MILESTONE 6
FINAL REPORT APPROPRIATE CRAB POT ESCAPE GAPS FOR THE BLUE SWIMMING CRAB FISHERY IN SOUTHEAST SULAWESI

30 Mei 2014

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FINAL REPORT APPROPRIATE CRAB POT ESCAPE GAPS FOR THE BLUE SWIMMING CRAB FISHERY IN SOUTHEAST SULAWESI

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Contract No. AID-EPP-I-06-00013
Task Order No. AID-497-TO-11-00003

30 Mei 2014
This publication was produced for review by the United States Agency for International Development. It was prepared by the CV. Mitra Bahari for Chemonics International Inc.
EXECUTIVE SUMMARY

The objective of the grant activity is to develop the most appropriate pot/trap escape gaps for the Blue Swimming Crab Fishery in Southeast Sulawesi. The determination of the configuration and shape of the escape gap is up to the grantee but should be scientifically sound and validated. One approach would be to test a variety of escape gaps in a set number of pots/traps mixed up together in a variety of fishing areas. Once an optimum design is arrived, it will be necessary to socialize the benefits of using crab pot/traps with escape gaps with crab fishers in Southeast Sulawesi. In implementation appropriate pot/trap escape gaps for the Blue Swimming Crab activities so that by conducting several stages.

The first stage is conducting FGD with purposes e.g.: (a) identify the fishermen and environmental issues related to the capture and management of blue swimming crabs; (b) accommodate the expectations and needs of fishermen in maintaining and developing the blue swimming crab fishing effort; (c) obtain information about the size of blue swimming crab who should be catched; (d) introduce a prototype design pots that environment friendly fishing gear to achieve sustainable bule swimming crab fisheries.

The results of FGD are (a) the number of fishermen catch fewer and size of blue swimming crab tends to be smaller along with the development of time, (b) lack of capital owned by fishermen to purchase fishing gear and crab nets and pots; (c) community accept the design blue swimming crab fishing gear prototype using the vent escape on each gear, and (d) community requested the Local Government (cq. Marine and Fisheries Board) to help provide blue swimming crab pots.

The second is study on escape vent selectivity with the aim which consisting of 3 sizes of 4.0 cm x 3.5 cm; 4.5 cm x 3.5 cm and 5.0 cm x 3.5 cm was to find out the appropriate escape vent size which only blue crab of ≥ 10 cm of carapace width retained in the crab pot, while blue crab of < 10 cm escape from the collapsible pot to the sea. The test of escape vent sizes of crab pot was undertaken in January – February 2014 in 3 fishing ground of blue crab in Southeast Sulawesi, namely Toronipa (Konawe), Torokeku-Tinanggea (Konawe Selatan) and Waepputang (Bombana). The number of crab pot tested was 50 units in the respective fishing ground. Each escape vent in the crab pot was equipped with a codend attached in the vent. Those crab pot of 17 units were tied in a plastic rope divided in 3 bunches and placed at 3 different water depths. Each fishing ground was hauled 6 trips of fishing. In the respective of blue crab caught in the crab pot (retained) and codend was identified its sex, measured its carapace length, width and height using caliper, weighed it body using electronic balance, and identified its gonad maturity stage and recorded in the data sheet. The blue crab data obtained was analyzed using “the gear selection ogive” which formulated in the mathematic equation forming sigmoid curve (Sparre and Venema, 1989). The results of analysis of blue crab data according to “the gear selection ogive” from 3 escape vent sizes found an ideal and rational to be recommended is L50% of 10.74 cm carapace width at the escape vent size of 5.0 cm x 3.5 cm. This carapace width of blue crab recommended supports the recommendation of APRI (Indonesia) of ≥ 10 cm.

The third is socialization activities that conducted to follow up the recommendation of escape vent of crab pot tested. The aim of socialization was to disseminate the result of escape vent of crab pot tested addressed to fishermen, management of mini plant processing, and local government. During the socialization, the team requested all
fishermen to use the escape vent of crab pot recommended due to population of blue crab had been drastically decreased as indicated by its small carapace width, limited in number, and fishing ground move further. The core of this socialization is to describe the long term benefit of crab pot having escape vent size of 5.0 cm x 3.0 cm which only catch big size of blue crabs, while small size return to the sea to grow and breed. During the socialization known that generally fishermen agreed using this crab pot recommended particularly if it is provided by local government. Rural government and local community gave support on blue crab conservation to maintain its population and habitat. Management of mini plant also agreed support this effort particularly because it had been recommended by APRI. It is hoped that each local government or province government will declare soonest the regulation of blue crab exploitation all round Southeast Sulawesi waters.

The forth is final design of crab pot recommended is collapsible crab pot in rectangular box-shaped consisting of the main frame of crab pot of white metal stainless and walls of dark green polyethylene multifilament net of crab pot. The diameter of wall net thread is 3 mm and mesh size of 3 inch (full stretched). The escape vent is placed in such a way in order to easier when crab pot closed and opened. Ropes used in the operation of the crab pot consist of 3 sizes based on in its respective function, i.e (a) the main strap – diameter of 4 – 5 mm, (b) branch ropes – diameter of 3 mm, and (c) knitter ropes – diameter of 1 mm. The cost production analysis of crab pot costs of Rp.15,650.908/unit or Rp.15.651/unit, while cost production of crab pot and escape vent services is Rp.5,000/unit and Rp.2,000/unit, respectively. Therefore, the total cost production of making crab pot recommended is Rp.22,651/units. The prediction of number of fishermen in Southeast Sulawesi is ± 1,750. It is estimated that fishermen using crab pot is 50% of 1,750 (875 fishermen). If the average optimum number of crab pot operated by fishermen ranges from 150 to 200 units that the total number of crab pot needed in Southeast Sulawesi is 131.250 – 175.000 units. Based on economic analysis of crab fishing effort and development of crab pot recommended industry that both of those business are feasible due to B/C-ratio > 1.

The fifth is producing collapsible crab pot equipped with escape vent and operations shall be known by fishermen that fishing eventually can make their own collapsible crab pot or fishing can at least make the escape vent on collapsible crab pot are bought in the market or from government empowerment. It is therefore very important to do creating for collapsible crab pot training that have escape vent size 50 x 35 mm² and tools of operation. Some of the purpose for the training of making collapsible crab pot and demonstrations of setting and hauling (operation) that is to: (a) improve the skills of the fishermen and the effectiveness of collapsible crab pot in an effort to make the arrest blue swimming crab which includes the principle of setting and the principle of hauling of crab pot which have escape vent to the size of 50 x 35 mm at 6 locations activities; (b) to train fishermen to be able to make the collapsible crab pot recommended and able to do repairs when damage occurs and capable of doing treatment crab pot; and (c) invites crab fishing blue swimming crab traps so that they would use the recommended. Participants in these activities are fishermen and blue swimming crab gatherers spread across six locations namely: Toronipa urban village (15 people); Bungkutoko urban village (20 people); Torokeku village (15 people); Lakara village (20 people); Lampopala urban village (20 people); and Waemputang village (28 people). Follow-up of experimental activities that collapsible crab pot have escape vent is distributing as many as 900 units of crab pot in three locations with details of 300 units of crab pot at each location. The desire to
participate in the management of blue swimming crab through the application of trial results, the number of fishermen grown to 15 people from 10 people each planned location. So overall these crab pot fishermen get, as much as 45 collapsible crab pot the number of crab pot each fisherman 20 units along the rope.

The sixth is publication on local television dan daily local newspaper, which is one model of the campaign in order to convey to the public about collapsible pot that has escaped vent gab. The information presented in this campaign is a series of research results or test collapsible crab pots are equipped with escape vent and recommendations as well as socialization and training to the communities in pilot test activities. On this dialog, there is emphasized that the use of collapsible pot yhat selective most important of all stakeholders should have the awareness to jointly manage the swimming blue crab. Also expected to the fisheren in order to release crab that are laying so that fishermen already have a role in the management of swimming blue crab. As teaching staff we are never an ever stopped to think about it, both swimming blue crab and society. While the province of DKP suggests that commitment with businessmen, fishermen and government to discuss with the preservation and prosperity of swimming blue crab fishing, the need for rules as a means of control so that there is certainty and this should be done jointly by all stakeholders.
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ANNEXES
I. INTRODUCTION

A. BACKGROUND

Southeast Sulawesi has a history as a vibrant and robust Blue Swimming Crab Fishery. However, if small crabs are continually taken and not released in good condition before they have had a chance to grow and breed then the overall biomass of crabs in a particular area will decrease and the area will eventually be fished out. Crabs are cannibalistic and in the confines of a pot, particularly over prolonged periods, the larger more mature crabs will kill or damage smaller crabs. Thus, it is essential to the long-term sustainability of the Southeast Sulawesi Blue Swimming Crab fishery that small crabs are systematically returned to the sea in good condition, and preferably as close as possible to their home waters.

One means of ensuring a sustainable population of smaller crabs is to return them to the sea when caught with larger crabs. This requires fishermen to physically measure all crabs that are around a minimum size before releasing the undersize ones. This is time-consuming and normally done after the fishing operation has concluded, i.e., often on the way back to port. The reality is that the majority of the time the small crabs remain mixed with the larger crabs until they are measured and, unfortunately, often get crushed or seriously injured. Additionally, when the undersized crabs are eventually returned to the sea they are often a long way away from where they were caught and the release area is not suitable for crab survival and results in significant small crab death rates.

Another conservation alternative is to close areas to crab fishing. “No Take Zones” and special Marine Protected Areas (MPAs) are not new to Indonesia. However, in reality, unless they are backed-up with highly efficient surveillance and enforcement, it is difficult to keep fishers out of the closed/restricted areas. This often requires significant funding to establish zones and areas, and the reality is that most cognizant government departments simply cannot afford to fund these activities. Also, there are often confrontations at sea between enforcement officers and fishers, which can lead to injury, and in rare cases, even death.

There are approximately 2,000 crab fishers in Southeast Sulawesi whose livelihood depends on the Blue Swimming Crab Fisheries. Most of these fishers operate from five districts. Additionally, demonstrating that a fishery can be efficiently and effectively managed for a species enhances the stature of local DKP officials. Most of the meat from the Blue Swimming Crabs is exported to the United States and if the fisheries collapse due to lack of management control then exporter/importers in both the US and Indonesia will suffer economic losses. Finally, Blue Swimming Crabs are a key component in the biodiversity network in the referenced fisheries and essential to the long-term health and sustainability of the fishery upon which 4,000 families depend for income and nutrition.
Fishermen understand that crabs need to breed at least once to maintain population numbers but many do not understand the best way to allow this to happen. Fishermen need to be convinced that allowing small crabs to escape in the same area they entered the pots/traps is biologically better than bringing them on board boats, stressing them, and then releasing them away from their natural home. It is vital to the long-term sustainability of the blue swimming crab fishery that the vast majority of fishermen are in agreement that an efficient, low impact method of sorting out/returning smaller crabs to the sea as close to the source of capture as possible is beneficial to the environment and local biodiversity, and in turn their long-term livelihood prospects.

Small, appropriately sized escape gaps (or exit points) can be fitted to pots or traps to greatly reduce the number of undersize crabs taken in a fisherman’s catch. Most traps or pots are fitted with a primary, one-way entrance point that is sized to accommodate the largest available crabs in an area. Through this entrance point, both large and small crabs enter the pot/trap. Escape gaps are normally found towards the bottom of a pot/trap and provide a convenient way for smaller crabs to escape while restraining the larger crabs (they can’t fit through the gap/hole in the wall of the pot/trap). If a smaller crab feels threatened by a bigger crab, or senses vibration when the pot/trap is being retrieved by the fishers, it can scurry out through the escape gap. This has the advantage that the smaller crab exits back into the environment in which it has been living in. Crabs are sensitive to their surrounding and often do not do well when removed from familiar, nurturing surroundings.

Escape gaps are compulsory in many countries to ensure the survival of the species. The escape gaps are normally holes in the lower wall section of a pot/trap. Escape gaps come in all shapes and sizes. The dimensions of the gaps are based on the minimum size limit fisheries managers recommend for a particular crab species. Crabs are measured from left to right across the greatest distance of their carapace (back shell). The escape gaps (ridged holes in the pots) are then designed to allow crabs having a smaller size than the minimum size limit to escape. Presently there is no minimum size limit for Blue Swimming Crabs in Southeast Sulawesi. MMAF, with the help of IMACS, is working to establish what size crabs should be taken and what size should remain in the sea. The recommended size limit on Blue Swimming Crabs will be established jointly by the Provincial and District DKP Southeast Sulawesi in the next 2 months and used as the basis for designing the most appropriate escape gaps. However, the need for escape gaps already exists and would likely be supported by most crab fishers today as it saves time and effort in sorting the catch and most fishermen want the tiny crabs to survive and grow to market size.

B. PURPOSE OF ACTIVITY

The objective of the grant activity is to develop the most appropriate pot/trap escape gaps for the Blue Swimming Crab Fishery in Southeast Sulawesi. The determination of the configuration and shape of the escape gap is up to the grantee but should be scientifically sound and validated. One approach would be to test a variety of escape
gaps in a set number of pots/traps mixed up together in a variety of fishing areas. Once an optimum design is arrived, it will be necessary to socialize the benefits of using crab pot/traps with escape gaps with crab fishers in Southeast Sulawesi. Fishers need to be in agreement that it is better and less work for them to allow the crabs to escape before being hauled aboard their boat, and that escape gaps are good for the Blue Swimming Crab industry. Additionally, fishers need to support the government by applying pressure on all fishermen to abide by the escape gap regulation. This will involve a joint public awareness and training program.

C. TARGET

The goals of the grant activity is:

- Finding a prototype of crab pots are more selective to ensure the sustainability of the stock and production of blue swimming crab in Southeast Sulawesi
- Giving a solution to the lack of knowledge and lack of political pressure to stop depleting the blue swimming crab stock that can be a reference for policy making and regulation of blue swimming crab fisheries in Southeast Sulawesi.
- Restoring and enhancing the productivity of ecosystem and crab fisheries to food and economic security.

D. SCOPE OF ACTIVITIES

The scope of research activities that selectively crab pot in three districts include:

a) the preparation phase
   - Identify the target or blue swimming crab production centers in the Southeast through the Department of Marine and Fisheries of Southeast Sulawesi, information and research results and trading activities crab.
   - Coordination with DKP each district target areas for implementation of the research.
   - Preparation Team.

b) Implementation Phase:
   - Activity Focus Group Discussion (FGD)
     This activity is intended to promote directly to the crab fishing community purpose implementation of these activities, as well as to obtain information from the real crab fishermen on the fishing conditions in their respective regions
   - Coordination with the Department and and extension of each study area
   - Construction of 105 units and 210 units codend trap net for study activities.
   - Implementation of studies / trials in three districts namely Konawe in Toronipa Village, South Konawe in the Torokeku village, and in the Village Waemputtang Bombana. At each study site posted 3 series totaling 52 units crab pot. Each series consists of 17 or 18 units of traps each consisting of 6 units escape vent size 4.0 cm x 3.5 cm; 4.5 cm x 3.5 cm and 5.0 cm x 35 cm.
   - Dissemination of study results
This activity is carried out in three districts by inviting crab fishing community, collectors and the Department of Marine and Fisheries of the local district. This activity aims to convey important information study shows that the escape vent size recommended based on the results of a study that is 5.0 x 3.5 cm.

- Construction of 900 units of crab pot that have had escape vent with the recommended size of the study.
- Creation and operation training fishing gear crab pot in 6 locations.
- Dissemination and Publication on TVRI activities in Southeast Sulawesi and Kendari Pos.

II. IMPLEMENTATION METHOD

A. LOCATION AND TIME ACTIVITY

Research activities are selective blue swimming crab pot was conducted in three districts in the Southeast Sulawesi namely Konawe concentration in Toronipa villages Soropia Subdistrict, South Konawe concentrated in the Torokeku Village Tinanggea Subdistrict, Bombana concentrated in Waemputtang village South Poleang Sub District of. This activity lasted for six months, starting from November 29, 2013 until May 15 2014. Stages For more details of these activities are presented in the following table:

Table 1. Activity, Time and Tempat Implementation

<table>
<thead>
<tr>
<th>No</th>
<th>Activity</th>
<th>time</th>
<th>place</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Focus Group Discussion</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Toronipa Village (Konawe)</td>
<td>9 Nov. 2014</td>
<td>Fisherman home</td>
</tr>
<tr>
<td></td>
<td>b. Torokeku Village (South Konawe)</td>
<td>16 Nov. 2014</td>
<td>Headman home</td>
</tr>
<tr>
<td></td>
<td>c. Waemputtang Village (Bombana)</td>
<td>17 Nov. 2014</td>
<td>Fisherman home</td>
</tr>
<tr>
<td>2</td>
<td>Preparation of 105 units crab pot and 210 units codend net</td>
<td>1 Jan-20 Feb 2014</td>
<td>Makassar South Sulawesi</td>
</tr>
<tr>
<td>3</td>
<td>Implementation Study of Selective fishing gear crab pot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Torokeku Village</td>
<td>25 Feb – 2 March. 2014</td>
<td>Torokeku coastal</td>
</tr>
<tr>
<td></td>
<td>c. Waemputtang Village</td>
<td>26 Feb – 3 March. 2014</td>
<td>waemputtang coastal</td>
</tr>
<tr>
<td>4</td>
<td>Socialization Study Results</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Toronipa Village</td>
<td>5 Maret 2014</td>
<td>headman office</td>
</tr>
<tr>
<td></td>
<td>b. Torokeku Village</td>
<td>7 Maret 2014</td>
<td>Fisherman home</td>
</tr>
<tr>
<td></td>
<td>c. Waemputtang Village</td>
<td>6 Maret 2014</td>
<td>headman office</td>
</tr>
<tr>
<td>5</td>
<td>Construction 900 units of crab pot and escape vent</td>
<td>5 – 29 Maret 2014</td>
<td>Makassar Soth Sulawesi and CV. Mitra Bahari office (Kendari)</td>
</tr>
<tr>
<td>6</td>
<td>Training in the 6 location at once delivery 900 units crab pot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Toronipa Village</td>
<td>18 April 2014</td>
<td>headman office</td>
</tr>
</tbody>
</table>
b. Bungku Toko Village (Kendari city) 18 April 2014 headman office

c. Lakara Village (South konawe) 19 April 2014 Fisherman home

d. Torokeku Village 19 April 2014 Fisherman home

e. Lampopala village (Bomabana) 20 April 2014 Fisherman home

f. Waemputtang Village 21 April 2014 headman office

Socialization and publications
a. Local television (TVRI Kendari) 30 April 2014 TVRI Kendari

b. Local daily newspaper 19 May 2014 Kendari

B. MATERIALS AND EQUIPMENT

Materials and tools are supporting the successful implementation of the program starting from the stage of socialization through the FGD to the training activities. In general, the tools and materials used in the program is as follows:

Table 2. Materials dan Equipment and its usefulness

<table>
<thead>
<tr>
<th>No</th>
<th>Material and Equipment</th>
<th>Advantage and Usefulness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Crab pot</td>
<td>media studies</td>
</tr>
<tr>
<td>2</td>
<td>Motor boat</td>
<td>transportation to the fishing ground</td>
</tr>
<tr>
<td>3</td>
<td>receptacle box</td>
<td>Accommodates samples on a boat</td>
</tr>
<tr>
<td>4</td>
<td>Sample bag</td>
<td>sample container crab</td>
</tr>
<tr>
<td>5</td>
<td>Electronic scales</td>
<td>to know the weight of blue swimming crab</td>
</tr>
<tr>
<td>6</td>
<td>Caliper</td>
<td>to measure the length and width of the Blue swimming crab</td>
</tr>
<tr>
<td>7</td>
<td>Set snorkeling</td>
<td>for underwater observations</td>
</tr>
<tr>
<td>8</td>
<td>Thermometer</td>
<td>to measure the water temperature</td>
</tr>
<tr>
<td>9</td>
<td>Refractometer</td>
<td>measured levels of waters salinity</td>
</tr>
<tr>
<td>10</td>
<td>Flowmeter</td>
<td>to measure the speed of water flow</td>
</tr>
<tr>
<td>11</td>
<td>Sechi dish</td>
<td>to measure the brightness waters</td>
</tr>
<tr>
<td>12</td>
<td>pH meter</td>
<td>to measuring the levels of acid and alkaline waters</td>
</tr>
<tr>
<td>13</td>
<td>Tide palm</td>
<td>to taking the waters substrate</td>
</tr>
<tr>
<td>14</td>
<td>DO meter</td>
<td>to measure the oxygen content in the water</td>
</tr>
<tr>
<td>15</td>
<td>Camera/under water camera</td>
<td>documentation of activities</td>
</tr>
<tr>
<td>16</td>
<td>Stationery</td>
<td>to writing observations and measurements in the field</td>
</tr>
<tr>
<td>17</td>
<td>T ropes</td>
<td>to binding codend on body traps</td>
</tr>
<tr>
<td>18</td>
<td>paper labels</td>
<td>to marking sample</td>
</tr>
<tr>
<td>19</td>
<td>Bait</td>
<td>to Attract the attention of blue swimming crab</td>
</tr>
<tr>
<td>20</td>
<td>Infokus</td>
<td>Tools for percentage</td>
</tr>
<tr>
<td>21</td>
<td>Pliers</td>
<td>to cut and bend the metal</td>
</tr>
<tr>
<td>22</td>
<td>Scissors</td>
<td>Cutting the nets</td>
</tr>
<tr>
<td>23</td>
<td>Hammer</td>
<td>Helped make the escape vent mall</td>
</tr>
<tr>
<td>24</td>
<td>Concrete steel 6&quot;</td>
<td>The basic ingredients of the pot framework</td>
</tr>
<tr>
<td>25</td>
<td>Concrete steel 4&quot;</td>
<td>Materials escape vent</td>
</tr>
<tr>
<td>26</td>
<td>Knitter (Sojo)</td>
<td>Knitting escape vent hole</td>
</tr>
<tr>
<td>27</td>
<td>sewing thread</td>
<td>materials knitter</td>
</tr>
</tbody>
</table>

C. DESCRIPTION OF STUDY AREA/FISHING GROUND

The third area of study as mentioned above is blue swimming crab spread area has been identified in advance with the appropriate type of crab habitat, which is described as
follows:

1. The Waters of Toronipa
   Toronipa is a village that stretches along the coast with beach vegetation such as palm trees and just a little overgrown by mangrove trees. The type of Toronipa coast is sloping coastal with the base substrate is dominated by sand. Waters of the Toronipa is the open waters that directly facing of the Banda Sea. The fishing ground of blue swimming crabs is along the coast of Toronipa that consist of coral reef and seagrass ecosystems as habitat of blue swimming crab. Coral reef ecosystem in this area dominated by hard corral life as massive and sub-massive, while the seagrass type is dominated by *Enhalus acoroides*. The depth of water at the fishing ground ranges from 0.5 m up to 3 m at high tide. The distance of fishing base close enough to the fishing ground approximately 100 up to 500 m so that the fisherman have mostly using a rowboat only.

2. The Waters of Torokeku
   Torokeku is the village where all the people are live on the surface of the sea water. This is due to the pattern of life such as local tribes who inhabit the "bajo tribe". The village is located precisely on the shore with the dominant vegetation in the form of extensive mangrove trees. In the east side of the village there is found big river thus allowing dominant mangrove trees grow in this area. Northern of the village there are found several milkfish ponds that have not functioning. The substrate fishing ground of blue swimming crab consists of silty sand composition, while the watershed area substrates such as mud and its surrounding of this area there have seaweed farming activities. Its surrounding blue swimming crab fishing grounds have found also coral reefs and seagrass ecosystems with an average water depth of 1 till 4 m. The distance between the residential communities with blue swimming crab fishing ground approximately 100 m to 1 km from the village, so as to achieve a more distant fishing grounds required a motorized boat.

3. The Waters of Waemputtang
   Waemputtang is one of the coastal villages with open water types and geographically located in the southeast of the Gulf of Bone. Blue Swimming Crab fishing ground in this area has located along the coastal with depths ranging from 2-4 m. The distance between residential areas with blue swimming crab fishing ground is less than 500 meters up to 1 kilometer from the village and can be reached by approximately 5 (five) minutes by boat motors. Along of Waemputtang coastal have overgrown mangrove forest and found underground freshwater flow that appear around the coast area that contained in the south of this village. The substrate of Waemputtang waters are consists of muddy sand composition. The fishing ground of blue swimming crab mostly have covered seagrass ecosystems as habitat for blue swimming crabs. Seagrass bed in this area is dominated by *Enhalus acoroides*.

Generally, blue swimming crab habitat in the three fishing areas are suitable habitat which have sandy substrate, muddy sand composition. As it has been known that crabs living in estuarine waters area and then migrate in the waters with higher salinity (deeper areas) to incubate the eggs, then after reaching the young blue swimming crabs will return to the estuaries.
III. RESULT AND DISCUSSION

A. FOCUS GROUP DISCUSSION (FGD)

The aim of this FGD is (a) identify the problems of fishermen and aquatic environments; (b) accommodate the expectations and needs of fishermen in maintaining and developing blue swimming crab fishing effort; (c) obtain information about the size of blue swimming crab from the fisherman who should be caught (4-6 ind/ kg); and (d) introduce a prototype design collapsible crab pot environmentally friendly fishing gear to achieve sustainable blue swimming crab fisheries.

This FGD have obtained a variety of issues, there are crabs catch continue to decrease and the size of the crab caught become smaller. The most concerning situation occurred in waters of Soropia, Konawe, in which fishermen have caught crab with minimum biomass which is 2-3 kg / trip (1 trip = 2-3 days). The catch biomass has the size 5-8 ind / kg and 15-20 ind / kg. The second indications of those size show that the population of blue swimming crab in the waters surrounding Soropia has shown over-exploitation. In the waters of Torokeku, Tinanggea, South Konawe and Waemputang, South Poleang, Bombana also has problems but in different aspects. Torokeku fishermen has caught blue swimming crab farther from habitat before, while fisherman in Waemputang have caught the blue swimming crabs with gill nets (mesh size 4 inch). The fishermen in the both region have realized that the amount of blue swimming crab caught more and more reduced.

In the implementation of the FGD also obtained information that the fishermen have wanted to catch blue swimming crab that sized 4-6 ind / kg. It is also recommended by crabs collectors to fishermen of blue swimming crab in order to catch only adult crabs, while the medium, small-sized, and the mature blue swimming crab were released at waters. Thus, the application of the crab pot prototype is expected with the fishermen desire.

The participants on the FGD activities are fishermen and blue swimming crab local collectors. In the FGD obtained information as follows:

- That the number of fishermen catch is fewer and fewer and the size is smaller along with the time.
• Limited financial owned by fishermen to purchase fishing gear ie pot crab and gill nets.
• Fishermen receive a prototype design of fishing gear (collapsible pot) for blue swimming crab using the escape vent on each pot
• Fishermen asked the Local Government (Department of Marine and Fisheries cq.) to assist procurement collapsible pot crab

B. SELECTIVITY STUDY OF CRAB POT

The Study of size selectivity of crab catch aims was to obtain the optimum size of escape vents that were caught in pots only measuring ≥ 10 cm. The results of these activities are expected to provide a solution to the problem of blue swimming crab fishery and crab fisheries stakeholder, there are :

• For crab resource:
  – Provide the opportunity to live and breed for blue swimming crabs to experience at least one to two times are production before being caught.
  – Maintaining the presence of blue swimming crab stocks in nature under conditions sustainable to be harvest

• For fishermen and blue swimming crab colector (mini-processing plant):
  – Maintaining continuity blue swimming crab business
  – Improving the quality of income and revenue assurance fishermen with larger size of crabs.
  – The blue swimming processing activites have been faster and efficient cost.

• For the government:
  – Assist governments in solving the problem of declining blue swimming crab production.
  – The size of the escape vent gap that recommended of blue swimming crab can be set by the regional regulation binding and enforceable.

The results of trials using 102 units of collapsible pot crab at three locations blue swimming crab fishing grounds in the Southeast Sulawesi to test the escape vent size selectivity of the three described below. In this selectivity study, examined the structure of crab carapace widths are caught in pots (retained) and the codend (escape) (Figure 2).
• Catch Size Composition

Figure 2. Composition crab carapace width were stuck in the trap (blue bars) and in the codend net (red bars) based on the escape vent size: 4.0 cm x 3.5 cm (top), 4.5 cm x 3, 5 cm (middle) and 5.0 cm x 3.5 cm (bottom)
• Selectivity of Escape Vent

The data of blue swimming crab are caught in pot crab (retained) and the codend (escape) respectively grouped by size class carapaces width. Each individual blue swimming crab grouped in each class then calculated the amount of carapaces width. Based on the number of crab in pots and codend in each group can be estimated carapaces width magnitude L25%, L50% and L75% and the coefficient of selection factors every escape vent size (Tables 3, 4 and 5). The data in Table 3, 4 and 5 respectively obtained crab carapaces width midpoint then plotted against the number of crab pts suspended in the crab pot (retained) by the escape vent size. The results of plot obtained sigmoid curve depicting "ogif gear selection in the size of escape vents pot" (Fig. 3, 4 and 5).

Tabel 3. Estimated ogif blue swimming crab gear selection using a collapsible pot with escape vent size of 4.0 cm x 3.5 cm were given codend

<table>
<thead>
<tr>
<th>Interval Carapace width (cm)</th>
<th>Suspended In Bubu (Ind.)</th>
<th>Suspended In Codend (Ind.)</th>
<th>Total amount (Ind.)</th>
<th>L25%</th>
<th>L50%</th>
<th>L75%</th>
<th>Intercept</th>
<th>Slope</th>
<th>SL est</th>
</tr>
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<tbody>
<tr>
<td>2-3</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>2,5</td>
<td>0,02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>3,5</td>
<td>0,04</td>
<td></td>
<td></td>
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<tr>
<td>4-5</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>4,5</td>
<td>0,07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-6</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>5,5</td>
<td>0,12</td>
<td></td>
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</tr>
<tr>
<td>6-7</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>-</td>
<td>6,6</td>
<td>0,21</td>
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<td>7-8</td>
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<td>7</td>
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<td>-0,91629</td>
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<td>0,46</td>
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<td>9-10</td>
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<td>10</td>
<td>15</td>
<td>0,3333</td>
<td>0,69315</td>
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<td>10</td>
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<td>-0,40547</td>
<td>10,5</td>
<td>0,75</td>
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<td>14</td>
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<td>0,85</td>
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<td>0</td>
<td>4</td>
<td>1</td>
<td>-</td>
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<tr>
<td>13-14</td>
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<td>0</td>
<td>-</td>
<td>-</td>
<td>13,5</td>
<td>0,95</td>
<td></td>
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<tr>
<td>14-15</td>
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<td>1</td>
<td>-</td>
<td>-</td>
<td>14,5</td>
<td>0,97</td>
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</table>

Intercept = a = S1 = 5,4854 - slope = b = S2 = 0,6272
L25% = (S1-ln3)/S2 = 6,99
L50% = S1/S2 = 8,75
L75% = (S1+ln3)/S2 = 10,50
SL est = 1/(1+exp(a-b*L))
SF= L50%/escape vent width = 2,1863
Figure 3. The Ogif of blue swimming crab fishing gear selection using a collapsible pot with escape vent size of 4.0 cm x 3.5 cm

Table 4. Estimated ogif blue swimming crab gear selection using a collapsible pot with escape vent size of 4.5 cm x 3.5 cm were given codend

<table>
<thead>
<tr>
<th>Interval Carapace width (cm)</th>
<th>Suspended In Bubu (Ind.)</th>
<th>Suspended In Codend (Ind.)</th>
<th>Total amount (Ind.)</th>
<th>Part retained SL obs</th>
<th>In(1/SL-1) (y)</th>
<th>Mid point (L1+L2)/2 (x)</th>
<th>Part retained SL est</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>4.50</td>
<td>0.19</td>
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<td>5-6</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>-</td>
<td>5.50</td>
<td>0.24</td>
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<tr>
<td>6-7</td>
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<td>0.30</td>
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<tr>
<td>7-8</td>
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<td>10</td>
<td>18</td>
<td>0.44444</td>
<td>0.22314</td>
<td>7.50</td>
<td>0.37</td>
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<td>8.50</td>
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<td>-</td>
<td>11.50</td>
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<td>1</td>
<td>-</td>
<td>12.50</td>
<td>0.73</td>
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intercept = a = S1 = 2,8491
slope = -b = S2 = 0.3077
L25% = (S1-ln3)/S2 = 5.69
L50% = S1/S2 = 9.26
L75% = (S1+ln3)/S2 = 12.83

SL est = 1/(1+exp(a-b*L))

SF = L50%/escape vent width = 2.0575
Figure 4. The Ogif of blue swimming crab fishing gear selection using a collapsible pot with escape vent size of 4.5 cm x 3.5 cm

Table 5. Estimated ogif blue swimming crab gear selection using a collapsible pot with escape vent size of 5.0 cm x 3.5 cm were given codend

<table>
<thead>
<tr>
<th>Interval Carapace width (cm)</th>
<th>Suspended ln Bubu (Ind.)</th>
<th>Suspended ln Codend (Ind.)</th>
<th>Total amount (Ind.)</th>
<th>Part retained SL obs</th>
<th>ln(1/SL-1) (y)</th>
<th>Mid point (L1+L2)/2 (x)</th>
<th>Part retained SL est</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5</td>
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<td>0</td>
<td>-</td>
<td>4,5</td>
<td>0,02</td>
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<tr>
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<td>3</td>
<td>0</td>
<td>-</td>
<td>5,5</td>
<td>0,04</td>
</tr>
<tr>
<td>6-7</td>
<td>0</td>
<td>6</td>
<td>6</td>
<td>0</td>
<td>-</td>
<td>6,5</td>
<td>0,06</td>
</tr>
<tr>
<td>7-8</td>
<td>0</td>
<td>11</td>
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<td>7,5</td>
<td>0,11</td>
</tr>
<tr>
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<td>13</td>
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<td>1,203973</td>
<td>8,5</td>
<td>0,20</td>
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<td>0,23529</td>
<td>1,178655</td>
<td>9,5</td>
<td>0,31</td>
</tr>
<tr>
<td>10-11</td>
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<td>6</td>
<td>12</td>
<td>0,5</td>
<td>0</td>
<td>10,5</td>
<td>0,46</td>
</tr>
<tr>
<td>11-12</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>0,625</td>
<td>0,510826</td>
<td>11,5</td>
<td>0,62</td>
</tr>
<tr>
<td>12-13</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>-</td>
<td>12,5</td>
<td>0,75</td>
</tr>
<tr>
<td>13-14</td>
<td>0</td>
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<td>0</td>
<td>-</td>
<td>-</td>
<td>13,5</td>
<td>0,85</td>
</tr>
<tr>
<td>14-15</td>
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<td>1</td>
<td>1</td>
<td>-</td>
<td>14,5</td>
<td>0,92</td>
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</table>

Intercept = a = S1 = 6,7910  - Slope = -b = S2 = 0,6323
L25% = (S1-ln3)/S2= 9,00  SL est = 1/(1+exp(a-b*L))
L50% = S1/S2 = 10,74
L75% = (S1+ln3)/S2 = 12,48  SF = L50%/ escape vent width = 2,1480
Based on the graph in Figure 3, 4 and 5 it is known that the value of the width which is retained in the pots by 50% (L50%) and the magnitude of the selection factor (SF) of each of the escape vent size are presented in Table 6 as follows:

Table 6. The value of some parameters of the selectivity of each of the escape vent size.

<table>
<thead>
<tr>
<th>No.</th>
<th>Escape Vent Size</th>
<th>L25%</th>
<th>L50%</th>
<th>L75%</th>
<th>Selection Range (cm)</th>
<th>Selection factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>4,0 cm x 3,5 cm</td>
<td>6,99</td>
<td>8,75</td>
<td>10,5</td>
<td>3,51</td>
<td>2,1863</td>
</tr>
<tr>
<td>2.</td>
<td>4,5 cm x 3,5 cm</td>
<td>5,69</td>
<td>9,26</td>
<td>12,83</td>
<td>7,14</td>
<td>2,0575</td>
</tr>
<tr>
<td>3.</td>
<td>5,0 cm x 3,5 cm</td>
<td>9,00</td>
<td>10,74</td>
<td>12,48</td>
<td>3,48</td>
<td>2,1480</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2,1306</td>
</tr>
</tbody>
</table>

Blue swimming crab that caught in all waters test site locations have begun carapaces width size interval 2-3 cm to 14-15 cm, although the number of crabs caught on the size is very small intervals (Figure 2 and Table 3, 4 and 5). There are many blue swimming crab caught in carapaces width interval 7-8 cm to 11-12 cm. These data indicate that the crab in the waters of Southeast Sulawesi in January-February still belongs to the category of young crabs (juvenile - adult: 7-8 cm) to the category of young adult (adult - mature) with a carapace width of up to 11 cm. Blue swimming crab adult (mature, the carapace width> 11 cm) found very few in number. The results of the analysis of data obtained in trials collapsible pot with 3 escape vent sizes showed two important phenomena, that is:

1) That the blue swimming crabs in these waters are still relatively juvenile (juvenile - adult) around September to February. Blue swimming crab relatively mature when

Figure 5. The Ogif of blue swimming crab fishing gear selection using a collapsible pot with escape vent size of 5.0 cm x 3.5 cm
carapaces width reaches 7-8 cm and an estimated age of about 6 months. With the
countdown starting in February (while testing done) then the crab growth reaching
8 cm is the case since September last year (2013). This analysis shows that if the
population were of the same stock population is predicted to occur then the season
nurseries around the September. The size of the young-adult with a carapaces width
of 11 cm can be achieved after about 9 months old. Thus, if the crab population
derived from the same stock size ≥ 10 cm carapaces width will be reached sometime
in April (2014).

(2) The results of the data analysis also indicate that the category of young-adult blue
swimming crabs (carapaces width of up to 11 cm) occupies the top position. If that is
allowed to be caught only sized ≥ 10 cm, then we have to give a chance to the
young-adult blue swimming crabs to reproduce so that the crab population is stable
(sustainable). Data lifecycle blue swimming crabs reach maturity 2-3 years it is
predicted that crabs have a chance to reproduce 2-3 times. Blue swimming crabs
start reproducing after reaching a carapaces width of about 10 cm.

This analysis is in line with the recommendations Indonesian Crab Processing
Association (APRI) that the blue swimming crab is received by the supplier (mini-
processing plant) has only carapaces width ≥ 10 cm.

![Figure 6. Hauling Process Photos of the collapsible crab pot from the waters after being installed on fishing ground in the Village](image)

![Figure 7. The Photo of width measurement process of blue swimming crab are catch in crab pot or codend in the Village Toronipa](image)
The results of data analysis blue swimming crab caught with collapsible pot 3 escape vent size (4.0 cm x 3.5 cm, 4.5 cm x 3.5 cm, and 5.0 cm x 3.5 cm) obtained sigmoid curves (Fig. 3, 4 and 5) shows that the blue swimming crab fraction retained in crab pot with a chance of 50% (L50%) is ideal and qualified to maintain the blue swimming crab population is when the escape vent size are used 5.0 cm x 3.5 cm (L50% = 10.74 cm). The results of this analysis are relatively similar to that imposed by Philippines Government to fisherman (supplier) and mini plant processing, which is captured allowed > 10.16 cm (weight range 120-130 g) (La Sara, 2014; Sustainable Fisheries Partnership, 2011).

The results of the study in Philippines shows that the average size adult (size of maturity) for females and males each 10.56 cm 9.64 cm (Ingles and Braum 1998; Ingles 1996). Kumar, et al (2000) state that, male and female blue swimming crab in the waters of Australia generally achieve size a maturity at a carapace width 70 mm - 90 mm. On the size of blue swimming crab on the size of about one year old. Nevertheless, on the waters that already high ecological pressure it happen changes the width of the carapace reaches adult, for example, found that female blue swimming crabs 5 month old already have a eggs (berried female) in the waters of the Philippines (Bureau of Fisheries and Aquatic Resources, na).

The results of the data analysis L50% (mainly on the size escape vent 5.0 cm x 3.5 cm) of very rational to applied of aspects sustainability blue swimming crab population and fishing effort is done fishermen to supply mini plant processing. L25% on all the escape vent size is not recommended because it is not profitable for the fishermen, even though for in the interests of sustainability blue swimming crab population it is very good. In contrast, L75% on all the escape vent size is also not recommended because carapace width size fraction restrained in the crab pot minimum 10.5 cm (escape vent size 4.0 cm x 3.5 cm). Approximately 75% the carapace width size of blue swimming crab restrained in the crab pot it including adult category so that opportunities blue swimming crab that exist in nature on the size of the adult to reproduce maintain the population becomes smaller. Among all the fractions value it of all the escape vent size then the most ideal and rational recommended is L50% in the escape vent size 5.0 cm x 3.5 cm.

This recommendation has met in sustaining elements: (1) the sustainability of blue swimming crab populations in nature, (2) the livelihoods of fishermen (still available), (3) supply the blue swimming crab to mini plant processing is secure, profitable because efficient in terms of time and cost, and (4) the requirements set by the importing countries blue swimming crab meat.

C. THE SOCIALIZATION OF THE RESULTS OF SELECTIVITY STUDY OF COLLAPSIBLE CRAB POTS

Based on the result of pilot test data by using the analyzed "the gear selection ogive" (ogif gear selection) using 3 escape vent size so it's recommended that crab pot with escape vent size of 5.0 cm x 3.0 cm is used fisherman blue swimming crab fisherman because the value L50% = 10.74 cm, which means that the size of the carapace width of 10.74 cm have a chance of getting caught with crab pot it by 50%. Previously (APRI) has recommended supplier did not accept the blue swimming crabs with a carapace width of <10 cm in order to provide an opportunity blue swimming crab to breed before being captured.
These recommendations are disseminated to the blue swimming crab fishermen, especially in fishing gear test site crab pot (Toronipa-Konawe, Torokeku-South Konawe and Waemputtang-Bombana), the areas become blue swimming crab landing station, and the Department of Marine and Fisheries officers each of the area. Local Government is expected soon to follow through on these recommendations.

The purpose of this socialization is as follows:

- Information delivering to the blue swimming crab fishermen, supplier (mini plant), Local Government and DKP each district that the escape vent size of 5.0 cm x 3.0 cm on each crab pot is selective fishing gear.
- Encourage the participation of fishermen using selective fishing gear these recommendations.
- Supplier (mini plant) does not accept the blue swimming crab with a carapace width < 10 cm from the fishermen.
- Ask for support of the Department of Marine and Fisheries district or province to follow up on these recommendations becomes regulations to apply all in waters southeast Sulawesi.

In this socialization Ir. Halili, M.Sc. convey the material through a power point about trade issues blue swimming crab, general issues of blue swimming fishery, threats and hazards to blue swimming crab resources because over-exploitation (declining crab population is characterized by increasingly smaller sizes caught, the amount of fishing gear the more while little catches, distance arrest the farther), APRI consensus (12 large companies blue swimming crab industrial) that catches blue swimming crab may be traded with carapaces width $\geq$ 10 cm; and recommendations escape vent size of 50 mm x 35 mm of crab pot. In this sosialisasi also invites all fishermen and interested parties to work together realize a sustainable of blue swimming crab resource using the recommended gear and release back to the sea to blue swimming crabs females are laying.
Resource persons also said that the current fishermen catch size to blue swimming crab of <10 cm are not purchased by the company. Thus, the fishermen would incur a loss (cost, time and effort). Also submitted to the fishermen who were present that initially catches by fishing gear is getting amount of blue swimming crab very little and even while not getting results, but fishermen are encouraged to be patient long most 2-3 months, so the blue swimming crab escape through escape vent will be caught again after the blue swimming crab grows larger with biomass (weight) is high. Advantages blue swimming crab catching large size although the amount of individuals slightly is higher weight and more importantly is the blue swimming crab which caught the received to company with high price relatively.

Secretary of the Department Marine and Fisheries South Konawe appreciation to implementing the IMACS especially because it does not directly have taken some tasks DKP in order to use the selective fishing gear in an effort improve the welfare of blue swimming crab fishermen. Next was that anything was do the research team supported by the IMACS will not have impact on the population of blue swimming crab if fishermen does not have consciousness collective to the protect of populations blue swimming crab in nature by applying crab pot to blue swimming crab that has escape vent (escape vent) and release to blue swimming crab eggs cradling. It also submitted that the DKP will discuss internally to support the post activities of IMACS this through a policy for the use of fishing gear blue swimming crab pot can be socialized and applied in other areas as a whole in South Konawe.

General fisheries instructor provides direction and appeals to support efforts by IMACS in preserving blue swimming crab resources to improve the welfare of fishermen. Fishing instructor in Waemputang (Bombana) suggest further research on crab feed, while fishing instructor in Toronipa (Konawe) expects continued guidance and assistance by a team researchers to evaluate the development use of crab pot selective by fishermen.

General government sub-district / village supports all policies on management catching to sustainably blue swimming crab in order to catching activities to blue swimming crab can be do continuously. Village officials and blue swimming crab fishermen community is ready to support conservation efforts to protect some areas of seagrass beds as a habitat for blue swimming crab with a fixed receive guidance from college teams.

Through this socialization occur discussion where fishermen in Toronipa and Torokeku which previously had to use crap pot were delighted with the 300 units of crap pot that they will be getting, while fishermen in Waemputtang village formerly using nets in catching blue swimming crab pessimistic feel with crap pot gear. However, as a first step they are still using nets while operate crap pot that have escape venr from the IMACS. They also proposed that every fisherman obtain 50 units of crap pot, because if 300 units crap pot divided in 10 fishermen then each only received 30 units. The amount is too small and inefficient. However, by the local government will regulate the distribution of crap pot fishing gear by giving two options whether to cycle or divided equally. Basically all fishermen to support this activity and would operate fishing gear crap pot that have escape vent.
The important point of these study socialization activities is delivered information as follow:

- Based on the research/trial obtained escape vent size 5.0 cm x 3.5 cm.
- Prototype gear crab pot using the escape vent was well received by fishermen and ready to operate if the crab pot are available or provided by local government.
- Department of Marine and Fisheries through the fisheries instructor in each region support IMACS efforts to preserve blue swimming crab resources through the use of selective fishing gear.

D. FINAL DESIGN RECOMMENDATION OF COLLAPSIBLE CRAB POT

Final design of collapsible crab pot (final draft of blue swimming crab pot recommendation) were determined after data blue swimming crab pot catches by the escape vent finished analysis with "gear selection ogive". Based on the analysis of data it is the escape vent size recommended is ideal and rational use of fishermen is 5.0 cm x 3.5 cm for the escape vent size has L50% = 10.74 cm. This means that the blue swimming crab are caught in crab pot (retained) by 50% in sized ≥ 10.74 cm. Picture design of blue swimming crab pot recommendation to be operated fishermen are presented in Figure 9.

![Figure 9. final design of blue swimming crab pot recommended](image)

The main dimensions of the crab pot are:

- **Length** = 44 cm
- **Width** = 30 cm
- **Height** = 17 cm
- **Escape vent Size** = 50 x 35 mm

Final design Collapsible pot recommended is a Collapsible pot rectangular box-shaped, consisting a crab pot frame of concrete iron and walls of the crab pot is polyethylene nets. The escape vent is a narrow slit lengthwise on both sides the box is shorter. When mounted crab pot frame enforced with glue and linking fastening two metal frame into the center pole crab pot and reverse when not in use the crab pot are fold back by releasing the latch. Two a a escape vent of iron reinforcing materials each mounted on the bottom wall of the left and right crab pot.

- **Iron Frame Component**
  When described the components of the frame to crab pot consist of 11 (eleven) pieces of concrete iron curved and assembled by each hooking the tip of the iron on the other
iron. Details each section blue swimming crab pot recommendation is presented in Figure 12. Material for the frame used in the manufacture of blue swimming crab pot recommendation is stainless white iron. This material can last up to one year if the treatment is done after each arrest. The use of white iron for the manufacture of blue swimming crab pot recommendations that are collapsible, there are two kinds of diameter, is a diameter of 4 mm white iron (trade number is 8) and a diameter of 3 mm (trade number is 12). The size of each part of the frame of blue swimming crab pot recommendation is as follows:

- 1 piece of round iron pedestal using concrete iron Ø 4 cm along 145 mm in arch form a rectangle sized 44 x 30 cm with arch two small circular in the middle of both sides of length as the associate frame others component.
- 1 piece elongated iron using concrete iron Ø 4 mm at base a length of 50 cm using concrete iron Ø 4 mm. Both ends attached to the base frame.
- 1 piece of iron widens using concrete iron Ø 4 mm at base a length of 40 cm using concrete iron Ø 4 mm. Both ends attached to the base frame.
- 2 pieces of iron sloping using concrete iron Ø 4 mm with a length each of 90 cm curved U-shaped (wide field curvature is 30 x 26 cm). Both ends of the iron attached to the base frame.
- 2 pieces of upright frame using concrete iron Ø 4 mm with a length each of 70 cm curved U-shaped (wide field curvature is 30 x 17 cm). Both ends of the iron attached to the base frame.
- 1 piece hook bait using concrete iron Ø 3 mm with a length of 35 cm, pairs at in the middle of the crap pot by linking both ends the bone widens at base and a upright frame.
- 1 piece hook door (locker) using concrete iron Ø 3 mm with a length of 25 cm, mounted on a upright frame.
- 2 pieces of the escape vent using concrete iron Ø 2 mm with a length of material 16 cm curved U-shaped (wide field curvature of 5.0 x 3.5 cm)

<table>
<thead>
<tr>
<th>Description</th>
<th><img src="image" alt="Diagram" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Base frame</td>
<td></td>
</tr>
<tr>
<td>b. elongated iron</td>
<td></td>
</tr>
<tr>
<td>c. Widens iron</td>
<td></td>
</tr>
<tr>
<td>d = 2 pieces of iron sloping left and right</td>
<td></td>
</tr>
<tr>
<td>e = 2 pieces of upright frame/iron</td>
<td></td>
</tr>
<tr>
<td>f = 1 piece hook bait</td>
<td></td>
</tr>
</tbody>
</table>
Intact Frame Components

Iron materials to producing the escape vent

Figure 10. Components Recommendations Blue Swimming Crab Pot Frame Before the Strung

- **Nets Wall Component**
  Crab pot wall made of polyethylene multifilament nets by color a dark green with a thread diameter is 1 mm. The mesh size of 3 cm (mesh fully stretched). On the condition of mesh attached maximum open, forming a square mesh size of 1.5 x 1.5 cm. The nets wall are covered crab pot consist of seven (7) pieces of nets, is:
  - 1 piece of nets size 70.5 x 30 cm or 47 x 20 eye. This net cover the crab pot base and sides of the bottom of the escape vent both.
  - 2 piece nets size of 33 x 30 cm or 22 x 20 eye. Each cover the upper half of the crab pot and the top side of the escape vent.
  - 4 pieces of net size 19.5 x 16.5 cm or 13 x 11 eye. Each covering half a wall left and right crab pot.

Figure 11. Components of Blue Swimming crab Recommendation Net
• **Escape Vent**
  
  – Escape vent size of 5.0 cm x 3.5 cm mounted on the left and right side of the crab pot. Position the escape vent the basic frame in place along is 5.0 cm and high is 3.5 cm.
  
  – Placement escape vent on the bottom of the crab pot (flush with the bottom side of crab pot so the blue swimming crab does not have to climb the wall) so that small blue swimming crabs out easily to escape through the escape vent.
  
  – Door placement is done in such a way so flexible when closing and opening the crab pot. A side of the escape vent is close to or coincide with a tilted side frame the crab pot, so as not to interfere when the crab pot perfectly folded.
  
  – Distance escape vent the escape vent on the other between 16-17 cm. This distance depends on the position of side of the tilted frame every crab pot are not exactly located because of the tip of iron meeting is flexible.
  
  – Distance escape vent at the top of the crab pot is 11 cm.

• **Ropes**
  
  Polyethylene multifilament ropes used in the operation of these blue swimming crab pot consist of 3 sizes based on their functions:
  
  – **The main rope - diameter of 4-5 mm.** which is the rope that connects a series of crab pot and the second end of the tie up buoys (as a sign). The size of main rope is adjustable to the number of blue swimming crab pot. The distance between the crab pot range 5-7 m. The difference the distance between the blue swimming crab pot is adjusted with during the process of fishing activities. The distance between the blue swimming crab pot used to fishermen around 7 -8 m with the intention that when setting crab pot are not dragged down by rate of the boat using the machine. Installation of blue swimming crab pot using the boat (without engine) then the distance between crab pot 5 m. Thus if using 20 units of blue swimming crab pot then the length of the main rope which is used about 100 m.
  
  – Branch Rope - dimater of 3 mm, ie rope is crab pot connecting with main rope. The crab pot each requires branch rope long is 50 cm. The position of branch rope (and blue swimming crab pot) with the main rope in the waters resembles longline nets. Needs of the branch rope on the main rope with 20 units of blue swimming crab pot approximately is 10 m.
  
  – Knitter Rope - diameter of 1 mm, namely ropes used to knitting or tie up the escape vent with crab pot body.

• **Construction of 900 units crab pot Recommendation**

  Blue swimming crab pot in the market currently in commercial production by industry or factory in South Sulawesi, Cirebon and Surabaya. The needs of crab pot in limited number can be easily purchased in fisheries store in Kendari or in several districts of the capital that has marine waters. But if buying in bulk (100-300 units) should be ordered in South Sulawesi or Cirebon which takes a relatively long time (usually 1-2 weeks). This order takes much longer if the dimension size blue swimming crab pot larger than
size dimensions blue swimming crab pot that have been marketed over the years. The price is more expensive.

The blue swimming crab pot procurement as many as 900 units ordered and made in Surabaya in accordance with the desired dimensions (Figure 12). The crab pot ordered does not have the escape vent. The escape vent on blue swimming crab pot made after arriving in Kendari (Figure 13). In the Figure 14, position shown of blue swimming crab pot at the time of operation to catch blue swimming crab and at the time folded. However, as a first step we convey to the manufacturer and merchants of crab pot that the future of all blue swimming crab pot created by the escape vent thus indirectly began to be introduced on the seller.

The process of making the escape vent starting with making "mold" sized is 5.0 cm x 3.5 cm in order to generate the escape vent uniform size. Escape vent made totaled 1,800 units (2 times the number of blue swimming crab pot). Blu swimming crab pot will be distributed to fishermen in the trials/studies that have escaped vent of crab pot, namely in Toronipa (Konawe), Torokeku (South Konawe) and Waeputtang (Bombana), each site totaling 300 units. It is expected that every fisherman at each location obtaining blue swimming crab pot is 30 units so that the number of fishermen can use this crab pot recommendation by 10 people, but if the number of fishermen more than 10 people, then the distribution of crab pot recommendations tailored to the usage time of the crab pot recommendation. Adjustment crab pot recommendation set in rotation according to the number of fishermen who are under the coordination of fisheries
instructor and placeholders of the blue swimming crab. According to the fishermen that the operation of blue swimming crab pot <30 units are inefficient, typically operational costs greater than revenues. In general, DKP district, village government and Fisheries instructor supports the use of this blue swimming crab pot recommendation.

Figure 14. A : The position Blue swimming crab pot Recommendations On Current Arrests. B: Blue swimming crab pot Recommendations When Using Folded (Collapsible)

In short the provision of blue swimming crab of 900 units including manufacturing escape vent is as follows:

1. Purchase of crab traps as many as 900 units
2. Repair parts crab traps that were damaged by the transport of the factory.
3. The determination of escape vents on either side of the crab traps.
4. Manufacture the "mold" as the escape vent size 5.0 cm x 3.5 cm so that the escape vent uniform.
5. Provision of iron wire and a frame diameter of 3 mm as the escape vent
6. Determine the length of wire or metal vent escape much as 1800 units.
7. Preparation escape vent
8. Installation and knitting escape vents on traps.

- **Data of Production Cost**
  - **Time of Production**

Making crab pot requires some specification work done by the team. If done individually will take a long time. The worker specifications include:

- Individuals who are responsible for cutting and propagation of iron as a framework of crab pot the number and size have been determined.
- Individuals are responsible for shaping each piece of iron into the basic framework.
- Individuals are responsible for stringing any metal that has been formed into order crab traps.
- Individuals are responsible for providing nets or cut to any size crab traps.
Individuals are responsible to install and bind nets in order to form small crab traps.

Individuals who are responsible for tidying and cleaning the pieces of netting.

Each job is handled with 1 person and in the completion of each unit of crab pot to be faster. Labor involved amounted to 6 people. The number of crab pot that can be completed each day ranges from 15-20 units crab pot. Because the manufacture of crab pot is done by labor groups that generally fishermen purchase crab pot are already ready because if done individually take a long time and production costs more expensive.

Making blue swimming crab pot is met from South Sulawesi and Surabaya Cirebon. Therefore in Kendari or other areas in the Southeast has been no circumstances that produce it then it becomes a new business opportunity by people develop their domestic industry of making blue swimming crab pot recommendation, especially if the Local Government requires the use of blue swimming crab pot this recommendation.

Materials And Needs Cost Producing crab pot

In general, the materials used in the producing the blue swimming crab pot recommendations are 3 kinds of, namely small iron wire, concrete iron and nets. Details of materials used per unit of blue swimming crab pot and production cost estimates are outlined in Table 7, Table 8 and Table 9.

<table>
<thead>
<tr>
<th>Crab pot recommendation Component</th>
<th>specification</th>
<th>cost Per Meter (IDR)</th>
<th>Needs per Unit (meter)</th>
<th>Cost (IDR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Roving frame base</td>
<td>iron Concrete ⊕ 4 mm</td>
<td>1.600</td>
<td>1,45</td>
<td>2.320</td>
</tr>
<tr>
<td>- iron elongated the base</td>
<td>iron Concrete ⊕ 4 mm</td>
<td>1.600</td>
<td>0,50</td>
<td>800</td>
</tr>
<tr>
<td>- iron wide at the base</td>
<td>iron Concrete ⊕ 4 mm</td>
<td>1.600</td>
<td>0,40</td>
<td>640</td>
</tr>
<tr>
<td>- The Framework two side sloping</td>
<td>iron Concrete ⊕ 4 mm</td>
<td>1.600</td>
<td>1,80</td>
<td>2.880</td>
</tr>
<tr>
<td>- two The Framework cover</td>
<td>iron Concrete ⊕ 4 mm</td>
<td>1.600</td>
<td>1,40</td>
<td>2.240</td>
</tr>
<tr>
<td>- hook bait</td>
<td>iron Concrete ⊕ 3 mm</td>
<td>1.000</td>
<td>0,35</td>
<td>350</td>
</tr>
<tr>
<td>- lock the door</td>
<td>iron Concrete ⊕ 3 mm</td>
<td>1.000</td>
<td>0,25</td>
<td>250</td>
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<tr>
<td>- Two Escape vent</td>
<td>iron Concrete ⊕ 2 mm</td>
<td>555,56</td>
<td>0,32</td>
<td>178</td>
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</table>

**Total** 9.658

<table>
<thead>
<tr>
<th>materials nets</th>
<th>materials</th>
<th>CostPer MN (IDR)</th>
<th>Needs per Unit (MN)</th>
<th>Cost (IDR)</th>
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<tbody>
<tr>
<td>The down side</td>
<td>Nets (mesh 1,5 inch)</td>
<td>2,505</td>
<td>940</td>
<td>2.355,072</td>
</tr>
<tr>
<td>The upper side</td>
<td>Nets (mesh 1,5 inch)</td>
<td>2,505</td>
<td>880</td>
<td>2.204,749</td>
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<tr>
<td>Left and Right side</td>
<td>Nets (mesh 1,5 inch)</td>
<td>2,505</td>
<td>572</td>
<td>1.433,087</td>
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</tbody>
</table>

**Total** 5.992,908
<table>
<thead>
<tr>
<th>construction services</th>
<th>Price Per Unit (IDR)</th>
<th>Total (IDR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction Services crab pot</td>
<td>5.000</td>
<td>5.000</td>
</tr>
<tr>
<td>Construction Services escape vent</td>
<td>2.000</td>
<td>2.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>7.000</strong></td>
</tr>
</tbody>
</table>

The results of interviews with fishermen catching blue swimming crabs in multiple locations and multiple sellers crab pot data showed that fishermen like dimension size crab pot that have been marketed over the years. Dimensional crab pot larger sizes have higher prices and heavier making it difficult for transportation, while the catch of blue swimming crabs remain the same in number. Thus, this recommendation prototype crab pot tailored to the dimensions of the size of traps that have been marketed over the years, which differ only blue swimming crab pot have escape vents recommendations. The price of crab pot these recommendations also sought relatively the same as the price of crab pot without escape vents that have been known to the public.

The results of the calculation of production costs (Table 7) is known for Rp15.650, 908/crab pot or Rp.15.651/crab pot (Fifteen Thousand Six Hundred Fifty One Rupiah) per unit of , while the cost of manufacturing services and escape vent each by Rp5.000/unit and Rp.2.000/unit. Thus the total cost of production the making recommendations for Rp.22.651/unit (Twenty-Two Thousand Six hundred and Fifty One Rupiah) per unit.

- **Capacity Assessment of Local Market**

  - **Maps Spreading Aquatic Habitat blue swimming crab In Southeast Sulawesi**
    Southeast Sulawesi, has 13 districts / cities are all coastal waters and has potential as a spread of blue swimming crab. Scientifically mapping potential blue swimming crab fishing in the waters of Southeast Sulawesi has not been done, but it is known or suspected by blue swimming crab habitat characteristics and experiences during this time that among these waters are a vital habitat blue swimming crab is:
    (1) Kendari is limited to waters Lapulu and Purirano
    (2) Konawe contained in the waters Toronipa and Toli – toli.
    (3) South Konawe contained in the waters of Lakara, Kolono, Bungin, Torokeku, Tinanggea, Torobulu and Pamandati village
    (4) North Konawe found in the waters of Lasolo
    (5) Konawe Islands found in Wawonii waters the north and west
    (6) Kolaka ; very limited crab fishing ground that is in the waters Anaiwoi.
      Fishermen catch sold in Waeputtang (strategic industries). The number of fishermen only ± 5 people.
    (7) North Kolaka contained in the North Pakue waters and Lasusua but blue swimming crab in these waters only as by-catch.
    (8) Muna, found in the waters between Raha and Tampo; Tiga Island waters, Bero Island and Mandike Island; Balu Island waters, Tondasi, Tanjung Pinang, Lasama, Langkobu; Pajala waters, Gala Island, Bangko Island, Pasikuta and Tapi-tapi; and other marine waters bordering Mawasangka (Buton)
(9) North Buton, found in waters Ereke, længere, Tanah Merah, North Kulisu and Bonegunu
(10) Buton, found in the waters of the Gulf Lasongko, Terapung Village and Mawasangka
(11) Wakatobi, found in the waters of Lia and kapota Island
(12) Bombana district, found in waters Kasipute (Kampung Baru and Lampopala), Poleang (Boepinang), South Poleang (Waemputtang, Tanjung Bainang, Dusun Bajo), Southeast Poleang (Marampuka and Lemo), Lora, and Kabaena (includes Sikeli, Baliara, Patenge, Teluk Pising, Dongkala) and Mataoleo (Lora).
(13) Baubau, there is a small part in island waters of Makassar, Lowu-Lowu, Lakologou Waruruma and Palabusa.

**Estimated Number of Fishermen And Needs blue swimming crab pot In Southeast Sulawesi**

The results of of interviews with collector and fishermen in some locations and collecting blue swimming crab catching in Southeast Sulawesi, predictable number of blue swimming crab fishermen in each district in Southeast Sulawesi is as follows:

(1) Kendari (Lapulu and Purirano): 25 dan 15 = 40 fisherman
(2) Konawe (Toronipa and Toli-toli): 35 fisherman dan 10 fisherman = 45 fisherman
(3) South Konawe (Lakara, Kolono, Bungin, Torokeku, Tinanggea, Torobulu dan Pamandati): ± 150 fisherman
(4) North Konawe (Lasolo), blue swimming crab in these waters as a bycatch.
(5) Konawe Islands (Wawonii the north and west): ± 15 fisherman
(6) Kolaka (Anaiwoi) ± 5 fisherman
(7) Noerth Kolaka (Noerth Pakue and Lasusua) but blue swimming crab only as bycatch.
(8) Muna (Raha and Tampo; Tiga Island waters, Bero Island and Mandike Island; Balu Island waters, Tondasi, Tanjung Pinang, Lasama, Langkobu: Pajala waters, Gala Island, Bangko Island, Pasikuta and Tapi-tapi; and bordering the waters Mawasangka (Buton): ± 1,000 fisherman
(9) North Buton (Ereke, Langere, Tanah Merah, North Kulisu and Bonegunu): ± 150 fisherman
(10) Buton (teluk Lasongko, Floating Village and Mawasangka): ± 100 fisherman
(11) Wakatobi (Lia waters and island kapota): ± 10 fisherman
(12) strategic industries (Kasipute (Kampung Baru and Lampopala), Poleang (Boepinang), South Poleang (Waemputtang, tanjung Bainang, Dusun Bajo), Southeast Poleang (Marampuka and Lemo), Lora, and Kabaena (includes Sikeli, Baliara, Patenge, teluk Pising, Dongkala) and Mataoleo (Lora): ±400 fisherman
(13) Baubau (Makassar Island waters, Lowu-Lowu, Lakologou Waruruma and Palabusa: ± 20 fisherman
Based on these data, it can predict the number of fishermen in the Southeast ± 1,750. blue swimming crab fishermen in each location mentioned above using crab pot and nets of fishing gear (gillnet). The blue swimming crab fishermen are mostly using both types of fishing gear, but others simply use any crab pot or nets (gillnet) only. It is estimated that fishermen who use crab pot account for 50% of the total blue swimming crab fisherman or numbered 875 people.

All this time, each fishermen using crab pot ranging from 50-300 units. If the optimal number of blue swimming crab pot per fisher operated averaging around 150-200 units, the required number of blue swimming crab pot fishermen in Southeast Sulawesi is ± 131250-175000 units.

- **Availability of Raw Materials And Supplies blue swimming crab pot Prediction**

The raw materials required blue swimming crab pot consist of:

- Anti-rust iron (for main frame crab pot)
- Stainless steel wire (to escape vent)
- Nylon net mesh size of 1 inch (to cover iron main frame)
- Nylon Rope (where crab pot strung together)
- Buoy (a sign put in place crab pot in marine waters)

All materials required for the making blue swimming crab pot to be operated at sea easily obtained locally, especially in Kendari and Baubau. Thus it is expected that the blue swimming crab pot made based on this IMACS has a relatively cheap price, or at least equal to the price of blue swimming crab pot that have been marketed.

If all collectors or mini plant managers seriously implement these recommendations are relatively similar to the recommendations Indonesian blue swimming crab Management Association (APRI) the need for "blue swimming crab pot recommendation" will be absorbed by the market in accordance with the needs of blue swimming crab fishermen in Southeast Sulawesi, amounting to ± 875 people. blue swimming crab in Southeast Sulawesi is one commodity that is popular with the public, but for the amount of local blue swimming crab is marketed very limited (except for the small or in places far) because almost all the fishermen sell their catch in the mini collector or processing plant. Thus, the marketing blue swimming crab in Southeast Sulawesi is huge potential. This situation also illustrates that the gear needs "blue swimming crab pot recommendation" will very likely the blue swimming crab fishermen needed.

- **Economic Analysis**

Based on the analysis described above it can be shown for the economic analysis: (1) blue swimming crab fishing effort in this area by using the "blue swimming crab pot recommendation", and (2) the procurement effort "blue swimming crab pot recommendation" to use the analysis of "benefit-cost ratio, B / C - ratio ".

**1) Analysis of B/C-ratio Catching Blue Swimming Crab**

If fishermen catch (catch): 0-10 kg / trip / day
CPUE (August-October 2013) (Nuraini, 2014):
Pamandati: 0.01 to 0.04 kg / crab pot / trip  
Kolono: 0.03 to 0.04 kg / crab pot / trip  
**If the average CPUE = 0.02 / kg / trip**  
Operation cost: 30,000 - Rp.50.000/trip  
**If the average operation cost: Rp.40.000/trip**  
And the number of crab pot operated fishing: 150-200 units  
**Then acceptance:** Rp.75.000 - Rp.100.000/fisherman  
The average cost (cost) of production: Rp.40.000/trip  
Then: B / C-ratio = (Rp.75.000) / (40,000) = 1.875  
= (100,000) / 40,000 = 2.500  
So B / R-ratio = 1.875-2.500  

(2) Analysis of B / C-ratio Industrial Business blue swimming crab pot  
The results of the analysis of production costs this blue swimming crab pot recommendation = Rp.23.150/unit  
Selling price in the public market: 25.000 - Rp.30.000/unit  
Then B / C-ratio = (25.000) / (Rp.23.150) = 1.08  
B / C-ratio = (30,000) / (Rp.23.150) = 1.30  
So B / C-ratio = 1.08 to 1.30  

Based on the results of the economic analysis it can be concluded that both the blue swimming crab fishing effort using blue swimming crab pot recommendation as well as industry business blue swimming crab pot recommendations feasible for both the business has a B / C-ratio> 1.  

E. TRAINING ON CRAB POT CONSTRUCTION AND DEMONSTRATION OF DEPLOYING AND RETRIEVING CRAB POTS HELD IN 6 LOCATIONS  
The purpose of training collapsible crab pot construction and demonstration of crab collapsible pot operation (setting and hauling) that have escape vents are as follows:  
• Improving the skills of the fisherman and the effectiveness of crab collapsible pot in an effort to catch crab which includes the principles of crab collapsible pot setting and the principle of crab collapsible pot hauling which has an escape vent with a size of 50 x 35 mm² in 6 waters the location of activities.  
• To train the fisherman to be able to make a Collapsible crab pot that are recommended (have escape vent size of 50 x 35 mm²) and be able to make improvements when pot to be damage and be able to perform maintenance crab collapsible pot.  
• Evocative fisherman so that they would use the recommended (having the escape vent size of 50 x 35 mm²) in doing the blue swimming crab catching.  
• Explain and describe the materials of each component, whether pots frame and their nets as well as cover how to obtain and how to cut the material.  
• Explain and demonstrate the making of materials and support tools as well as how to make a collapsible crab pot that have escape vents.
• Train fisherman to able making escape vent size of 50 x 35 mm² when they buy collapsible crab pot that have been made in the market.

a. Training Activities
The training activities conducted at 6 locations namely Toronipa Village Soropia subdistrict Konawe district, Bungkutoko village Abel subdistrict Kendari city, Lakara village Palangga subdistrict, Torokeku village Tinanggea subdistrict Sout Konawe District, Lampopala village Rumbia subdistrict and Waemputtang Village South Poleang Subdistrict Bombana District.

Implementation phases as follows:
1. Presentation Training materials presented by Ir. Halili, M.Sc. and further explanation followed by other presenters are Dr. Bahtiar, S.Pi., M.Si and Ahmad Mustafa, S.Pi., M.Pi. In a presentation put forward some of the following:

   • Introduction: The participants were remained that 12 blue swimming crab exporting companies have voluntarily signed the agreement that they will not buy again blue swimming crab with a width of less than 10 cm. By this information then the fishermen and crab collectors should immediately anticipate by changes their behavior gradually on blue swimming crab fishing that have been carried out without selecting by size. Therefore blue swimming crab fishing gear that can select the desired size of the blue swimming crab by the buyer (sizes above 10 cm) is fishing gear that can be passed smaller sizes than the target size (size of market demand). One of the gear is collapsible crab pots with escape vent size 50 x 35 mm². The existence of collapsible blue swimming crab pot is widely available in the market but not yet equipped with escape vent, either semicircular or rectangular. Operation (setting and hauling) of collapsible blue swimming crab pot by the fisherman on the same principle but the difference is the distance between each crab pot that vary depending on the ship that used to catch blue swimming crab.

   • Collapsible Blue Swimming Crab Construction:
Construction of collapsible blue swimming crab pot is not difficult and can be made by the fishermen. So far, no one of the fishermen who have ever made due
to theiy easy getting Collapsible blue swimming crab pot that ready-used, while the construction of collapsible crab pot require equipment and materials that was not owned by a fisherman unless owned by a group. This condition is influenced by the presence of collapsible crab pot materials to be purchased in bulk (big number). The stage of construction of collapsible crab pot was starting from construction base frame to the process throughout the knitting nets on each side meeting with yarn and knitting tools.

- **Escape Vent Construction:**
  Blue swimming crab collapsible pot in the market is still the standard crab pot without having the escape vent. Therefore blue swimming crab fishermen should have the awareness and skills to make their own escape vent, so the blue swimming crab is caught in the size as recommended by the blue swimming crab company. Therefore construction of escape vent on collapsible crab pot is quite simple and requires very low cost (price of Rp 350 per unit crab pot). The construction process is also very simple, as well as the equipment contained in every fisherman's house. What if the fishermen have the desire to use collapsible crab pot with escape vent so they are easily make the escape vent on collapsible crab pot that have been purchased. The process of construction the escape vent is also shown from the process of forming the escape vent to the knitting process.

- **Operation (setting and hauling) of collapsible crab pot:**
  Operation of collapsible crab pot are very simple and fishermen have no trouble because it is their daily habits. In general, the operation of the crab pot is done on the area of fishing ground by helping a boat or a motor boat that adapted to the coverage area of the operation, the more distant areas of operation and the number of collapsible crab pot that used so the needs of a motor boat is very important. The first done on the setting of collapsible crab pot is by lowering the buoy and buoy rope that serves as a sign that easily found at would haul crab pot. Further by slowly lower the crab pot that already contains bait one by one until the last crab pot and subsequently followed by a lowering in the second buoy.

In summary the stages of training construction and operation of collapsible crab pot are as follows:

- **Collapsible Crab pot Construction**
  - Preparing materials and tools construction collapsible crab pot
  - Cutting white steel in accordance with sections collapsible crab pot
  - Forming a piece of white steel to be ready to assembled
  - Assembling the pieces of white steel into the frame of crab pot
  - Cutting the nets as crab pot wrapping
  - Install and knitting nets to crab pot surface

- **Escape Vent 50 x 35 mm² Construction**
  - Preparing materials and tools of construction the escape vent.
  - Cutting white steel with a diameter of 2 mm along the 16 cm and 2 times the number of collapsible crab pot
− Establish white steel pieces of to size 50 x 35 mm² which is the escape vent.
− At each end of the arch formed escape vent for easy folding paste the Collapsible crab pot.
− Install (bind) the escape vent on the left and right side of collapsible crab pot.
− Tighten both ends of the collapsible crab pot escape vent in order not to loose.
− Cutting nets contained in the escape vent.
− Knitting or bind escape vent on nets that are cut so that no holes except the escape vent.

▪ **Operation**
  − Preparing ropes and buoys
  − Install branch rope on each collapsible crab pot
  − Determine the distance between collapsible crab pot in the major rope
  − Stringing collapsible crab pot on the the major rope
  − Put the collapsible crab pot that have been strung together on a ship or boat
  − Transporting collapsible crab pot in fishing ground
  − Setting collapsible crab pot;
    o Lowered the first buoy
    o Lowered the crab pot one by one until the last crab pot
    o Lowered the second buoy
  − Crab pot hauling (The first way);
    o Lifting the first buoy or second buoy.
    o Lifting collapsible crab pot one by one into the ship or motor boat until last bubu
    o Lifting the second or the first buoy.
    o Transporting crab pot to the fishing base to take the results and correct any damaged crab pot
  − Crab pot setting (The Second way);
    o The motor boat towards the point first or second crab pot
    o Lifting collapsible crab pot and take the result, repair or replace the bait and lowered back into the sea.
    o In the same way also performed up the last crab pot.
    o bringing the catch to the mainland for later measurement of weight

2. **The Practice activities of constructing of collapsible Crab Pot**
   The construction of collapsible crab pot activities as much mass can occur if there are groups of crab fishermen in the area have the same interests because the construction of collapsible crab pots in bulk will reduce production costs for the purchase of materials can be carried out in the party. However, if done by each fisherman will require a lot of expense and inefficient. At this meeting
exemplified the way in which the constructing of crab pots in which the constructing of this pot is done in several stages, there are:

- The preparation of tools and materials to be used
  The materials used in the construction of collapsible crab pot are; white steel 4 mm of diameter as concrete steel frame parts and 3 mm as a hook of bait and lock the door; gill nets with a mesh size of 1 inch.

- The White Steel Cutting
  White steel still rolled then cut according to the size of each piece frame pots as many as 11 pieces.

- The forming of the white steel frame
  The pieces of white steel each end is made in such a way to be reconciled and mutually bind to each other according to the order form collapsible pot.

- Assemble the Collapsible pot Frame
  White steel pieces assembled starting from the formation of the basic frame, the lengthwise frame and the extends frame then stringing two sloping frame and two frame upright, and finally put the bait hook and lock the door so as to form a perfect frame collapsible pots.

- Installing nett to cover the collapsible crab Ppt
  Installation of nets as a wrapper frame pots made with three parts, there are; the first part covers the bottom side and sides of the the below entrance of crab pot, two pieces of nets that cover the top side and sides of the upper entrance and two side nets that cover the left and right side of the collapsible pot

3. The Activity of Construction the Escape Vent on Collapsible Pot

Constructing the escape vent require some materials and tools; white steel 2 mm diameter along the 2 x 16 cm and nylon multifilament yarn and uts diameter 1 mm, pliers, scissors and caroban (nets knitting tools) as well as a mall or appliance doors so that the size of the gap is same. White steel cutting 2 units for each trap with a length of 16 cm each. Each square shaped piece of white steel with a size of 5 x 3.5 cm which is made form on both ends in order to be binding on the collapsible pot frame. Binding of escape vent performed at a certain distance from the left and right in such a way so as not to interfere when pot is folded. Upon binding of the escape vent then the next is cut nets that are
exactly in the escape vent (about 2 mesh nets) then knitting with yarn 1 mm in diameter and finally completed the process of constructing the escape vent on collapsible crab pot.

4. The Activities Demonstration of Operating Collapsible Pot

The demonstration includes the setting and hauling of collapsible pot which is symbolic and a demonstration because most fishermen have been accustomed to use collapsible pot. There are differences between the fisherman experience with a team of researchers in which fishermen are trying to extend the distance between pot on the grounds so that the pots are not dragged and the binding branch rope in section under part of pot in order if the crab pot dragged so it was not reversed. In operation, the distance between crab pot can be adjusted to the depth of the water so that the main rope is not extravagant, but it must be followed by the installation of a regular pattern with low speed, especially when using a boat without a motor so that when the main rope stretched perfect start to the next pot can only be lowered so that the position of traps in the water as on the basis of longline. However, if the installation of a motor boat so the pot generally dragged and distance between pot long enough (7-10 m) so that the condition is much use of the main rope, but mostly fisherman using this method. Therefore, on this occasion the instructor inform that the operation can be done by saving the main rope, which is pot put in gradually starting from the first buoy rope to the second buoy.

Figure 17. Escape vent that has been formed

Figure 18. Operations crab pot.
The hauling of crab pot is done in two ways, namely (1) the crab pot raised overall and (2) the crab pot raised just to take the results and put back in the waters. The hauling of crab pot overall begins by lifting the float (float first order lifted adapted to current and wind conditions) then the first crab pot lift and so on until the buoys. Crab pot and rope arranged in such a way on a motor boat so easy to move or lowered again. Catches collection was done after fishermen are off the coast. The hauling of all crab pots is done only at certain times, that is the condition number of catches very little, the weather disturbance or damage of crab pot. The hauling crab pot primarily to destinations just take the catch is done, then the result is raised crab pot removed and repair or replace the bait and then lowered again and then the same way for the next trap to trap the latter.

5. Fisheries Extension Officer (PPL) statement:
In this training fisheries extension officer assumed that in principle, collapsible blue swimming crab pot gear equipped by escape vent can be made by fishermen. Its working principle is simple and material components can be obtained in the market. The constraints is the production of collapsible blue swimming crab pot must be made by a group or household scale industries to provide pot for a number of fishermen. Therefore the government support is required to accomodate it. Consequently, the fishermen can only using common pot which available in the market, but they have to equipping with escape vent by utilize low price and available materials. It is depend on fishermen awareness on blue swimming crab sustainability in the habitat which strongly influence on their major income/livelihood, it could be sustain or unsustain. In addition, the officer informed that monitoring to 15 fishermen I each site who operating crab pots with escape vent to be reported to district DKP and implementor for further supports and or assistances.

6. Head of Village statement:
Generally, head of villages convinced the fishermen that capture rate of crab pots with escape vent will not increase rapidly, as the small crabs needs to grow, thus in upcoming months the rate will obtained better. Basically, the simple construction of crab pot easy to made by the fishermen, but during the time most of the pots without escape vent were supported by the government agency, therefore the pots should be completed by escape vent based on reference of the implementor (CV. Mitra Bahari). The head of villages expected district DKP and CV. Mitra Bahari provide assistance and supervision to the fishermen to ensure usage of recommended crab pot.
7. Discussions:
In this training, blue swimming crab fishermen suggested that not only those who use collapsible pot that recommended but the whole blue swimming crab fishermen should be required to use the same gear. In addition, the collector has not been fully aware of the size of the blue swimming crab to be purchased the company because information that has signed an agreement by company in order not buy blue swimming crab that size less than 10 cm, especially fishermen who were in the village Torokeku, Lakara and Toronipa. While collectors in the Village Lampopala since the first did not accept small blue swimming crab caused the complaining employee will be troublesome issue a small sized blue swimming crab meat (it took a long time). Besides the fishermen said that if the government already requires the use of blue swimming crab pot is recommended that they be easy to make the escape vent, therefore the government that will be instrumental in connection with the use of these crab pot.

8. Training At 3 New Locations
Training is conducted in 3 new locations not only focused on the construction and demonstration of operation of collapsible crab pot gear that recommended (have escape vents) but also preceded by revealing the conditions and problems of blue swimming crab in Southeast Sulawesi. Furthermore socialization research results so that with the fishermen came to the conclusion that in order to preserve and standards minimum size of blue swimming crab to be purchased by a company, the application of these results is very important. Based on this information it is expected that the fishermen of blue swimming crab at 3 new locations can implement the collapsible pot recommended (having the escape vent). Therefore, the public, especially fishermen in 3 locations have to know how to construction and operation of collapsible pot that has an escape vent so expect of fishermen can fix or make your own the collapsible pot it. In the training also of local fishermen said that the making of this crab pot is easy to do and most importantly, facilitated by the government, especially related to materials and equipment. But so far the government has the crab pot provided a ready-made with no escape vent. On this occasion also
fishermen expect that they can try to apply this tool as in location other. While the operation collapsible pot do not find it difficult even though they use crab pot semicircular but the same operating principle with collapsible pot rectangles.

b. Distribution Of 900 Units of Recommended Collapsible Crab Pot

The follow-up stage is deploying 900 units of crab pot with escape vent in three locations where 300 units provide for each location. It aims to support the fishermen who have engaged in socialization and training activities could applied the theory and practice using the recommended pots as eco-friendly catch tool for sustainability of blue swimming crab and obtained pilot project result. The number of involved fishermen in each location are increase from 10 to 15 due to enthusiastic of other villager to applied the pots, thus 45 fishermen have using the pots, where each fisherman supported by 20 units of pots and lines.

Generally, fishermen aware that capture rate will getting down, but due to commitment to ensure sustainability of blue swimming crab, then the recommended pot will be used. The down rate of capture will be obtained only for first two months, and then the stock will be normal as the biomass grow up. Otherwise, head of villages and fisheries extension officer as well as the fishermen in Toronipa, Torokeku and Waeputtang village are commits to support and overseeing the using of the pots. To ensure the distribution and application of these pots, the fishermen signed a handing over letter.

c. Result of Training:

- The fishermen communities in 6 training location to get that information so that blue swimming crab resources is sustainable and fishermen's income increases, the fishermen have to sell blue swimming crab measuring the above is 10 cm by using collapsible pot gear recommended.
- The blue swimming crab pot of Fishermen became aware that the manufacture of collapsible pot can be performed by each fisherman but the constraints is they do not have the initial capital.
- The collapsible pot purchased in market can be made escape vent with the size in accordance the recommended and crab size requirements of the gatherers.
- Most of the gatherers district level do not yet know the size of the crab to be purchased by a gatherers on top of such an blue swimming crab agreement has not been published of blue swimming crab entrepreneurs among blue swimming crab fishermen.
- Distribution of 900 units collapsible pot with a escape vent that has a size of 50 x 35 mm² amount still not enough for fishermen (only 45 fishermen) It is therefore necessary that all the fishermen can get the same amount.
• Blue swimming crab fishermen very capably operate collapsible pot with methods adapted to the current state of fishing operations and the depth of waters and the number of collapsible pot.
• In a blue swimming crab catching, fishermen using of fishing gear a variety so that the application of crab pot gear recommended is collapsible pot will be difficult to apply.
• Local government and blue swimming crab fishermen expect to government make rules relating to the use of fishing gear of the collapsible pot recommended and blue swimming crab size may be arrested.
• Community empowerment by the government related to the management of blue swimming crab immediately performed at all locations in the Southeast.

F. PUBLICATION IN THE LOCAL TELEVISION AND DAILY NEWSPAPER

In order dissemination of research results and conditions of swimming blue crab in Southeast Sulawesi, in locations not reached by the trial activities and socialization and training is carried out in the form of campaign dialogue through local television (TVRI) and daily newspaper

Campaign on the use of collapsible pots are selective intended that the selective use of pots can be well known by all fishermen community, academia, government and other stakeholders are involved either directly or indirectly based on activities that occupied each of the swimming blue crab.

Implementation of the campaign focused on dialogue through local television local and daily newspaper, which is one model of the campaign in order to convey to the public about collapsible pot that has escaped vent gab. The information presented in this campaign is a series of research results or test collapsible crab pots are equipped with escape vent and recommendations as well as socialization and training to the communities in pilot test activities. As a speaker at the dialogue in local television (TVRI) Sultra is composed of two people, namely (1) that represents the CV. Mitra Bahari and (2) a representative of the Department of Marine and Fisheries of Southeast Sulawesi, and (3) the moderator or the steering of TVRI Sultra dialogue that set the course of the dialogue

In closing on this dialog is the speaker of the CV. Mitra Bahari emphasized that the use of collapsible pot what selective most important of all stakeholders should have the awareness to jointly manage the swimming blue crab. Also expected to the fishermen in order to release crab that are laying so that fishermen already have a role in the management of swimming blue crab. As teaching staff we are never an ever stopped to think about it, both swimming blue crab and society. While the province of DKP suggests that commitment with businessmen, fishermen and government to discuss with the preservation and prosperity of swimming blue crab fishing, the need for rules as a means of control so that there is certainty and this should be done jointly by all stakeholders.
IV. CONCLUSION AND REKOMENDATION
A. CONCLUSION

- **FGD**
  - The blue swimming crab population have already been over exploitation; fishing gear prototype using the escape vent will be received well by fishermen and the blue swimming crab collectors; and they have hopped procurement of pot crab that facilitated by the Local Government (Department of Marine and Fisheries eq.) or from private sectors involved in the crab meat collectors.
  - Studies or pilot test the selectivity of collapsible pot crab with escape vent. The sizes have been determined that the 4.0 cm x 3.5 cm, 4.5 cm x 3.5 cm and 5.0 cm x 3.5 cm.

- **Selectivity Study of Crab Pot:**
  - The recommended of escape vents size in collapsible pot to be used fishermen of blue swimming crab in the waters of Southeast Sulawesi is the escape vent size 5.0 cm x 3.5 cm.
  - The collapsible pot with escape vent size this to guarantee and maintain the sustainability of the blue swimming crab population in the waters of Southeast Sulawesi.

- **Socialization**
  - Prototype collapsible crab pot with escape vent gap was well received by fishermen and ready to operate if the crab pots are available or provided by local government.
  - Department of Marine and Fisheries (DKP) through the Fisheries Extension in each region to support IMACS efforts to preserve blue swimming crab resources by using selective fishing gear.

- **Training and Publication**
  - Fishermen have the skills and knowledge about the effectiveness of collapsible pot include the principles of setting and the principle of hauling of crab pot which has an escape vent with a size of 50 x 35 mm2.
  - The blue swimming crab fisherman be able to make the a collapsible pot are recommended (have escape vent size of 50 x 35 mm2) and able to carry out repairs when damage occurs and is able to perform maintenance collapsible pot.
  - Blue swimming crab fishermen would use the crab pot recommended (have escape vent size of 50 x 35 mm2) in making arrests blue swimming crab.
  - Fishermen know the material of each component of the crab pot frame and nets, as well as how to obtain and how to cut the material, the material and support tools as well as how to construct of collapsible pot that have escape vents.
  - Fishermen know how to make the escape vent size of 50 x 35 mm2.
- IMACS collaborative with CV. Mitra Bahari have distributed 900 unit collapsible crab pots to 45 fishermen on 3 locations.
- Implementation of collapsible crab pot with escape vent already have socialised and disseminated on local television and daily local newspaper.

B. RECOMMENDATION

- Fishermen of blue swimming crab have to use collapsible crab pot with escape vent to maintain sustainability blue swimming crab.
- The village head and fishery extension do counseling and supervision to fishermen whom they have gotten collapsible crab pot in order to always use them to catch blue swimming crab.
- The DPK immediately have to empower to blue swimming crab fishermen especially in locations implementations 900 units collapsible crab pot.
- Local government immediately review the applicability of socialization and the use of collapsible crab pot throughout the province of Southeast Sulawesi.
- Local Government immediately make arrangements in particular blue swimming crab catching gear uniformity and size may be captured through regulation.
- There is cooperation between the local government (DKP) and universities in the sustainable management of blue swimming crab.
REFERENCE


Undang-Undang Republik Indonesia Nomor 31 Tahun 2004 Tentang Perikanan.
ANNEXES

Focus group discussion in Torokeku Village

Focus group discussion in Waemputtang Village

Research activities (setting) Blue Swimming crab pot in waters
The socialization results of research in waemputtang Village
Process of making Escape vent for 900 units of blue swimming crab pot

Distribution process 900 units of blue swimming crab pot recommendation for fishermen

Condition of Training in Bungkutoko Village Kendari City
Training activities of construction and operation blue swimming crab pot recommendation

The handover blue swimming crab pot to fisherman representation

The socialization results of research through the TVRI southeast Sulawesi