

STUDY ON FISHING TECHNOLOGY OF BEACH SEINE NET AT KELURAHAN BUNGUS SELATAN, PADANG CITY AREA, INDONESIA

by:

Pareng Rengi¹⁾ and Arthur Brown¹⁾, Sri Wenti²⁾

^{1,2)} Lecturer of Fisheries and Marine Science of Faculty, Riau University ²⁾ Student of Fisheries and Marine Science
of Faculty, Riau University

Abstrack

The research was conducted at Kelurahan Bungus Selatan beach from March, 27th till April 4 th 2012. Purpose of the research is to evaluate whether this beach seine fulfill the eco friendly technology criteria or its rentability is feasible to sustain as a kind of bussines. Based on set the eco friendly criteria, this gear was classified not a friendly technology and not feasible from bussines perspective. The fishers use this gear just for subsistence and maintain their hereditary tradition.

Key word: beach seine, eco-friendly criteria, rentability, subsitence and hereditary.

1. INTRODUCTION

Beach seine (beach seine) is one type of fishing gear used to catch fish and other marine life in the waters near the shore. Including beach seine gear-operated active since pulled towards the coast by way of confining the fish are or migrate to the coast.

Fisheries statistics show that there are beach seine found almost in all provinces. In some areas, beach seine is retained and is seen as a traditional fishing as beach seine may be the best alternative for a group of fishermen, particularly those who have limited capital. It is due to such construction tool is very simple and requires operating costs and maintenance costs are relatively small. Given the current trend of increase in prices occurred ingredients for fishing operations, such as fuel, the gear is still to be maintained in order to empower coastal communities, the opportunity to earn income and enhance the welfare of fishermen (Ahsan Mardjudo 2002).

The development of the people of the beach seine fishery will require a comprehensive study considering the resources that can be accessed is generally in a critical phase, ie the fish that are still juvenile. Excessive fishing juvenile will cause breaking of fish life cycle so that endanger its preservation, therefore, to develop a sustainable fishing folk beach seine must be designed in such a way. Strategies to avoid such hazards is the use of selective fishing gear. Management of fishing effort based on technical analysis can be done by several methods regarding both the arrest and the method of operation is based on the design and construction gear. Implementation of a policy governing the fishing effort in terms of technical and construction can be done by limiting some of the characteristics of fishing gear.

Potential fishery located in the Village of South Bungus them is to fishing, fishery product processing and ecotourism beach and ocean. One way to increase fish production without destroying the biological sustainability of fisheries resources is to use gear or selective fishing technology and environmentally friendly and viable business.



The most urgent problems to be asked is whether the gear is relatively environmentally friendly fishing gear, which refers to the criteria of FAO (1995), and whether the beach seine gear is still economically viable (business profitability studies).

The purpose of this study was to determine whether the beach seine gear in the Village of South Bungus already belong to the eco-friendly fishing gear, and if it is still economically viable in terms of its profitability aspects.

2. METHODS

Time and Place

This study was conducted on March,27th to April,4th 2012 in South Bungus Sub Sub Bungus Kabung Gulf of Padang West Sumatra Province.

Materials and tools

The materials and tools used in this study are:

a.) Beach seine gear unit and questionnaires, b) camera was used to dokumentasi, c) writing instrument to record data obtained during the study, d) calipers for measuring eye beach seine nets, e) the meter rolls, for measure the length of rope used on a beach seine ropes and bottom rope.

Data Collection Methods

The method used in this study is a survey method with direct observation of spaciousness see various fishing activities with beach seine gear.

Primary data, ie data obtained directly through interviews using a table that has been prepared questioner and respondent will be found directly interviewed. The data includes the data on the characteristics of the respondents, fishing gear, fishing technology, number and types of fish caught, and the management of arrest. Secondary data, ie data obtained from the relevant office or agency, including data on the geographical location and its development, namely the demographic, social, economic, fishermen, and others. Sources of environmental friendliness level data obtained from interviews with the beach seine fishermen by establishing criteria to measure the level of environmental friendliness beach seine is with reference to the criteria of FAO (1995).

Data Analysis

To see easily whether the beach seine gear is environmentally friendly or not then be weighted value against the criteria set by the FAO (1995) in which the criteria are four sub criteria consisting of the lowest to the highest. Weighting value assigned each sub criteria are as follows:

The weight values were as follows: a) Number 1 = 1, b) Number 2 = 2, c) Number 3 = 3, and d) No.4 = 4.

Assessment index then grouped into four classes, namely:

a) 27 - 36 = Very friendly environment, b) 18-27 = Environmentally friendly, c) 8-17 = less friendly environment and d) 0-7 = Not environmentally friendly.

The data obtained were collected and analyzed qualitatively and quantitatively. Financial feasibility of coastal trawl fishing effort that aims to determine the feasibility of their business. Analysis of the data is as follows:

(a) Benefit Cost Ratio

$$BCR = GI / TC$$



GI = Gross Income

TC = Total Cost

(b) Financial Rate of Return

$FRR = NI / I \times 100\%$

NI = Net Income

I = Investment

If the FRR (Financial Rate of Return) value is greater than the interest rate on the bank it is better to invest the capital in a business than a bank savings.

(c) Payback Period of Capital

$PPC = I / NI \times 1 \text{ year}$

PPC = Payback Period of Capital

I = Investment

NI = Net Income

Purpose of calculating PPC (Payback Period of Capital) is to determine the length of time needed for return on capital. The smaller PPC the faster return of capital, this means that the business is profitable.

3. RESULTS AND DISCUSSION

Beach Seine

The population beach seine in the village South Bungus still quite a lot of that is 21.12% of the total fishing gear in the Village, to more clearly it can be seen in Table 1 below.

Table 1. Gear types operating in the Village of South Bungus.

No	Fishing Gear	Unit
1.	Beach Seine	15
2.	Seine Net (Payang)	11
3.	Long line	25
4.	Lift Net (Bagan)	20
Jumlah		71

Source : Office of Marine and Fisheries of Padang, 2010

All fishing gear numbers that operates in the Village of South Bungus is increase from year to year. Beach seine fishing gear including fishing gear favored by local fishermen. Based on the results of field measurements, in general, the kind of beach seine nets used by fishermen is the beach that has pockets. Beach seine is operated around the beach and fishing operations are usually performed in the morning until late afternoon. The type of beach seine in the Village South Bungus can be seen in (Figure 1).

The principle of operation is active the beach seine encircle schools of fish with a net, then the net is pulled to the ground so that the fish will be collected in the bag. Operation of this beach seine at the start with the preparation of gear, then lowered the boat around the coast to locate schools of fish with the help of a fish handler. If water conditions showed signs of schools of fish, first step is lowering a crew at one point holding a net withdrawal towing rope, then the boat move towards of seaward by pulling down the rest of the towing rope, followed by a decrease in the net by forming semicircle toward the shoreline and towing ropes followed by a decline, and the wings up to the seashore. Furthermore, another fishing crew took a rope puller, then start withdrawing simultaneously.

Withdrawal of rope (warp) form a balance so that the position of each end of the line wing. If the tip of the wing has reached the hands of the crew each taking a position. There is an interesting section top cord and there is also a pull the cord down, and no one on duty stepped



down the cord. Once the net is pulled entirely, then the catch is in the bag in place on the beach with the open end of the bag, and then performed the sorting to be placed in the bucket provided. The time required in the process of hauling lasted approximately three hours.

From the measurement beach seine components dimension data obtained as shown in Table 2 below.

Tabel 2. Measurement results of beach seine Component dimensions data.

No	Beach Seine component	Length (m)	Mesh size (cm)	Materials	Diameter (mm)	Weight (Kg)	Source :
1.	Wing	387	5,5-60cm	PA	-	-	Primary Data (2012). Type of
2.	Body	7.5	1,5-2,5cm	pA	-	-	
3.	Net Package	5.3	0.7 mm	PP	-	-	
4.	Floats	11,5 cm	-	-	-	-	
5.	Pemberat	6 cm	-	Tin	-	-	
6.	Top cord	130 - 180	-	PE	-	-	
7.	Bottom cord	130 - 180	-	PE	-	-	
8.	buoy rope b	130 - 180	-	PE	-	-	
9.	Ballast	130 - 180	-	PE	-	-	
10.	Towing Warp	450	-	PE	-	-	

beach seine in the can in this research is the type of beach seine lace ruffle which is a modification of fishing gear seine net. The type of beach seine fishing gear and beach seine gear construction in the Village of South Bungus can be seen in (Figure 1).

Fishing boat

The boat used in the beach seine operation in the Village South Bungus have a simple construction, made of wood. Most of the fishing boat made by the ship builders and those that are built by the fishermen themselves.. The boat is used as a place to store and transport nets and they serve as a vehicle to spread nets on the high seas during fishing operations. Boats are used have varying dimensions, ie length range 6-8 meters, beam ranging from 1-3 meters and depth 1.5 meters. On the left and right the ship fitted with an outrigger to prevent the ship upside down when exposed to strong waves. Ship propulsion generated by a gasoline engine branded robin, no special treatment of the boats, after used the boat is immediately landing on the beach.

Fishing Ground

Fishing ground are waters that contained valuable fishes which is the gear can be operate comfortably. What beach seine operations in the waters of the Gulf Bungus Kabung one of them is a white sand beach in the Village of South Bungus, white sand beach is perfect for beach seine operation, because the sloping and sandy.

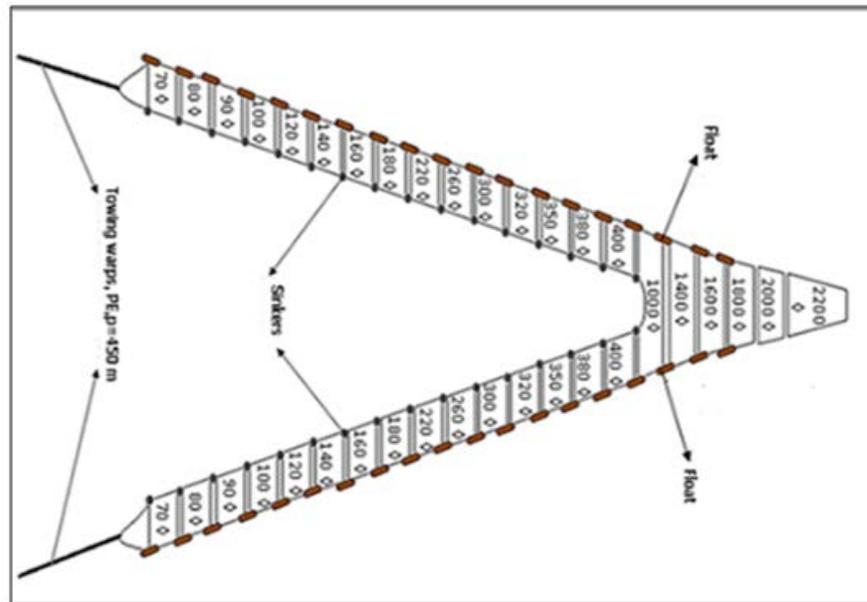


Figure 1. Beach Seine.

Fishing ground is generally determined using a designated fish handler and is believed to determine the place where there are plenty of fish to be caught, the operation starts from 08.00 until 17.00 pm every day.

Beach seine fishermen in the southern village Bungus catch the fishes throughout the year, but most fishing season is begun from September till February and the dry season from April till July.

Fishing Technology Operating Time.

When fishermen fishing operations in the Village of South Bungus starts from 08.00 - 17.00 hrs. In the Village of South Bungus there are 4 groups of fishermen and the capture system is done by using a system of rolling the four groups so that all groups of fishermen can catch the fishes everyday.

Operation method of beach seine

Methods beach seine operation in the Village South Bungus divided into three stages, namely preparation, casting and hauling..

1. Preparation Phase

At this stage begins with the determination of fishing areas, the first step is to prepare the gear and pull on the rope near the beach. Then pull the rope gear and raised on the boat and neatly arranged for easy spreading nets in the sea. One end of the pull rope moored on the beach, while the other end is brought by boat. Once completed prepared, the boat began dikayuh to sea.

2. Casting Phase

While the boat move to the seaward, the crew lowered a pull rope, followed by a lowering wings, body and pockets. Then buoy marks lowered and the boat began moving

towards the coast. Arriving at the beach, the end of the pull rope is given to fishermen and rope pullers begin to haul. The time required for the casting is 30 minutes.

3. Hauling Phase.

At this stage the beach seine fishermen who were on the beach begin to work. Each rope, pulled by 10 peoples. Once the rope is pulled over by the fishermen the crew returned to retrieve a float from sea . The time required in this phase is 1-3 hours. This stage ends with a bag on the beach.

The dominant fish species caught are: 1). Goatfish (*Parupeneus* sp), 2). Dussumier's Pony Fish (*Leiognathus dussumieri*) 3) Anchovy (*Stolephorus* sp); 4) Squid (*Loligo* sp); 5) Horse-Eye Jack (*Caranx stelatus*); 6) Spiny turbot (*Psettodidae*); 7) Mackerel scad (*Decapterus* sp); 8) Fish layur (*Trichiurus savala*); 9) Fish Mackerel (*Scomber neglectus*) 10) Fish lemuru (*Clupea fimbriata*); 11) Slender rainbow sardines (*Dussumeria hasselti*) And 12) Spot-fin porcupinefish (*Diodon histrix*).

Business Rentability

a) Cost Analysis

In the cost analysis, cost components are taken into account consists of investment and production costs. Costs consist of fixed costs (fixed cost) and variable costs (variable costs). Details of the total cost of investment and fixed costs and variable costs can be seen in (Table 4).

Table 3. Business Investment Costs of Beach Seine

No	Investment costs	Price (Rp)
1.	Buying the boat	4.500.000
2.	Beach Seine	32.500.000
3.	Engine	2.500.000
4.	Licence	500.000
	Total Invesment	40.000.000

Source : Primary Data (2012).

Fixed cost and variable cost necessary to know the total cost required in running a business is like a beach seine decomposes in Table 4.

Table 4. Details of Total Fixed Costs and Variable Costs of Beach Seine bussiness.

1	Fixed cost/ Depreciation	Values (Rp)	Economical ages (Year)	Cost/Year (Rp)
	a. Beach seine	32.500.000	5	6.500.000
	b. Boat	4.500.000	5	900.000
	c. Engine	2.500.000	5	500.000
	Depreciation Cost			7.900.000
2	Fixed cost /maintenance	Improvement		Cost/Year (Rp)



	a. Boat	Boat Services (2 x setahun)	3.000.000
	b. Gears	Gillnet improvement, rope, etc.	3.000.000
	c. Engine	Regularly Engine Service/month	1.000.000
Maintenance Cost			7.000.000
Fixed Cost (Depreciation Cost + Maintenance Cost)			14.900.000
3	Variable Costs/Operational Costs	Volume /trip	Price per Unit (Rp)
	a. Bahan bakar bensin	20 ltr x 240 trip	4.500/ltr
	b. Pelumas (oli)	2 ltr/ 3 months	25.000/ltr
	c. Beli kayu salam	72 unit/tahun	35.000
	d. Upah tumbuk kayu salam	2 men	50.000/man
	e. Konsumsi	10.000/day	-
	f. Pembayaran upah nelayan sistem bagi hasil	-	-
Total variable cost			Rp. 304.410.000

Source : Primary Data (2012).

From the calculation above, the obtained value of the total cost (total cost) results from the sum of the fixed costs (fixed costs) and variable costs (variable costs). So the total cost is as follows:

$$TC = FC + VC$$

$$= \text{Rp. } 14.900.000 + \text{Rp } 304\,410\,000$$

$$= \text{Rp. } 319,310,000 / \text{year}$$

The importance of the total cost (TC) were issued in one year is Rp. 319,310,000 / year.

Revenue

a. Gross Income (Gross Income)

Gross income of an owner is revenue earned by the fishermen in the form of a sum of money, as a result of the sale of fish produced. Gross income (gross income) is calculated based on production volume multiplied by the prevailing market price of each species.

Fishermen go fishing in a month on average 26 days at sea with a number of trip 1-4 times a day with uncertain catches, sometimes more and sometimes less, but at least fishermen get some fish for them to eat at home when the catches just a little bit so it can not be sold.

Based on the results of interviews with business owners, there are 3 fishing season, the peak fishing season, middle seasons and scarcity of fish season, while the price fluctuate depending on the market price and volume of fish stocks in the market, as detailed in Table 5.

Table 5. Revenue according to catch season in 1 year

No	Musim	Catches	Price	Total
1	Southeast season October-January Peak	400 basin (8000 kg)	Rp.22.000/kg	Rp. 176.000.000
2	West Season May-October Middle	200 basin (4000 kg)	Rp.22.000/kg	Rp. 88.000.000
3	East Season February-May Famine	100 basin (2000 kg)	Rp.30.000/kg	Rp. 60.000.000
				Rp. 324.000.000

Source : The results of interviews with beach seine owners (Primary Data 2012).



According to the records and information of the beach seine owner Mr. Zainal Malay they distribute the money of the nett income is 30 % to the owner of fishing gear and the rest they bring to the fishermen and crew.

Table 6. Production and sales results of the beach seine owner (Mr. Zainal).

No	Date	Production(kg)	Sale(Rp)	Expenditure (Rp)	Results(Rp) (hari)
1	03-29-2012	1.5 basin	Rp. 500.000	Rp. 40.000	Rp. 460.000
2	03-30-2012	1 basin	Rp. 300.000	Rp. 40.000	Rp. 260.000
3	03-31-2012	8 (kg)	Rp. 230.000	Rp. 30.000	Rp. 200.000
4	04-01-2012	2 basin	Rp. 675.000	Rp. 40.000	Rp. 635.000
5	04-02-2012	1.5 basin	Rp. 400.000	Rp. 50.000	Rp. 350.000
6	04-03-2012	7.5 (kg)	Rp. 210.000	Rp. 40.000	Rp. 180.000
7	04-04-2012	1.5 basin	Rp. 365.000	Rp. 50.000	Rp. 315.000
Jumlah			Rp.2.680.000	Rp.290.000	Rp.2.400.000

Source : Primary Data (2012).

b. Net Income

The net income are all the results obtained from the real beach seine fishing effort for one year. Production revenues calculated from the difference between total revenue (gross revenue) and total cost (total cost).

The net income (net income) = GI - TC

= Rp. 324.000.000 - Rp. 319 310 000

= Rp. 4.690.000/year

c) Financial Analysis

Determining the feasibility of beach seine fishing effort in the Village of South Bungus cost of using formula Benefit ratio (BCR), Financial Rate of Return (FRR), (Kadariah, 1998) and Payback Period of Cafital (PPC) (Riyanto, 1983).

Table 7. Financial fasibility parameter of beach seine.

No	Parameter	Value	Description
a.	Benefit cost of ratio (BCR),	1,0	Impas
b.	Financial Rate of Return (FRR)	11 %	Lower than the bank rate
c.	Payback Period of Cafital (PPC)	8,53 years	Payback takes time.

Source: Data Processed.

3. Discussion

Analysis of Sustainable Fisheries

Trend fishing technology development focused on technology environmentally friendly fishing practices (environmental friendly fishing tecnology) in the hope of a sustainable use of fisheries resources. Fishing technology is an environmentally friendly fishing gear that does not give negative impact to the environment, ie the extent to which fishing gear does not damage the bottom, no negative impact on biodiversity, target resources and non-target resources. In accordance with the code of conduct responsible fisheries (FAO, 1995) that the fishing activities should ensure the sustainability of exploitation of fish resources.

From the evaluation results of obtained weighting assessment set point number totally are 17 that mean the beach seine in southern Bungus village is less environmentally friendly.

Table 8. Criteria capture technologies that are environmentally friendly according to the FAO (1995).



No	Criteria of eco-friendly fishing gear according to FAO (1995)	1	2	3	4
1.	Gear must have a high selectivity..	4			
2.	Fishing gear used does not damage the habitat, shelter and breeding of fish and other organisms		3		
3.	Not harm the fishermen.			2	
4.	Produce good quality fish.				0
5.	The product does not harm the health of consumers.				0
6.	Wasted catches is minimum.		3		
7.	Fishing gear used should provide minimum impact on resource diversity (biodiversity).			2	
8.	Not capturing protected species legislation or endangered.		3		
9.	Socially acceptable.				0
Total			17		

Judging from the nine criteria established by the FAO (1995) about the eco-friendly fishing technology, the first beach seine gear caught more than three species with vastly different sizes, the main target is anchovy, although beach seine gear can caught Horse-Eye Jack, Dussumier's Pony Fish, Squid dan Goatfish which are sold in the market. Both beach seine fishing gear cause habitat destruction on small areas. It can be seen from the results in reduced catches and fishing gear is the working principle of the dredge to the bottom waters. Third, the gear is not harmful fishing gear and beach seine gear is how its use can result in a temporary health problems. views of the beach seine gear operation requires power and full power , so it can harm the health of fishermen. The four beach seine gear live fish and fresh produce, this is because the working principle of this gear catches fish then bracketing obtained fresh and alive and safe for consumers.

Top of Form

Catch (by-catch) is a wasted beach seine consists of several types of fish that are not sold in the market like a puffer fish. Fishing gear and beach seine fishing operations cause the deaths of several species but does not damage the habitat, the fish were caught fishing gear typically experience fatigue physical damage and death due to swimming in the net mesh sizes were very small at 0.7 cm and the gear is not environmentally friendly and habitat damage seen from the dredge works prinsif bottom waters. Beach seine fishing gear fishing've protected several times. And beach seine gear is very welcome in the Village South Bungus because gear is very simple and more economical than the other gear. And this beach seine gear hapir all the criteria set by the FAO (1995) are met and beach seine gear is classified into environmentally friendly fishing gear.

Judging from the construction of beach seine fishing gear that is in the Village of South Bungus, beach seine conditions at the sites in terms of technical resources have not been able to preserve the small fish being targeted. This is indicated by the mesh sizes on the bag that only 0.7 cm. while the corresponding regulatory mesh which is set FAO (1995) the minimum mesh size is 1 inch.



Beach seine terms of sustainable utilization of fish resources, indirectly had cut the food chain for larger fish, seen from the dredge basic working principles of the waters and beach seine catches are small fish which are a source of food fish in great number, but when viewed from local tourism visit, beach seine should be preserved because it has special appeal to the community, both local people and for tourists who visit the city of Padang.

Business Profitability

Profitability of a fishery can be measured by connecting the gains or profits derived from the capture of the capital used to produce profit.

Profitability shows the amount of interest that can be generated by the investment of total wealth. In order for these investments to be accounted for the profits derived must be higher than the interest rate to be paid or accounted for. (Nuraini and Hidayat, 2011). from data obtained by beach seine fishermen investment consists of the purchase of boats, engines and fishing gear beach seine is Rp 40,000,000.

Soekartawi (2002), the income of fishermen is the difference between revenues and all costs (total cost). Admission fisher production obtained multiplying the selling price. Costs fishers usually classified into two: the fixed costs (fixed costs) and variable costs (variable costs). Fixed costs (fixed cost) is relatively fixed cost incurred in number and continue production even earned a lot or a little. variable costs (variable costs) are costs that are influenced by the size of the production obtained.

Sukirno (2006), revenue is the amount of income received by the top of his performance during the period, either daily, weekly, monthly, or yearly. Perikann feasibility beach seine in the Village of South Bungus measured by several indicators, namely: Benefit Cost of Ratio (BCR), Financial Rate of Return (FRR), and Payback Period of Capital (PPC). From the results perhitungan has done that beach seine fishing effort in the Village of South Bungus continue or not depends on the investor concerned, this is seen from a $B / C = 1$.

Economically beach seine fishing effort is not worth it to continue if seen from the state of the field, and from the income of fishermen every day is not sufficient for daily needs. However, because the beach seine fishing effort has been done for generations by the local fishermen and the absence of a better job option given the low level of local fishermen, so the business is still running even though the results the less profits.

4. CONCLUSIONS AND RECOMMENDATIONS

Conclusion

From the results of the evaluation with reference to the criteria of FAO (1995) the beach seine gear of South Bungus can be classified into gear a less friendly environmental.

Judging from the indicators of the feasibility of beach seine is a business that values high enough investment but the revenue is subsistence, the payback period is quite long, but the effort is more labor intensive and is one of Bungus coastal marine attraction, so it deserves to be preserved because it has the power attraction for the community, both local people and for tourists who visit the city of Padang.

Mesh sizes used in the beach seine is small so that it is not selective.

Suggestion

To support beach seine fishing technology that is environmentally friendly and sustainable, it needs to be done as following efforts:

- a. Mesh size in the pocket of beach seine must enlarged to free small fish not caught
- b. Need to change the design on the inside and the length of the wing to further expand the coverage area of fishing operations, and especially in the improvement of selectivity.

- c. As an iconic attraction and labor-intensive effort, it is expected that the local government to pay more attention again fishing conditions in the Village South Bungus like to provide assistance or loan capital with a lower interest rate.

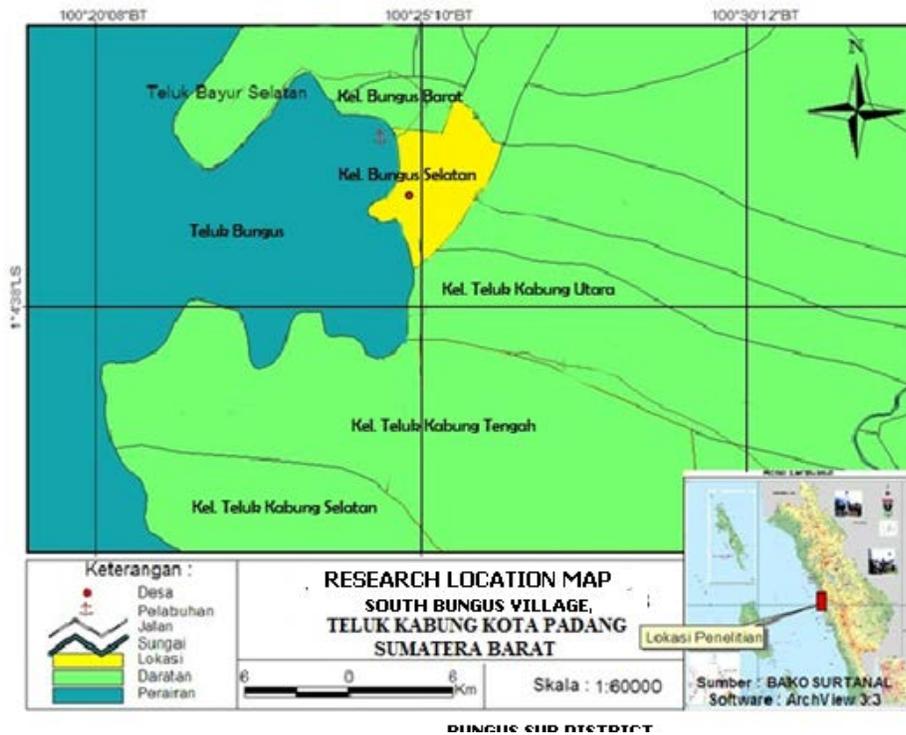
REFERENCES

- Ayodhya.1975.Fishing Methods dictate of Science Lecture Fishing Techniques. Departmente of Fishing Technolgy, Faculty of Fisheries IPB. Bogor.
- Charles. A.T. 1994. Towards Sustainability: The Fishery Experience. Ecological economis, 11:201-211.
- Department of Marine and Fisheries of Padang West Sumatra Province., 2010. Reports Kelauatn and Fishery Department of West Sumatra Province. Office of Fisheries. West Sumatra Province.
- FAO. 1995. Code of Conduct for Responsible Fisheries. FAO Fisheries Department. 24p. (Online) (<http://fao/fisheries/code>. Accessed January 2012).
- Kadariah. 1978. Introduction to Project Evaluation. Publisher Institute Faculty of Economics, University of Indonesia. Jakarta 104 pages.
- Monintja, D.R, 1991. Technology Utilization of Marine Biological Resources Ii. (College textbook). Bogor: Higher Education Enhancement Project, Bogor Agricultural University. Pages 33-35.
- Najamuddin. , 2009. Design Build Fishing Equipment. Lecture Module. Faculty of Marine Sciences and Fisheries, University of Hasanuddin Makassar. Online www.unhas.ac.id.
- Nikijuluw, VH. 2002. Sasi As A Community Based Resource Management (Psbk) In Saparua Maluku, marine fisheries research journal no. 93 In 1994, Marine Fisheries Research Institute, National Agricultural Research, Ministry of Agriculture, Jakarta.
- Nuraini, Ida. Herman Hidayat. 2001.Manajemen Farming. Publisher Center Open University. Jakarta.
- Nybakken WJ. 1988. Marine Biology An Ecological Approach. Translation Eidman et al. Marine Ecology An Ecological approach. New York: Scholastic.
- Rahardi, F, 2003. Agribusiness Fisheries, Governmental spreader. Jakarta. 63 pages.\
- Soekartawi.2002. Analysis of Farming. UL-Press. Jakarta.
- Sukirno. S., 2006. Macroeconomics. King Grafindo Persada, Jakarta.
- Omar H. , 2003. Business Feasibility Study Edition II. Engineering Feasibility Analyzing Comprehensive Business Plan. New York: Scholastic Press. 462 p.
- Von Brandt A. 1984. Fishing Catching Methods of the World. Farnham-Surrey-England: FAO Fishing News Books, Ltd..



http://id.wikipedia.org/wiki/Ari_purbayanto. Visited January 2012

. Annex 1. Map of Research Location.



Annex 2.

Catches of Beach Seine:



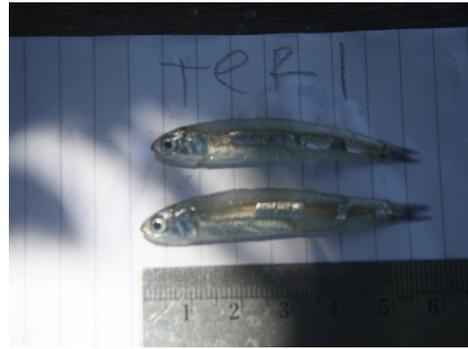
Squid (*Loligo sp*)



Goatfish (*parupeneus sp*)



Dussumier's Pony Fish)



Anchovy (*Stolephorus sp*)



Horse-Eye Jack



Catches of Beach Seine.