Fishery Law is 100,000,000 Rp (US\$ 44,150). Chartering to local companies and disposal of catch in an Indonesia port is, however, required in principle but is not strictly enforced.

By comparison any foreign fishing activity in the EEZ of 14 Pacific Island countries, New Zealand, and Australia is licensed under regionally agreed uniform minimum terms and conditions of access. These terms consist of:

- Uniform vessel identification: all foreign fishing vessels (FFV) operating in the region are required to be marked according to the 1989 FAO Standard Specifications for the Marking and Identification of Fishing Vessels
- Catch and position reporting: all FFV are required to provide to the licensing country or their representative, information relating to the vessel position and the catch on board at least every Wednesday while in the zone and prior to entry and departure from the zone.
- Trans-shipment: Full reporting on trans-shipment activity, including 24 hours notice of intention to do so, is required. Since June 15, 1993 the licensing country determines the time and place (at designated areas) where trans-shipment may occur, and may elect to place an observer on board to monitor operations.
- Catch and effort logsheets: standard logsheets have been adopted for all fishing operations in the region. They must be completed daily and returned to the licensing country within 45 days of trip completion. A preliminary report is required within 14 days of trip completion. Information on activities within the zone, as well as on adjacent high seas areas, is required when a trip includes fishing in both areas.
- Observers: The licensing country has the right to place observers on board FFV for scientific, monitoring, compliance, and other functions. The observer is entitled to officer-level accommodation and the vessel operator is responsible for observer travel, salary, and insurance. Observers placed on board FFVs can continue their observations duties during a trip which extends beyond national jurisdiction into high seas areas.
- Appointment of agent: The flag state government and/or fishermen's association and/or vessel operator is required to nominate, appoint, and maintain an agent. The agent shall be resident in the licensing country, and must have authority to receive and respond to any legal process.
- Foreign fishing vessels in transit: Foreign fishing vessels navigating through the fisheries zone or EEZ are required to have all fishing equipment on board stowed or secured in such a manner that it is not readily available to use for fishing.
- Flag state or fishermen's association responsibility: Flag states, or in the absence of access arrangements with flag states, the appropriate fishermen's association, are required to take measures to assure compliance by their fishing vessels with coastal state laws.

With regards to license fees, the average access arrangement between a Pacific Island country and overseas vessels is around 4.4%<sup>12</sup> of the landed value of the

<sup>12</sup> World Bank (1995) estimates that in 1993 total access fees for the Pacific Islands region were about US\$56 million and the total catch value was US\$1.2 billion.

catch. Subsequent to successful prosecution, many fines in the Pacific Islands have exceeded ten times the maximum fine in Indonesia.

For the above, it can be concluded that Indonesia has relatively lenient access terms compared to neighbors to the east. It should also be mentioned that the agency responsible for coordinating access agreements in Pacific Island countries, the Forum Fisheries Agency, has expressed interest in cooperating with Indonesia to broaden the area in which their uniform terms of access are applicable.

### 7. Some Considerations on the Concept of Maximum Sustainable Yield

Several observers have noted the large importance that the DGF attaches to the concept of maximum sustainable yield, or how it is often expressed in Indonesia, potential yield. Development projections, fleet expansion plans, foreign fishing allocation, ideas on development opportunities, objectives of fishery management and many aspects of the work programme of the DGF revolve around the notion of MSY.

The faults associated with using maximum sustainable yield as a management concept are numerous and mostly relate to over-simplifying the dynamics of an exploited fishery. The drawbacks of MSY have been mentioned in several reviews of the fisheries management situation in Indonesia. Nevertheless, the concept is embodied in both the Indonesian fisheries legislation and in the UNCLOS treaty and the reality is that it will be a central feature in Indonesian fisheries management for the foreseeable future. The concept of MSY, due to its simplicity can play a very useful role in the country, providing that its shortcomings are acknowledged and compensated for. It may therefore be useful to discuss the major difficulties of the use of MSY in Indonesia.

- Imprecision: In a recent examination of the subject, a recognized international authority on the stock assessment stated that he was not aware of any fishery in the world where a sustainable quota could be truthfully said to be assessable within an accuracy of 40% (Walters 1996). This should be compared to the perception of accuracy of MSY in Indonesia as exemplified by several 1995 publications of the DGF which give the accuracy of overall MSY exploitation to 1/10 of a percent.
- Institutionalization: Once established, MSY figures become entrenched and are used amazing periods of time without modification. The Martosubroto MSY has been used for many years without modification and many of the MSY figures used for EEZ resources date from a publication from the early 1980s. The situation is mirrored at the provincial level; the 1995 Merauke Provincial Service Annual Report uses an MSY calculated in 1975 to show remaining potential.
- Non-Economic: The implied management objective in many cases is attaining MSY. This notion disregards the possibility that, due to declining CPUE as MSY is attained, a non-economic fishery may result.
- Mis-conception in Overexploited Situation: If the MSY is greater than present production in an overexploited situation, more fishing will actually decrease the catch.

- Non-Consideration of Best Scientific Evidence: Although MSY should be established using the best scientific evidence available, specialized researchers do not always have input on the establishment of MSY at DGF.
- Non-Precautionary: Perhaps the greatest shortcoming of the use of MSY in Indonesia is the common practice of subtracting estimated present catches from MSY to determine “remaining potential”. There is no precaution against any uncertainty of MSY, inaccuracy of reported catches, unauthorized fishing, or any natural fluctuation in stock abundance. It should be noted that the Code of Conduct for Responsible Fisheries is especially relevant here: “In the case of new or exploratory fisheries, States should adopt as soon as possible cautious conservation and management measures, including *inter alia* cautious catch limits and effort limits.”

MSY can be a very useful tool provided that the above difficulties are accommodated.

As mentioned by several reviewers in the past, fisheries management by MSY is most appropriate in the early development stages of a fishery. As effort increases, the concept becomes less relevant and information from the fishery assumes a greater importance in determining any remaining potential. Expressed in simplistic terms, as a fishery grows, thinking on remaining potential should undergo a change from “How close are we from MSY?” to “what is the CPUE doing?” An appropriate example is now occurring in the Arafura Sea demersal fishery. Although a comparison of MSY to the estimated landings still shows substantial potential (landings not close to MSY), if the catch per unit of fishery were to be monitored, the likely recent decline would be indicative of limited remaining potential.

It should be noted that an over-reliance on MSY may result in the economics of the fishery not receiving adequate attention. As a fishery develops, information should be collected to enable bio-economic analysis.

## 8. Fisheries Management Plans

There does not appear to be any conventional fisheries management plans for Indonesia’s EEZ fisheries. There are general notions of objectives such as full utilization and localization of EEZ fishing, but these have yet to be set in the framework of formal plans for each important fishery.

The advantages of fisheries management plans are numerous. The plan formulation process requires that attention be focussed on issues that may currently be overlooked, such as the setting of specific objectives and discussion of alternative means to accomplish the objectives. The plan formulation process also encourages input from the fishing industry. The plan once formulated can serve as a mechanism to assure coordination between the various units of DGF and other agencies which is much needed in a system which tends to be compartmentalized. Finally, the plan is a useful tool to evaluate performance of the managers, discourage deviation from policy, and introduce a degree of transparency into the system. It should also be mentioned that a management plan is internationally-recognized as being a valuable tool: the Code of Conduct for Responsible fisheries encourages the formulation of fisheries management plans.

The core components of a fisheries management plan may include:

- Objectives to be achieved in the management of the fishery
- A description of the fishery:
  - \* Species, distribution, condition of stocks, MSY
  - \* Fishery activities
  - \* Levels of exploitation
  - \* Economic characteristics of the fishery
- Problems and issues
- Principles
- Management options, including for each option a discussion of the impacts:
  - \* economic
  - \* social
  - \* biological
  - \* environmental
- The Selected option
  - \* Supporting action
  - \* Monitoring activities

It should be stressed that direct input from all concerned parties, especially the fishing industry, is critical for the long-term success of management measures. The various Coordination Forums for Management of Fisheries Resources (FKPPS) appear quite promising and may be an appropriate vehicle for this input, as well as for implementation of management measures.

### 9. Fisheries Research

Venema (1996) details the institutes involved in fisheries research in Indonesia, examines difficulties, and offers suggestions for improvement. He discusses among other items concentration of research effort in Jakarta, minimal production of high quality scientific papers, need for strengthened ties with DGF, lack of documentation of previous work, and need for better data and for biological sampling.

The relationship of fisheries research to fisheries management deserves special attention. In DGF there is the notion that many of the important questions in fisheries management are not receiving enough priority from fisheries researchers. On the other hand, the researchers feel that to effectively study many of the important questions would require much-improve fisheries statistics, which is the responsibility of DGF. Clearly, more dialogue at the working level between researchers and managers is required and there are indications that some progress has been made recently.

It is suggested that further improvement in the applicability of fisheries research to management would occur if there was substantially more input from DGF on the establishment of research priorities.

From the perspective of DGF one of the most important outputs of research is information on the stock status. The reality, however, is that many of the important management decisions are made with very old assessments. For example, data from research almost two decades ago is used to manage the resources in the Arafura

Sea. The Martosubroto estimates remained for several years without reassessment. It is suggested that there be a mandatory annual review of the assessments in all the major fisheries by DGF and CRIFI and that the results of this review be incorporated into the body of information used for management decisions. DGF should also be made aware of the limitations of the assessments.

Priority subjects for fisheries research in the EEZ would certainly include assessment of the tuna resources due to the poor state of knowledge, importance of the resource to the Indonesian economy, and reports of both the large potential for expansion and of falling catch rates in some areas. Other priorities for management-oriented fisheries research are the assessment of resources where over-exploitation is suspected, such as the demersal fisheries of the Arafura Sea and South China Sea. Also important for future research are the resources about which there is little information (e.g. small pelagics in the Arafura Sea).

It should be noted that an observer programme (Section 6.1) could play an important role in fisheries research. Some of the information which was collected in the past on relatively expensive research cruises could be collected by observers should such a programme be instituted.

## 10. General Comments on the Status of Fisheries Management

### 10.1 The Present Situation

The activities of DGF are largely oriented to development, production, promotion of fleet growth and estimating future potential. This is quite normal in a developing country with, on one hand substantial marine resources and on the other, large requirements for food, export earnings, and industrial growth.

With respect to effective fisheries management in Indonesia, there are major challenges: the information input is poor while the enforcement of management measures is weak. The DGF has nine fisheries managers staff to manage what amounts as one of the world's largest and most diverse fisheries. In short, the task is enormous.

How successful has fisheries management been in Indonesia? Considering that fisheries management is the implementation of measures to achieve the objectives which have been set for a fishery, it must be acknowledged that fisheries management has been *highly successful* in Indonesia with respect to growth. The management objective of maximizing production has resulted in landings growing remarkably over the previous decade. In terms of total catch, Indonesia now ranks among the major fishing nations of the world.

Presently there is no major conservation element in fisheries management. This is probably due to the idea of vast unexploited resources, especially in the EEZ and eastern Indonesia. There is, however, a general notion that at some point in the future, control measures to safeguard the resources may be required, but it is not a major concern at present.

### 10.2 Recent Considerations

There is a natural limit to what the marine capture fisheries can produce. This is quite unlike agriculture or aquaculture in which production can be increased substantially with technical breakthroughs, intensification, fertilization, and other manipulations. In practical terms, the upward sloping lines depicting ever-increasing catches on the Repelita graphs of marine fisheries production will at some point stop.

It must be acknowledged that the state of assessment of Indonesia's EEZ marine resources is not very accurate and there is a great amount of uncertainty. This results in a need for special caution when projecting resource potential. Recent assessments which consider all relevant stock assessment information indicate that some of the past estimates may have been too large. Even if the earlier optimistic assessments are considered valid, when they are compared to the expected catches of the vessels now fishing, the conclusion is that the limits of some of the fisheries have been reached or surpassed. For others, it indicates that the state of knowledge is so poor that further expansion would be unwise.

It appears therefore a milestone in the development of fisheries in Indonesia has been reached. The major conclusion of this report is that the primary objective of fisheries management in Indonesia requires change from being one of maximizing production to be one of assuring the long-term sustainability of fisheries resources.

It is recognized that such a change will not be easy. Major modifications will be required in institutional orientation, attitudes, goals and links between government agencies. The alternative, however, would be a decrease in benefits from the fisheries. The Gulf of Thailand and its depleted fisheries serve as example of what could be the result of maintaining the present production-oriented management objective.

### 10.3 Changes for the Future

The suggested change in management objectives will make major demands on the existing management system.

A fundamental issue that must be addressed is the issue of effort limitation. At present, any controls on the level of fishing would in principle be applied through license refusal. Section 3.3 suggested that a procedural mechanism be instituted so that when the expected catch for a fishery reaches the level of the total allowable catch, additional licensing for that fishery legally ceases. If this is not possible, the system of effort limitation by limited entry requires re-thinking.

With re-defined management objectives, the past concept of using the difference between MSY and present catches to project fleet expansion must be modified. Where potential is shown, a gradual fleet build up with careful monitoring of the effect of the additional effort is suggested. In such a scheme, accurate data from the fisheries would assume a much greater importance than in the past.

There will be tremendous demands on the fisheries management staff of DGF. Capability of the staff must be enhanced through training and acquisition of additional expertise. Special attention should be focussed on the staff obtaining a thorough

knowledge of the fisheries to be managed and to applying the principles embodied in the Code of Conduct of Responsible Fisheries, with emphasis on the precautionary principle. A network of fisheries managers in Indonesia may be a useful mechanism for increasing the awareness of fisheries management principles.

There is a need to draw attention to the consequences of ineffective fisheries management. Accordingly, consideration should be given to carrying out a comprehensive study of the economic losses due to unauthorized catches by foreign vessels, inefficiencies in the licensing system, low fee for foreign fishing access, weak enforcement, and other difficulties.

## 11. Conclusion and Summary of Recommendations

1. **The major conclusion of this study is that a shift of objectives of fisheries management should occur. To assure that maximum benefits accrue from the fisheries, the objectives must change from increasing landings to assuring sustainable exploitation.**
2. To assure sustainable exploitation, the collection of accurate data from the fisheries should receive much more priority from DGF than in the past.
3. The replacement of the large foreign tuna fleet, especially the longliners, is seen as perhaps the only clear possibility for expansion of the Indonesian EEZ fleet.
4. A comprehensive study of the economic losses due to an ineffective management system should be carried out.

Other priority recommendations are:

### **License allocation**

- Additional attention should be paid to the resource situation
- Precaution catch limits should be set
- The body of information used to determine the expected catches should be enhanced
- A mechanism should be established so that when the allowable catch level is reached, additional licensing for the fishery ceases

### **Localization of the EEZ Fleet**

- To achieve the objective of localization of the EEZ fleet, government policies should be modified by either allowing the purchase of foreign vessels for certain fisheries or positive incentives to purchase local vessels

### **Administration of the Licensing System**

- The technical capability of the unit responsible should be enhanced
- The section should not be purely an administrative unit, but should take an active role in enforcement through its ability to refuse a license

### **Enforcement in the EEZ**

- The implementation of the existing checkpoint system should be accelerated and should be fully functional prior to considering more complex schemes
- Consideration should be given to mechanism to generate the political will for effective enforcement

### **Observer programmes**

- As there is much to be gained from an observer programme, DGF should consider implementation of such a programme

### **Foreign Fishing Conditions**

- Because Indonesia appears to be relatively lenient, conditions commensurate with those of neighboring countries should be considered

### **MSY**

- The concept of MSY can play a very useful role in the country, providing that its shortcomings are acknowledged and compensated for

- More attention should be paid to the precautionary principle in setting levels

**Fisheries Research**

- There should be substantially more input from DGF on the establishment of research priorities

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