



The Status and Utilization Rate of Squid (*Loligo edulis*) in Alas Strait at West Nusa Tenggara Province

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Abstract

Alas Strait is a potential water area for fishery in West Nusa Tenggara Province (NTB), especially for squid (*Loligo edulis*). Squid has played an important role for fishermen in Alas Strait, the squid catch in this area are dominated by 15 species but the most dominant is *Loligo edulis*. The aim of this research is to analyze the status and the utilization rate of squids (*Loligo edulis*) in Alas Strait waters at NTB Province. Maximum Sustainable Yield (MSY) of squid (*Loligo edulis*) is 657.2 ton/year, while the optimum fishing effort (F_{opt}) is 13,687.7 trip/year, and the Total Allowable Catch (TAC) is 525.8 ton/year. The utilization rate of squid (*Loligo edulis*) in Alas Strait is 140.4%, with over exploited status.

Keywords: Alas Strait; Maximum Sustainable Yield; over exploited; utilization rate; Total Allowable Catch.

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1. Introduction

Alas strait is a potential area for fisheries in West Nusa Tenggara Province (NTB) especially for traditional fishermen. This strait is also an ideal fishing area for fishermen who lives in East Lombok and West Sumbawa regencies. East Lombok regency is the most populous district in NTB province with its population nearly one million where 19% of them live in Alas strait coast. Almost all the inhabitants are traditional fishermen. This can be proved from the number of fishermen boats which 93% or three thousands of them are small boats. (< 5 GT) [1].

Alas Strait lies between the western part of Lombok island and Sumbawa island in the East, and is connected by the Flores Sea in the north and the Indian Ocean to the south (Figure 1). Some of the waters in this Alas Strait, especially on its beach side is a shallow waters (with a depth of 1-20 m), but in some places that deal directly with the Flores Sea and the Indian Ocean is a deep waters (with a depth of more than 200 m) [2].

The fishery in this Alas strait is dominated by artisanal fisheries. The fishermen catching is dominated by 40 species of fish, and 20 other types of catches including squid [2]. The squid catch in this area are dominated by 15 species but the most dominant is *Loligo edulis*. The commonly fishing gear that is used by the fishermen is "Jala-Oras"(a light lured, lampara-type seine net)[3].

It has been known that the Alas Strait waters are the centre of squid catching in NTB province. In 1996, the catching of squid from Alas Strait contributed 7% to the total National production of squid catching [4]. The increasing rate of this squid production is followed by the increasing number of fishing boats. Ghofar [5] Stated that it has been an increase in the fleet of squid catching in Alas strait more than ten times during ten years that is 60 units in 1960 became 700 units in 1978. The increase of this fleet rate is followed by the significant increasing of catching production from 70 ton to more than 1600 ton during that period. The high production of that squid catching during that period is caused by the higher selling price of squid more than other fish. Until now, the information about the status and the utilization rate of the squid in Alas strait is very limited that is why the research about this is very important to be conducted. This is important because squid has played an important role for fishermen in Alas Strait.

The aim of this research is to analyze the status and the utilization rate of squids (*Loligo edulis*) in Alas Strait waters at NTB Province.

2. Materials and Methods

This research is done from July to December 2012. The location of the research is fishermen village in Alas Strait territory, West Sumbawa Regency and East Lombok Regency (Figure 1)

Those villages were chosen because they are the traditional fishermen village where catching fish is major work for them.

The data was collected using the literature study. The time series data during 10 years are obtained from fisheries statistic of NTB province, West Lombok regency and West Sumbawa regency. Those data included the type of the fish, fish catching production, the number of the boat, the type and number of fishing gear, and the number of fishing trip.

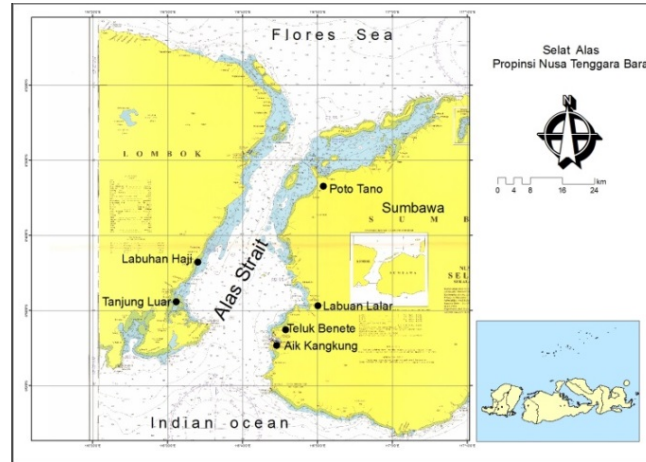


Figure 1: The research location of traditional fishermen village in Alas Strait Waters at NTB Province.

The analysis of optimum fishing effort (F_{opt}) and Maximum Sustainable Yield (MSY) are determined by these following steps: (1) The fishing gear standardization, according to [6] if there is a variety of fishing gear (multi gear) in a waters territory then one of those gear can be used as a standard gear. Other fishing gear can be standardization to that standard gear. The fishing gear that is set as a standard gear is selected from the fishing gear that has the highest productivity. The maximum fishing effort (F_{opt}) and the maximum sustainable yield can be calculated by using the Schaefer equation. Optimum fishing effort (f_{opt}) can be calculated by F_{opt} equation below:

$$F_{opt} = a/2b$$

Maximum Sustainable Yield (MSY) can be calculated by the equation below:

$$MSY = a^2/4b$$

Where a is intersep and b is slope at liner regresi equation.

This Schaefer equation is often used to calculate the MSY and the optimum fishing effort (F_{opt}) because this equation is simple, easy, and accurate and also can be understand by anybody including the decision maker [3]

(3) Calculate the utilization rate using by the following equation :

$$\text{Utilization Rate} = \frac{C_i}{MSY} \times 100\%$$

Where C_i = the number of fish catching; MSY = Maximum Sustainable Yield

3. Results and Discussion

The fish's composition of the fishermen catching in Alas strait during this research showed that pelagic fish like squid, litle tuna, skip jack tuna, anchovy, and layang (Decapterus sp.) dominated the fishermen catching (Figure 2). The squid productions get the first rank by its 17% of the total catching, followed by litle tuna, skip jack tuna, and anchovy.

These pelagic fish is a schooling fish because they are always in a group. This group of fish makes them caught in a large quantity. This pelagic fish also indicated a small scale fisheries [4].

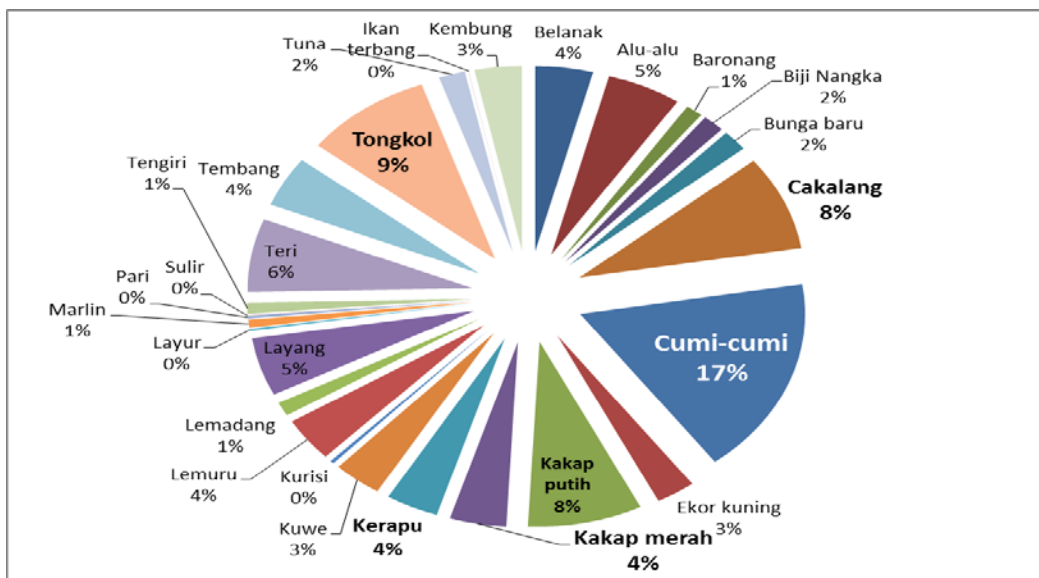


Figure 2: The composition and propotion of the fish catching by fishermen in Alas Strait (source: primary data processed in 2012)

The squid production in Alas Strait tends to show the increase in the last 5 years (2008-2012). This high rate production is caused by the high effort of the fishermen to catch the squid in order to fulfill the high demand of the market. Squid has the highest selling price compare to other fish commodities. Fresh squid price 20 thousand to 25 thousand rupiah that is the price in fishermen level. If it is dried the price will be doubled to 125,000 to 150,000 rupiah, this is showed that by a simple processing a fisherman can get to more than 50% prices increase of squid than when it is fresh. The squid production in Alas strait in the last 10 years (2003-2012) showed in Figure 3.

The high level of the squid production in this Alas strait is not in spite of the fishermen effort. The high level of effort that have been done by the fishermen (Figure 4) have exceeded the optimum suistability that is 13,687.7 trip/year (Table 1), this case is strongly associated with the fulfillment of the fishermen basic need or the livelihoods of the fishermen.

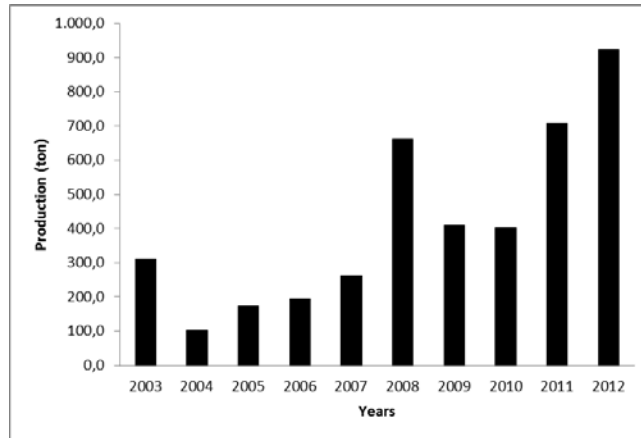


Figure 3: The production of squid in Alas Strait in the last ten years

Source: [7]

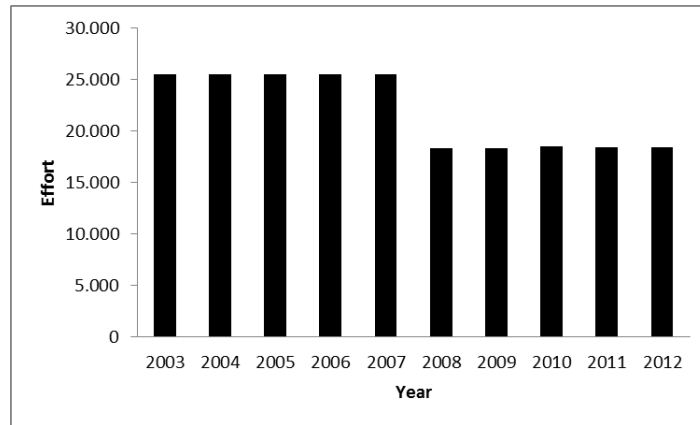


Figure 4: The effort of squid catching in Alas Strait in the last 10 years (source : [7])

The increasing number of squid fleets is not only happened in Alas Strait Waters but also in North Java sea waters, like the research that has been done by [8]. He is stated that purse seine vessels have changed to squid fishing vessels in North Java Sea Waters.

The sustainable maximum potential or often called the sustainable potential is the number of fish stock resource that be caught every year without influence the sustainable resource. The analysis of linear regresi CPUE to the effort catching trip we get a value (intersept) and b value (slope). By using that value then the optimum fishing effort (F_{opt}) and Maximum Sustainable Yield (MSY) can be determined. The number of MSY, F_{opt} , total allowable catch, and utilization rate of squid in Alas Strait at NTB province is shown in Table 1.

The analysis of sustainable potential by using the Schaefer model like showed in Table 1 indicate that the squid utilization rate has exceeded its Maximum Sustainable Yield (MSY), because of the production ($C_{present}$) more than MSY and bigger than TAC. The high production due to the high efforts made by fishermen, the average effort made more than 15,000 trips/year (Figure 4), exceeding the optimum effort (F_{opt}) should be is equal to 13,687.7 trips/year (Table 1). It is also strengthened by the previous research [9] and [5] that is stated that there

was a significant declining production to the squid in Alas Strait Waters because of the increasing number of squid fishing vessels rapidly. Moreover [10] stated that because of that fisheries there was a declining production over 1000 ton in 1979.

Table 1: Utilization rate of squid (*Loligo edulis*) in Alas Strait

	MSY (ton/year)	F _{OPT} (trip/year)	C _{present} (ton)	TAC (ton/year)	Utilization Rate (%)
Squid (<i>Loligo edulis</i>)	657.2	13,687.7	922.8	525.8	140.4

The high utilization rate of squid at Alas strait in NTB province is caused by high fishing effort as a result of high number of squid fishing vessels. The relationship between the high catching effort and the outcome production is showed in Figure 5.

From Figure 5 it is showed that the high effort of squid catching has inflicted the increase of squid exploitation in the last five years (2008 - 2012) in Alas strait and has exceeded its Sustainable Maximum Yield. If this is allowed continuously the resource will be interfered. The resource exploitation should consider some aspects one of them is reproduction aspect, as an example, the catching of squid spawn. It can disturb the squid recruitment and the next catching.

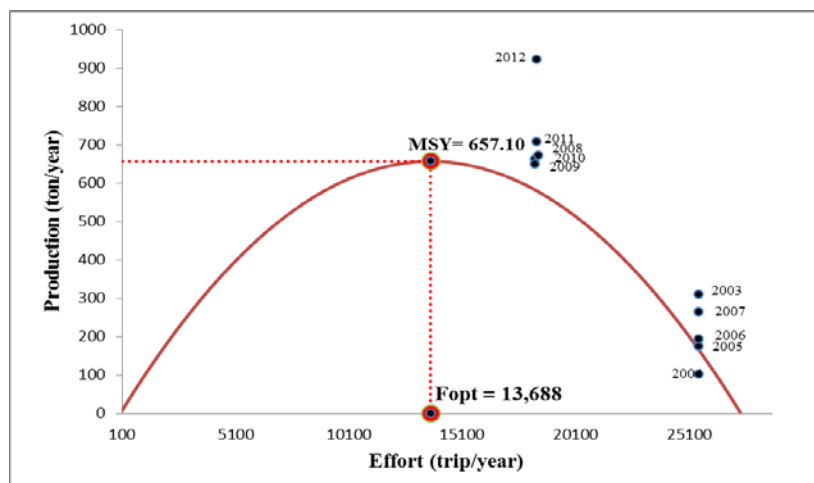


Figure 5: The relationship between the production and the catching effort of squid in Alas Strait at NTB province

The catching of squid in spawning season has a potential effect to change the sexual selection process and the mate behavior of the individual that involved in that population [11]. Because of that the catching activity

during this period should be closed or not done. In spite of the wrong catching period, the number and the type of the using gear also contributed to the existence of squid in a waters territory. It has been clearly known that one of the fishing gear that is used in Alas Strait "jala oras" is not appropriate and not selected [4]. It is because the mesh size at the pocket of this fishing net "jala oras" is 0.5 cm which means that many young squid will also be caught by this traditional fishing gear.

The high effort of cathing is not always give a high production too. This case happened in Alas strait. Although the squid fishing effort has exceeded its sustainable maximum in 2003 to 2007 but there is no significant increase of the production. On the other hand the production of squid has decreased (Figure 5).

From Table 1 and Figure 5, showed that the squid development opportunities in Alas Strait should be lessened both in the number of the fleet or the catching effort. Nevertheless the high fluctuation production of the squid in Alas strait not only caused by the high effort of squid catching but also from the environmental alteration (ENSO/El-Nino and Southern Oscillation) which result in change of the squid resource in Alas Strait [5].

4. Conclusion

Maximum Sustainable Yield (MSY) of squid (*Loligo edulis*) is 657.2 ton/year, however the optimum effort (F_{opt}) is 13,687.7 trip/year, and the Total Allowable Catch (TAC) is 525.8 ton/year. The Utilization rate of squid (*Loligo edulis*) in Alas Strait is 140.4%, with over exploited status.

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