

Small-scale fisheries of the Asian Moon Scallop *Amusium pleuronectes* in the Brebes Coast, Central Java, Indonesia.

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Abstract

Asian Moon Scallop is a Pectinid bivalve found in Northern Coast of Central Java. The scallop have an economic importance and the taste is delicious. Brebes Coast is one of the important landing place on the scallop's small-scale fishery. Landing of this scallop is the result of by-catch of the traditional vessels fishing for prawns. Scallop was normally catchable by one day fishing trip. The scallop fisheries were unlimited entry fisheries. There was no legally defined season, and fishery operates within period four (4) month, from December to March, coincide with the prawn fishery. There was no minimum shell size was set. All catch was landed whole and processed a shore by hand, mainly for the export market.

Preliminary studies on the various patches at the Brebes Coast have been carried out by using a GPS on the fisherman vessel. The vessel tows three times during 2.5 - 3 hours. Trawling speeds in the surveys varied between 3 and 4 km. hour ⁻¹. Growth was also performed by regression analysis. It was identified there were four (4) patches in the scallop fishery in Brebes Coast. The catch from this patches by the fishery within January - March 2008 were more than 41 tones. The size of scallop catches was 176 mm – 875 mm. Pattern of the morphological growth of the scallop was allometric negative.

Keywords: *Amusium pleuronectes*, Asian Moon Scallop, small-scale fisheries.

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INTRODUCTION

The Java Sea, an area of 467 000 km², corresponds to the south-east of the large plate of the Sunda that extends from the Gulf of Thailand to the south-east of Kalimantan (Borneo).

It is a relatively closed that communicates by the Karimata Strait with China Sea and those of the Sunda and Bali with the Indian Ocean. To the east, it is widely open to the Flores sea and separate in north-east through the Strait of Makassar, Sulawesi Sea. The Java Sea plays a major economic role in Indonesia as it is, in particular, creating jobs and income for the communities bordering the northern coast of Java and the southern coast of Borneo. It's correspond to the needs in animal proteins of the population of the Java island, which accounts for nearly 60% of the total population of Indonesia (Nurhakim, 1993).

The marine organisms that inhabit at Northern Java sea are captured by multiple gear, including seines (Danish, rotating and sliding) and various trawls.

For Indonesia, an Asian moon scallops, *Amusium pleuronectes* (local name is "simping") could be a lucrative for the economy of the sea, as are many pectinids in various oceans. This is the case, for example *Placopecten magellanicus* in Canada, *Argopecten irradians* in the USA, *Argopecten purpuratus* in Chile and Peru, and *Amusium papyraceus* in Venezuela (Penchaszadeh, 1991), *Pecten fumatus* in Australia and *Argopecten irradians* (Zhang, 1991) in China and France, among Queen Scallop, *Pecten maximus*, the richness of the natural harbour of Brest (Piboubes, 1973).

The Java Sea is a marine ecosystem whose biogeochemical characteristics can be seen as moderately productive. However, it is the site of important fisheries and the first fishing zone in Indonesia. The Directorate General of Fisheries of Indonesia considers that the maritime space is already fully exploited for shrimp penaeid and overexploited for small pelagic fish and demersal.

Materials and methods.

Methods of sampling

The study site is located on the northern coast of Central Java Indonesia, in the town of Brebes (6 ° 51 '50.02"S, 109 ° 02' 00.60"E), which was determined after consultation with fishermen. Samplings were carried out on the study site on 3rd and 24th May, 2008 by using a traditional fishing vessel called "Arad". The vessel is of 9 m long and 2.70 m wide. The number of crew is usually two people, the power of the engine is 16 horsepower and speed trawling was between 1.45 and 2.21 knot, with averaged of 1.83 knots. For each boat trip 3 stations were sampled, time trawling was on average 1 hour and 45 min. Sampling site has been defined by using a GPS (Garmin map 60C). The first sampling was approximately 13 nautical miles of coastline, while the second one was about 15 nautical miles from shore.

Capture of the scallops from the sea bottom was done by using a traditional shrimp net, with a 18.80 m length and an opening of 4 m. This net has five different types of stitches, from front to rear (trawl) which are : 4 x 4 cm, 3 x 3.5 cm, 2 x 2.5 cm, 1.5 x 1.5, and 1 x 1 cm. The use of different mesh was used by the fishermen to capture all species on the merits and those living near it.

The scallop were treated during fishing by cleaned up the shell, sorted and put on plastic bags containing the number of the station and then directly placed in a container with ice. The transport of scallops port to the laboratory was done by using a polystyrene insulated box with ice to maximize their conservation. The measurements are then performed on the laboratory at Semarang.

RESULTS

Preliminary studies on the various patches at the Brebes Coast have been carried out by using a GPS on the fisherman vessel. The vessel tows three times during 2.5 - 3 hours. Trawling speeds in the surveys varied between 3 and 4 km. hour ⁻¹. It was identified there were four (4) patches in the scallop fishery in Brebes Coast.

Table 1. Summarize of ordinat sampling's station and catch of Asian Moon Scallop, *Amusium pleuronectes* from the coast of Brebes, Central Java, Indonesia.

No	Location	Started of fishing	End of Fishing	Number of tawing	Scallop's size	Catch (kg)
1	Station 1	S.06°.38'.47,3'' E.109°01'.24,1''	S.06°.38'.28,7'' E.109°.02'.50,1''	3	Small	2.9
2	Station 2	S.06°.38'.23,5'' E.109°03'.16,5''	S.06°.38'.35,7'' E.109°04'.13,9''	3	Medium	2.5
3	Station 3	S.06°.37'.16,9'' E.109°.04'.36,5''	S.06°.37'.57,2'' E.109°.03'.38,9''	1	Medium - Large	1.6
4	Station 4	S.06°.37'.05,4'' E.109°.04'.43,6''	S.06°.37'.15,6'' E.109°.04'.38,8''	2	Large	3.5

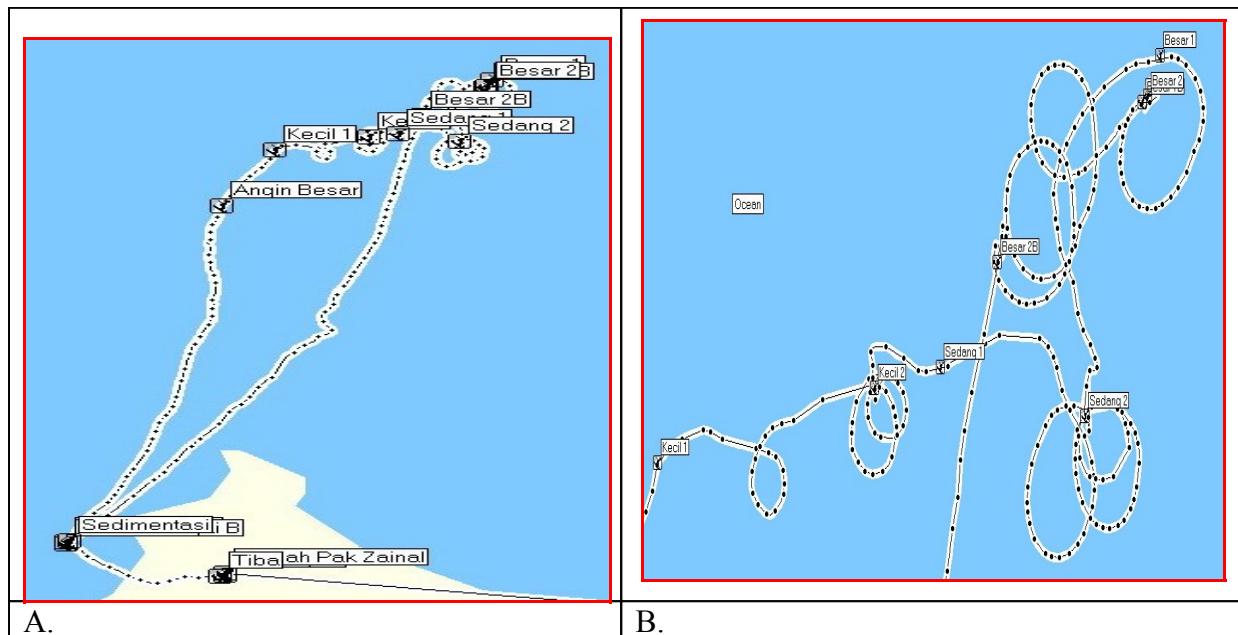


Figure 1. Patches of Asian Moon Scallop (*Amusium pleuronectes*) at Brebes waters, North Coast of Java – Indonesia.

The catch from this patches by the fishery within January - March 2008 were more than 41 tones. The size of scallop catches was 176 mm – 875 mm. Pattern of the morphological growth of the scallop was allometric negative.

Table 2: Summarize major outstanding values on biometrics Asian Moon Scallop, *Amusium pleuronectes* from the coast of Brebes, Central Java, Indonesia.

	First Sampling (03/05/08)		Second Sampling (24/05/08)		
	Station 2	Station 3	Station 1	Station 2	Station 3
Number of individus	211	256	265	198	182
Individus <4cm	171	202	67	70	76
Individus >4cm	40	54	198	128	106
Size minimal	1.98	1.88	2.16	2.28	2.12
Size maximal	8.54	8.81	8.12	8.42	8.02
Average size	3.9	3.82	4.51	4.58	4.57

Table 2 shows that for the first sampling (03/05/08), the majority of individuals captured are smaller than 4 cm (81.04% for the station 2 and 79.91% for the station 3). The average sizes of individuals are respectively 3.9 and 3.82 cm.

For the second sampling (24/05/08), the majority of individuals are larger than 4 cm (74.72% for the station 1, 64.65% for station 2, and 58.24%. for station 3). The average sizes for each station are respectively 4.51, 5.58 and 4.57 cm.

The linear regression between height-length measures of the shell are shown in Table 3. The coefficient of allometry ($b = 0.878$) is significantly different from 1 (t test, $p < 0.05$) and the overall relationship between the height and length can not be regarded as allométrique.

Table 3. Characteristics of key relationships morphometric applicable to *Amusium pleuronectes*. The results are of the form $Y = ax + b$

	a	b	test t*, p <0,05	R ²
Ht et Lt	0.212	0.878±0.007	-17.033	0.828

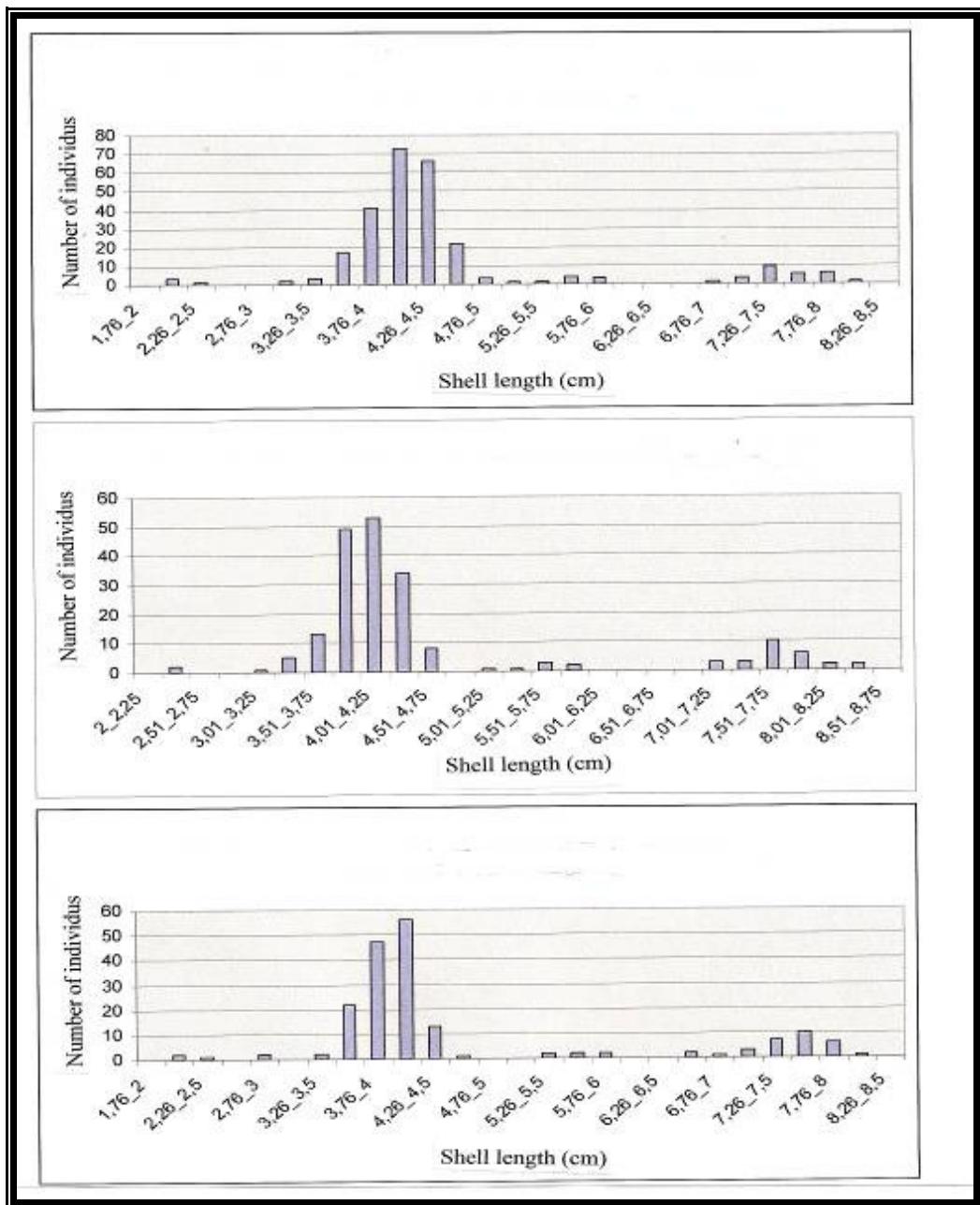


Figure 3. Shell size of the Asian moon scallops, *Amusium pleuronectes*, captured from Brebes waters, Central Java, Indonesia.

DISCUSSION

The exploitation of this species and their fisheries in the fishing zone in Java Sea has a major economic role in Indonesia.

This fishing activity, create a jobs and income for the communities bordering the northern coast of Java. Marine organisms are captured by multiple devices in many fishing areas scattered along the northern coast of Java.

The quantitative data was not available for fishing zones and this study started to specify the scallop resources obtained by trawling.

In Indonesia, *A. pleuronectes* fisheries is catch by fishermen using a modification of the trawl, which called “ arad”; rather than drag. Arad was initially performed with the standard equipment used for demersal fish or shrimp. At the moment, most fishing trips is for 1 to 3 days. The traditional sorting methods have been developed to retain the shells marketable for export and smaller sizes are sold separately at a local market.

In Indonesia, *A. pleuronectes* is known for a long time. The local fishery has grown: it occupied before 1978, trawlers a full-time and provided a catch of the order of one tonne per boat. Since then, scallops, is subject to an intensive fishing effort. The first fisheries statistics dating back to 1980. This overfishing has led to a sharp decrease in tonnages collected. They have risen from 228 tonnes in 1980 to 10.3 tons in 1997. The tonnages are back up to 65.5 tons in 2002 (Anonymous, 2002).

In 1980, the prohibition of trawling in Java Sea modified the scallop's fishing. The number of units is growing strongly by the transformation of a part of the fleet trawlers to seiners. The fishing pressure increasing in traditional areas, catches and returns of these areas are declining.

According to surveys, many fishermen exploited the fish populations of the Java Sea. The fishery is divided into two fleets, one consisting of vessels with outboard motors and other vessels with internal motors. The main fishing ports in Java Sea are Kendal, Batang, Pekalongan, Pemalang, Tegal and Brebes.

Asian Moon Scallop are regarded as a demersal fish and not included yet in official statistics of Indonesian fisheries bureau. However, the fishing effort is maintained on demersal fish which has negative consequences for natural stocks of *A. pleuronectes* because the use of nets with mesh size smaller than 5 cm does not support to renewable stock.

The growth, as reproduction, is an important factor to be considered for the study of a dynamic population. The growth of shellfish is traditionally addressed by monitoring the size of the shell (Seed, 1980 in Keys, 1990). The criterion most frequently used is the height which, by its easy access, can be found in the natural environment without harming the individual measured. The evolution over time of other dimensions can be inferred from these data by applying relations allometry.

Our results in *A. pleuronectes*, shows that the coefficient of allometry between the height and length corresponds to the equation:

$$Y = ax + b$$

$$Y = 0.212 x + 0.878 \text{ with } r^2 = 0.828$$

The coefficient of allometry (0.878) is significantly different from 1 (t test, $P < 0.05$) and the overall relationship between the height and length can be regarded as allometric.

Generally, each year "fishing for this species" becomes profitable for fishermen from the month of December / January until May. From the June / July, the fisherman stop receiving this product because the scallops are no good quality and fishermen would catch more than small fish like anchovies. From this period, fisherman, choose animals based on their weight indices and their economic values.

Overall the fisheries sector makes a very important contribution to the diet of coastal populations and also, for several years there has been a strong export of seafood. Thus, the values of exports have increased during recent years to reach today, the annual value of 3,383 million rupiah (1 € = 14.500 IDR).

Based on preliminary data obtained, despite the lack of information on fishing periods, the quantification of production, income from fishing, and the cost of distribution, we proposed a development of fisheries, the aquaculture and marketing for direct access to international markets.

In the future, to preserve the natural deposits *A. pleuronectes* and their parents in reserves, it will regulate fishing by limiting the size, quota and fishing periods.

In its economic aspect, the current fishing, being free, does that secondarily our biological considerations. A regulation necessary to operate *A. pleuronectes* is therefore indispensable. Regarding to the biological, economic and socio-economic aspects, we could achieve. Finally, to be applicable, these rules must be consistent and acceptable by all partners whose naturally professionals from the sea to whom the message is often difficult to pass.

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