

Final Report on Fishing and Vessel Repair Technology Improvement in Langkawi

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INTRODUCTION

The activity on *Fishing and Vessel Repair Technology Improvement in Langkawi* was initiated under the *Locally Based Coastal Resources Management – Palau Langkawi (LCBRM–PL)*. The activity was carried out in collaboration of the Department of Fisheries Malaysia, KEN and LKIM (Malaysian Fisheries Development Authority) in Kedah State, and SEAFDEC/TD. The activity comprised the following six (6) sub-activities:

- 1) Fishing Gear Survey (29-31 March 2004)
- 2) Mechanical Training for Fishers in Langkawi (4-6 May 2004)
- 3) Fishing Trial I (14-17 June 2004)
- 4) Fishing technology and practices training for fishermen in Langkawi (9-11 August 2004)
- 5) Fishing Trial II (19-23 December 2004)
- 6) Fiber Reinforced Plastic (FRP) Works Training for Fishers in Langkawi (23-26 May 2005)

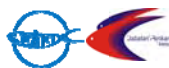
After the December 2004 Tsunami that affected the activities of the project site, the fishing trials for the remaining fishing gears have been cancelled in order for the related organizations to conduct relief assistance to the fishers. For its part, SEAFDEC/TD strengthened the implementation of several related project activities, e.g. CBFM through zoning management system, the development of local enforcement approach, identification of possible products for development, etc. Fishing gear improvement was given less priority in 2005 except the training of Fiber Reinforced Plastic (FRP) Works for Fishers in Langkawi which was arranged from 23 to 26 May 2005. Moreover, it was also agreed to suspend some activities in 2006, e.g. responsible fishing approach using selectivity fishing gear, i.e. the introduction of shrimp bottom drifted gillnet for responsible fishing, training on safety for small scale fishing boats.

FISHING GEAR SURVEY (29-31 March 2004)

Fishing Gear and Practices Survey was the first sub-activity of the *Fishing and Vessel Repair Technology Improvement in Langkawi* under the *Locally Based Coastal Resources Management – Palau Langkawi (LCBRM – PL)*, carried out with the collaboration of the Department of Fisheries Malaysia and SEAFDEC/TD. As a preliminary survey, the Fishing Gear and Practices Survey focused on the identification of the fisheries conditions, i.e. fishing gears and their accessories, fishing practices and fishing grounds as well as catch compositions around the project sites in Langkawi Island. The collected information was used as basis for the initiation of appropriate fishing technology improvement in the target fisheries communities in Langkawi through the SEAFDEC/TD extension methodology.

Objectives

- 1) To investigate the current fishing gears and activities at the project area, i.e. Kuala Teriang and general observation at Kuala Malaka;
- 2) To identify the needs for fishing technology improvement of the local fisherman in the project area; and
- 3) To draft the tentative details for improving local fishing techniques through training methods.



Fishing ground and fishing village

The survey and observation was carried out in Kuala Teriang and Kuala Melaka, western part of Langkawi Island. Both fishing communities are located on the coast of Teluk Barambung Bay. The bay topography is wide and plain with muddy bottom. The distance from the port to the fishing ground according to the type of fishing activities (e.g. for gillnet fishing operation), is 5-8 nm with a depth of 8-20 m.



Aerial view of Langkawi Island (left) and (right) Kuala Teriang (A) and Kuala Melaka (B)
(Photo by Google Earth)

Fishing boat

Most of fishing boats in Kuala Teriang, are small scale. Before the Tsunami disaster, almost all fishing boats were made of wooden materials. Few Fiber Reinforced Plastic (FRP) fishing boats were noted during the observation. Most of the boats were 5-6 meter long, installed with 15-40 hp outboard engine and a few with long-tail engines, not equipped with any deck machineries, fish finders and radio communications. The fishing boats in Kuala Teriang operate in the zone A.



A fishingboat in Kuala Teriang
(Photo by Research Division, SEAFDEC/TD)

After the 2004 Tsunami, some of the wooden fishing boats were damaged. Almost all of the new fishing boats are now made of FRP material and equipped with outboard engines because this was convenient to obtain government technical assistance.

Some fishing boats at Kuala Melaka were bigger in size than at Kuala Teraing and were fitted with inboard engines. Some of the boats were equipped with deck machineries such net hauler. But since Kuala Melaka was not within the project site, only a general observation was conducted without any deeper details.











A fishingboat in Kuala Melaka
(Photo by Research Division, SEAFDEC/TD)

Fishing Gear

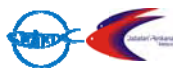
There were seven main fishing gears found in the project area in Kuala Teriang (**Table 1**).

Table 1. Fishing gear with corresponding descriptions

<p>Shrimp trammel net (Pukat tika lapis*) Since the fishing ground has a muddy bottom characteristic, it is a common habitat for shrimps. Trammel net was the most dominant gillnet used by the local fishermen in the survey area. The target catch was Banana Shrimp (<i>Metapenaeus merguensis</i>).</p>	
<p>Bottom gillnet (Pukat hanyut dasar laut*) There were few types of bottom gillnets found during the survey. The main target species were the Indo-pacific mackerel (<i>Rastellinger</i> spp.) and blue swimming crab (<i>Portunus pelagicus</i>).</p>	
<p>Drift net (Jaring hanyut permugaan air*) The most important target for drift gillnet is the Silver Pomfret (<i>Pampus argenteus</i>).</p>	
<p>Bottom longline (Rawai*) Bottom longline used for catching demersal fishes, e.g. grouper (Serranidae), crocker, etc., was noted during the survey. However, the number of fishermen operating the bottom longline was less than those using the gillnet.</p>	
<p>Crab trap (Bubu ketan*) Few fishermen used the collapsible trap for catching crab. Their target catch is the Serrated Mud Crab (<i>Scylla serrata</i>), found in the mangrove area.</p>	
<p>Ivory whelk lift net (Bubu siput*) Only few fishermen use 40-50 lift nets to collect the Ivory whelk (<i>Babylonia</i> spp.) due to the limited marketing. The Ivory whelk is not widely harvested by local fishermen.</p>	
<p>Hand line or Fish jigging (Kail mengail*) Fisherman in Kuala Teriang installed fish aggregating devices (FADs) around the gulf to provide fish shelters and means of gathering fishes. The major fishing gear used within the FADs was hand line. The dominant catches were sea bream, snapper and grouper. Some carangid could also be caught using suitable hook and line techniques.</p>	
<p>Trolling line (Mengeret*) Trolling line is operated around the Artificial Reefs/Fish Aggregating Devices (ARs/FADs). The dominant catches were pelagic fishes, i.e. Spanish mackerel, barracuda, bonito, etc. The present local technology was appropriate for fisherman to catch few fishes everyday.</p>	

Conclusion and Recommendation

The LBCRM-PL Project Manager coordinated with fishing gear and fishing ground researchers for the conduct of the fishing gear survey and data collection at Kuala Teriang fishing community, Pulau Langkawi Island before the end of March 2004. The survey team reported results of the survey to the local fishers, and proposed an action plan on the introduction of fishing technique improvement. The participating local fishers made some recommendations based on results of the survey. Finally, they agreed that the proposed action plan on the introduction of fishing technique improvement should be implemented. The conceptual framework of the action plan places emphasis on the promotion of selected fishing gears, methods and improvement.



The general conceptual framework consists on four categories as follows:

1. The selected fishing gears and methods should not be in conflict with the Malaysian Fisheries Regulations;
2. The selected fishing gears and methods should be convenient for the fisheries management people in order for them to be able to control the fishing activities;
3. The selected fishing gears and methods should be similar and consistent with the local fishing gears employed in project area; and
4. The selected fishing gears and methods should be eco-friendly fishing gear to enhance effective ARs/FADs* utilization.

Based on the above four main concepts, fishing gear technologists selected seven (7) types of fishing gears listed as follows:

1. Bottom vertical longline (BVL) targeting the demersal fish resources around the FADs and ARs/FADs;
2. Collapsible crab trap targeting the blue swimming crab resources around the fishing village as well as mud crab in the mangrove area;
3. Collapsible crab trap may be used as fishing tool for the diverse responsible practices, e.g. crab bank, juvenile release, etc.
4. Squid trap targeting the cuttlefish resources in the bay around the fishing village;
5. Trolling line for cuttlefish around the FADs and ARFADs;
6. Trolling line for pelagic fish resources around the FADs and ARFADs; and
7. Fish trap targeting the demersal fish resources around the FADs and ARFADs.

The fishing trials for the Fishing Technology Improvement in Langkawi were split into two sessions. In the first session on June 2004 (Fishing Trial I), four fishing gears such as the BVL, collapsible crab trap, trolling line for pelagic fish, and Ivory whelk trap were used for the conduct of the planned sea trials and promoted to the fishermen. For the second session in December 2004 (Fishing Trial II), three fishing gears, i.e. collapsible fish trap, lobster trap and wooden squid trap were used for the conduct of the sea trials and promoted to the fishermen.

MECHANICAL TRAINING FOR FISHERS IN LANGKAWI (4-6 May 2004)

The LBCRM-PL Project Manager coordinated with Department of Fisheries Malaysia, KEN and the LKIM in Kedah State, fishers group at the project site, and SEAFDEC mechanics/researchers to conduct a mechanical training for fishermen at Kuala Teriang fishing community, Pulau Langkawi Island. The course focused on workshop arrangement, maintenance and handling procedures for engine trouble. The training also introduced the implementation of gasoline engine, engine selection for ship propulsion, and propeller selection. Handling of mechanical tools, basic measuring tools and tester used for engine repair and maintenance were also included.

Objectives

This training course was organized on 4-6 May 2004 for technical fishermen in the coastal fishery management project, to promote the setting up of local workshop and maintenance for fishing vessels with small sized engines.

This training course was also aimed at promoting the establishment of engine repairs shop for handling engine trouble in fisheries communities. As envisaged, after the training the fishermen themselves should be able to handle basic maintenance of engines, and maintain longer lasting engines with good condition and without any trouble while operating at sea. Specifically, the objectives were:

- 1) To train local mechanics on the management of engine workshop;
- 2) To train local mechanics on outboard engine repair and maintenance;
- 3) To train local fishermen on the technique of outboard engine daily maintenance; and
- 4) To discuss with fishermen and fisheries officers the plan for improvement of mechanical services.

Training schedule

First day

- 0900-1200
 - General information on workshop set up
 - Mechanical equipment for workshop
 - Storage and arrangement of tools
- 1300-1600
 - Introduction to gasoline engine and combustion system
 - Fuel system and appliance
 - Ignition system
 - Starting devices
 - Transmission system and propeller selection
 - Questions and answers

Second day

- 0900-1200
 - Engine disassembly handling
 - Major important measuring parts
- 1300-1600
 - Engine assembly
 - Engine running test
 - Trouble shooting
 - Fine tuning and adjustment
 - Questions and answers

Third day

- 0900-1200
 - General information on gasoline engine
 - Basic maintenance procedures of outboard engine
- 1300-1600
 - Periodic maintenance
 - Engine running test
 - Questions and answers

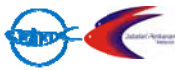
Training activities

Specifically, the training activity was conducted in order to:

- 1) Provide technical knowledge to the participants through lectures, practical, discussion and demonstration of engine workshop maintenance, including the introduction of appropriate periodical maintenance check and fine tune up of engines to prevent engine trouble while operating at sea and maintain the engine's long-life, fuel savings, good engine performance with low pollution and improved incomes;
- 2) Introduce the method of determining the engine parts replacement after the engine has been used for some period of time as well as handling engine operations and maintenance;
- 3) Impart knowledge on engine trouble shooting of various systems such as carburetor, cooling, ignition, and transmission systems;
- 4) Guide the participants on workshop tools arrangement and management of a local service workshop; and
- 5) Guide the participants in developing the lay out of new local engine workshop building construction and acquisition of the necessary workshop equipment, hand tools and facilities.

Results of the training

- 1) The technical fishermen gained technical knowledge on small marine engines and in the periodical handling methods for engine maintenance together with local workshop establishment with the appropriate workshop tools and facilities for engine services, and management of tools, data taking and technical data profile arrangements.
- 2) The fishermen should be able to handle basic engine trouble shooting, daily check and maintenance procedures for engines.



Expectations

This training course is expected to help promote in fisheries communities the establishment of engine repairs shop for handling any engine trouble. The fisherman themselves should be able to handle basic maintenance of engines and enable them to use engines longer with good conditions and without any trouble while operating at sea.



The training activities



The establishment and promotion of locally engine workshop in Langkawi

FISHING TRIAL I (14-17 June 2004)

The local fishers agreed that the proposed action plan on the introduction of fishing technique improvement should be implemented. The first fishing gear trial was therefore designed to investigate the effectiveness of the selected fishing gear.

Objectives

- 1) To conduct fishing trials and investigate the fishing efficiency of the following fishing gears:
 - a) Collapsible crab trap
 - b) Bottom vertical longline (BVL)
 - c) Trolling line
 - d) Ivory whelk trap

Area of Operation

The fishing trial covered the area around the Artificial Reef and Fish Aggregating Devices (ARs/FADs), 3-5 nautical miles (nmi) off the coast of Kuala Teriang in the western part of the Langkawi coastal zone. The approximate depth of the area is 20-25 m while the depth around the ARs/FADs is 15-20 m and in front of the Marina Yacht Club, Pantai Kok with a depth of 5-8 m. The stations for the trials are marked as in the Map below:



Fishing trial stations in Kuala Teriang

Detailed Activities

14 June 2004 (Monday)

- 0900 Arrival Kuala Teriang, preparation of fishing gear and discussion with fisheries officer and fishermen group leader.
- 1145 Departure from Kuala Teriang for fishing ground at ARs/FADs and FADs.
- 1205-1240 Setting up of fishing gear: 50 collapsible crab traps, 20 Ivory whelk traps then return to Kuala Teriang
- 1340 Arrival in Kuala Kuala Teriang

15 June 2004 (Tuesday)

- 0935 Departure from Kuala Teriang for fishing ground
- 1005-1430 Hauling of collapsible traps and Babylonia traps, setting up of 1st BVL (50 branch lines) and 4 sets of trolling line, setting up of 2nd collapsible trap then return to Kuala Teriang
- 1500 Arrival at Kuala Teriang

16 June 2004 (Wednesday)

- 0900 Departure from Marina Yacht Club, Pantai Kok for fishing ground
- 0920-1330 Hauling of collapsible traps, setting up of 2nd BVL (50 branch lines), setting up of 3rd collapsible trap then return to Pantai Kok
- 1330-1400 Arrival at Marina Yacht Club, Pantai Kok

17 June 2004 (Thursday)

- 1000 Departure from Marina Yacht Club, Pantai Kok for fishing ground
- 1015-1100 Hauling of collapsible traps then return to Pantai Kok
- 1100-1115 Arrival at Marina Yacht Club, Pantai Kok

Results and Conclusion

Collapsible crab trap

Three fishing operations were deployed overnight during the sea trial operation. The fishing ground for the first and second operations were set around the ARs/FADs. The third operation was set in front of the break-wave of Marina Yacht Club, Pantai Kok, in order to compare the sizes of the crabs between near shore and around the ARs/FADs. The number of traps deployed on every operation was 50 traps. Indo-Pacific mackerels were used as bait for the traps.

The total volume of swimming crabs caught during the three (3) operations was 14.86 kg consisting of 76 pcs of crabs. The total percentage of the swimming crab caught compared with number of traps deployed was 50.67 %. The highest catch was in station No.2 at 7.92 kg/38 individual crabs followed by station No.1 with 5.1 kg/26 individual crabs, and station No.3 with 1.84 kg/12 individual crabs. The average size of the crabs at the ARs/FADs area was about 200 g/crab and at station No.3 which represented the near shore fishing ground was about 150 g/crab. Considering the fishing ground and the size of the crabs, responsible researchers recommended to operate the collapsible crab traps in the area around the ARs/FADs since the abundance and size of swimming crabs near the shore area was less and smaller than those around the ARs/FADs.

The second dominant species was Terapon (*Terapon* spp.). Ninety individual Terapons with a total weight of 3.9 kg were caught during the three (3) operations. The first operation had the highest catch (3.3 kg with 73 individual fishes). However, since Terapons were classified as trash fish it is necessary to develop an appropriate method for filtering out the fish from the trap. So far, the responsible manner adopted was releasing the fish back to the sea during the hauling operation otherwise using the fish as baits for the traps.

The other commercial catch is grouper (*Epinephelus* spp.) Forty three groupers with a total weight of 6.33 kg were caught during the three fishing operations. The average size of the grouper was 147 g, which comprised the third major catch. Most of groupers were alive during the hauling operation and most of them were delivered to fish cages for culture. Ivory whelk (*Babylonia areolatus*) was an important incidental catch, discovered only during the third operation in front of the Marina Yacht Club, Pantai Kok. Collapsible trap has shown to be efficient for collecting the Ivory whelk.

Thus, it could be concluded that the collapsible trap trial was very successful. The target resources, i.e. swimming crabs and grouper showed high catch rate. However, investigation of the trap selectivity for other marine animals such as trash fishes, Ivory whelk, etc. should be done before extending the technology to the local fishermen. The following management issues should be considered before extending the technology to local fishermen:

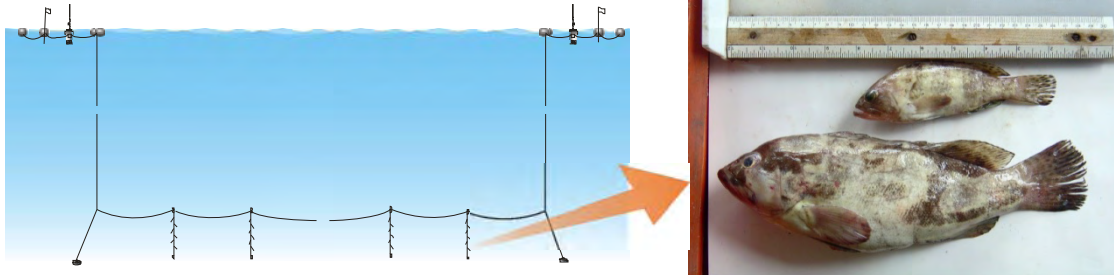
- 1) Investigate crab abundance in the fishing grounds
- 2) Control the proper number of traps in fishing grounds
- 3) Monitor the number of crab landing in order to find out the indication of abundance
- 4 Control the landing size of crabs in order to reduce recruitment and over-fishing
- 5) Increase the value of the catch by live preservation techniques or live storage methods



Collapsible crab trap trial and catches in Langkawi
(Photo by Research Division, SEAFDEC/TD)

Bottom Vertical Longline

The problem in setting up of the BVL around the ARs/FADs was the lack of an echo sounder. In order to prevent entangling of the BVL with the ARs/FADs, the mainline was set out of the artificial reef area in the fishing ground as done by local fishermen with the ordinary bottom longline. The catch was successful during the fishing trial, with the highest catch in the first operation. Croaker was the dominant catch with 6.8 kg/46 fishes. Other fishes caught were the Starry emperor fish and Threadfin bream. It should be mentioned that the dominant catch was not the rocky fish but remained with their schooling behavior. The hooking rate by the 1st operation was satisfactory, about 30 fishes/100 hooks.

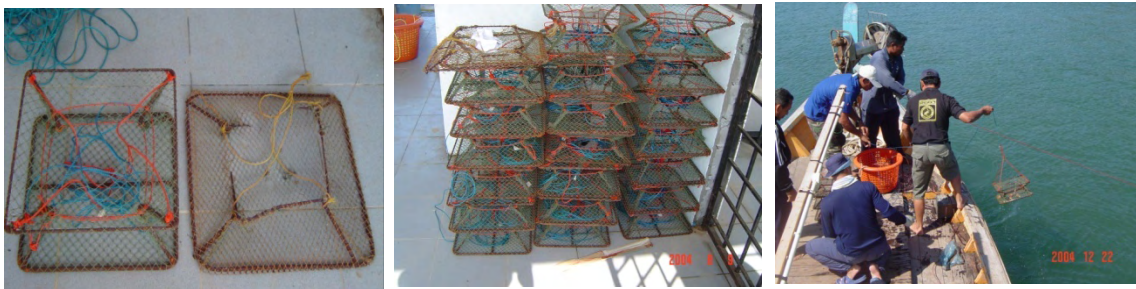


Bottom Vertical Longline construction and catches
(Illustrated and Photo by Research Division, SEAFDEC/TD)

The second operation was deployed crossing the artificial reef area, but it was observed that the bait was eaten by the smaller fishes. Majority of the catch could not be identified because of the less number of catches, 12 individual fishes. The hooking rate in the second operation was unsatisfactory, less than 10 fishes/100 hooks. The BVL fishing operation at the fishing ground of Kuala Langkawi showed different fishing potential because the operation could be conducted even in the area without rocky substrate, showing that the fishing ground has very rich resources.

Ivory whelk lift net and ivory whelk trap

Operating the ivory whelk lift net and ivory whelk trap was not successful during the first trial because the researchers selected the wrong fishing ground. It was only during the conduct of the last collapsible trap operation that the researchers were able to recognize the Ivory whelk fishing ground which was located in front of the break-wave of Marina Yacht Club, Pantai Kok. The fishing ground for the ivory whelk was in a very particular place as suggested by the local fishermen.



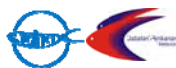
Ivory whelk lift net and ivory whelk trap and fishing trial
(Photo by Research Division, SEAFDEC/TD)

Trolling line

Trial operation of the trolling line in Langkawi was aimed to test the artificial lure. The result of the trial around the ARs/FADs was not successful because the types of artificial baits were not able to catch the fishes. From the previous trips during the fishing gear survey, trolling and hand lining made use of live baits. This was applicable and the local fishing techniques were found appropriate for fishing in the ARs/FADs area.



Trolling line accessories
(Photo by Research Division, SEAFDEC/TD)



FISHING TRIAL II (20-23 December 2004)

Because there were various kinds of fishing gear planned to be tried in Langkawi fishing ground, the first fishing trial could not be completely investigated. After the local fishers agreed that the proposed action plan on the introduction of fishing technique improvement, the second fishing gear trial was designed to investigate the effectiveness of remaining fishing gear.

Objectives

- 1) To conduct fishing trials and investigate the fishing efficiency of the following fishing gears:
 - a) Collapsible fish trap
 - b) Lobster trap
 - c) Wooden squid trap
 - d) Ivory whelk Trap
- 2) To compare the fishing efficiency of various types of collapsible crab traps.

Area of Operation

The Fishing trial covered the area around the Artificial Reefs and Fish Aggregating Devices (ARs/FADs), 3-5 nmi off the coast of Kuala Teriang, western part of the Langkawi coastal zone. The approximate depth of the area is 20-25 m, the depth around the ARs/FADs was 15-20 m and in front of the Marina Yacht Club, Pantai Kok, the depth was 5-8 meters. The stations were marked as shown in the Map below:



Detailed Activities

20 December 2004 (Monday)

- 0930 Departure from Marina Yacht Club, Pantai Kok for fishing ground
1000-1500 Fishing trial around ARs/FADs off Kuala Teriang, i.e. setting up of 52 collapsible crab traps, 5 collapsible fish traps, 10 squid traps, and 20 Ivory whelk traps
1630 Arrival at Kuala Teriang

21 December 2004 (Tuesday)

- 0930 Departure from Marina Yacht Club, Pantai Kok for fishing ground
1000-1400 Hauling of 1st collapsible traps and resetting for 2nd operation, hauling of squid traps (found that 6 squid traps were lost), hauling of Ivory whelk traps, and setting up for 2nd operation.
1400 Arrival at Kuala Teriang

22 December 2004 (Wednesday)

- 0900 Departure from Marina Yacht Club, Pantai Kok for fishing ground
0920-1330 Hauling of 2nd collapsible trap and setting up of 3rd operation, hauling of 2 squid traps (found 8 squid traps were lost), hauling of 5 fish traps and then resetting, hauling of 20 Ivory whelk trap, and resetting for 2nd operation
1400 Arrival at Marina Yacht Club, Pantai Kok

23 December 2004 (Thursday)

- 0900 Departure from Marina Yacht Club, Pantai Kok for fishing ground
0930-1200 Hauling of collapsible crab traps, hauling of remaining 2 squid traps, hauling of 5 fish traps, hauling of 20 Ivory whelk traps
1230 Arrival at Marina Yacht Club, Pantai Kok

Results and Conclusion

Collapsible Fish trap

Referring to the first fishing trial of Bottom vertical longline, the potential of demersal fish resources particularly grouper and Jew fish around the ARs/FADs showed efficiency for developing a steady supply for the fish markets and cage culture facilities around Langkawi and adjacent areas. Fishing gear technologists therefore considered designing and constructing a local fish trap the size and material of which should not create burden for the fishers to carry to their fishing boats. The design of such collapsible fish trap was based on the combined design of the collapsible crab traps and red sea bream fish traps which are widely used by Thai fisherman.

The frame of trap is made of 8.0 mm iron bar. The trap wall is made of polyethylene net with 380d/15 twine size. The trap's height is 80 cm, width is 70 cm and length is 120 cm with 2 circle shape entrances. The trap is meant to be collapsible in order to maximize the number of traps that can be loaded in a fishing boat. Approximately, about 20 traps could be carried by a fishing boat in one trip. Baits are used to attract the target fish. During the fishing trial, five collapsible fish traps were set up over-night and the catch result was very satisfactory. The dominant target species caught by the fish traps was grouper. The average catch of grouper per trap per hauling time was 0.51 kg/trap/hauling with an average size of 221 g/individual grouper. Swimming crabs were also caught as by-catch. The total weight of the swimming crabs was 4.88 kg and average swimming crab per trap per hauling time was 0.49 kg/trap/hauling with an average size of 257 g/individual crab, which was bigger than the average size of crabs caught by the collapsible crab trap. Based on the preliminary catch report, it can be concluded that the collapsible fish trap is efficient for promotion to the fishermen in Langkawi.

The first operation for this fishing trial was on 20-22 December 2004 and the second operation on 22-23 December 2004. The different soaking interval has been set between operation No.1 and 2. However, there was not much difference in catch between the soaking time of 48 hours and 24 hours. It can be preliminary concluded that the collapsible fish trap could be set over-night only and the fishermen could haul the catch every day.

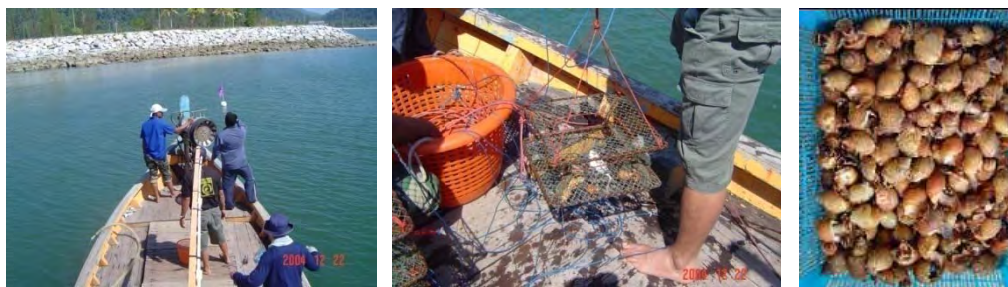


**Collapsible fish trap trial and catches in Langkawi
(Photo by Research Division, SEAFDEC/TD)**

Ivory whelk trap

The Ivory whelk trap was targeted to collect the Ivory whelk (*Babylonia aerolatus*). The design of the trap is uncollapsible, which was developed from the Ivory whelk small lift net. The top side of the trap is left open for convenience in removing the Ivory whelk, while the non-targeted fishes and crabs can easily escape from the Babylonia trap. The only problem with the Ivory whelk is marketing since it is not a favorite shell in Langkawi, while there are no export industries operating in the island at present.

Since the first fishing trial in June 2004, the operation of Ivory whelk trap had not been successful because of some misunderstandings on the location of the appropriate fishing ground. On this fishing trial, three operations were conducted and the result was not different to the previous trips in June and August using the collapsible crab trap. The average size of the Ivory whelk was 40 g/trap and a catching rate of 10.1 kg/100 traps (373 ind/100 traps). However, it was still deemed necessary to investigate the abundance of Ivory whelk before extending the technology to the local fishermen because only one fishing ground was discovered at present.



Fishing ground, out of Marina Bay, Pantai Kok, Ivory whelk trap fishing trial and the catches
(Photo by Research Division, SEAFDEC/TD)

Squid trap

The squid trap targets the big-finned reef squid (*Sepioteutis lessoniana*). The trap, which was designed by Thai local fisherman, is uncollapsible. Ten squid traps were set during the sea trial and two traps were retrieved back after completing the last operations. The loss of 8 squid traps during the operations was caused by the weight of trap sinker which was too light. Since some trawlers came close to the ARs/FADs area at the night, these must have possibly caused some traps to be swept away.

Three squids were caught after soaking the traps for one night, all of them big-finned reef squid caught by only one trap. The total weight of the three squids was 920 g with an average weight of 307g/squid. The result of the squid trap fishing trial was unclear because almost of the squid traps disappeared from their original setting positions. However, from the observation of the first hauling, squid traps had shown efficiency to catch the three big-finned reef squids. It is therefore possible to harvest squids using the squid trap in the fishing ground around Langkawi Island.



Squid traps and catch, big-finned reef squid
(Photo by Research Division, SEAFDEC/TD)

An experiment was conducted to compare the fishing efficiency of the various types of collapsible trap designs. Three (3) types of collapsible traps, namely: 20 rectangular collapsible crab traps, 20 semi cylindrical crab traps and 12 local Malaysian traps, were set during the fishing experiments. All operations were deployed overnight around the ARs/FADs. The total catch from the three operations was 21.15 kg. The dominant species was the swimming crabs (63 pcs weighing 13.22 kg). The average weight of the crab was 220 g/crab. Almost all were female swimming crabs as indicated by the out-carapace egg stage. It should be considered that the spawning season of swimming crab around Langkawi Island is during the northeast monsoon.

During the first operation, there was a trouble in sorting the catch. All catches by type of collapsible trap were mixed on board without sorting so that it was not possible to separate the catches by trap. Thus, the comparison of the three types of traps was calculated from the catch data during the second and third operations. The catch result from the second operation had the best catch with 30 swimming crabs weighing 6.26 kg. The total weight of the swimming crabs from the 3 operations was 13.22 kg with an average weight of 0.08 kg/trap. The total number of swimming crabs was 63 crabs and the average number of swimming crabs was 0.4 crab/trap (2 crabs/5 traps).



**Three types of collapsible fish traps tried in Langkawi Island
(Photo by Research Division, SEAFDEC/TD)**

The catching performance of the SEAFDEC-designed collapsible crab traps was 180 g/trap and 75 ind/100 traps, while the catching performance for the local collapsible crab trap was 30 g/trap (10 ind/100 traps). The lobster traps were not able to catch any lobster but in terms of the catching performance of crab, the rate was 710 g/trap and 30 ind/100 traps. From the preliminary report, it appeared that the rectangular collapsible crab trap had the highest efficiency compared with the other two designs. The semi cylindrical and the local Malaysian trap designs showed closely similar average catch in terms of weight/trap.

TRAINING ACTIVITY ON FISHING TECHNOLOGY AND PRACTICE (9-11 August 2004)

After the selected fishing gears were found applicable during the conduct of the fishing trials, practical on-site training on fishing technology was designed for local fishers. The training on fishing technology is a sub-activity of the Fishing Gear Improvement in Langkawi under the LCBFM-PL.

Objectives

- 1) To conduct practical training for local fishers on fishing gear construction. This practical training aimed to make the local fishermen understand the construction of fishing gears and be able to construct and repair the gears by themselves. Aside from knowing the fishing gear construction technique, fishing selectivity features and responsible fishing methods are also introduced to the fishermen. The selected fishing gears are the *Bottom Vertical Longline* and the *Collapsible trap*
- 2) To conduct practical training for local fishers on fishing operation as part of the training program which aims to evaluate the fishing efficiency of the fishing gears. The fishermen's participation is enhanced through actual practice of the fishing operations for 3 types of fishing gears, namely: *Bottom Vertical Longline*, *Collapsible trap*, and *Ivory whelk trap*; and
- 3) To investigate the fishing ground for the Ivory whelk trap in front of Marina Yacht Club, Pantai Kok.

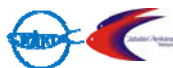
Area of Operation

The fishing gear construction training sessions were carried out at the office of KEN (Fisheries Cooperative) in Kuala Teriang. The fishing operations were conducted around the ARs/FADs, about 3-5 nmi from the Kuala Teriang. The approximate depth is 20-25 m, while the depth around the ARs/FADs is 15 to 20 meters. The catching efficiency of Ivory whelk trap was re-evaluated and its fishing ground was investigated in front of Marina Bay, Pantai Kok with a depth of 5 to 8 meters.

Detailed Activities

9 August 2004 (Monday)

0930	Arrival in Kuala Teriang, preparation of training facilities and training materials
1445	Departure from Pantai Kok for fishing ground at ARs/FADs
1445-1530	Setting up of fishing gears, i.e. 50 collapsible crab traps and 20 Ivory whelk traps then return to Pantai Kok
1600	Arrival at Pantai Kok



10 August 2004 (Tuesday)

- 0900 Arrival of all training instructors at Kuala Teriang
- 1100-1600 Departure of instructor and group A participants from Pantai Kok for fishing station. 20 Babylonia traps were set first in front of break-wave out of Marina Bay, Pantai Kok. First hauling of collapsible crab trap operation (24 traps were lost probably due to the encroachment of some bottom trawlers near the ARs/FADs). The second set of collapsible crab traps were put in operation.
- 1130-1200 Six participants under group B attend the lectures on Bottom vertical longline and Collapsible trap. Appointment for afternoon practicing set.
- 1445-1600 Continuation of the practice on collapsible crab trap construction

11 August 2004 (Wednesday)

- 0900 Arrival of all instructors at Kuala Teriang
- 1015-1200 Four participants in Group A attend the lectures and practicals on collapsible crab trap construction
- 1130-1330 Participants attend the shipboard training while instructors leave for Pantai Kok for the hauling operation of the deployed fishing gears
- 1430-1600 Eight participants attend the lectures and practice on the collapsible trap construction
- 1730-1900 Discussion on the training and activities concerning the trip

Results and Discussion

- 1) The training had the full cooperation of the Department of Fisheries Malaysia, specifically providing the hydro-acoustic equipment, i.e. echo sounder for detecting and recording the bottom topography around the ARs/FADs and Global Positioning Satellite (GPS) for recording the position of ARs/FADs. Two experts from the Fisheries Training Institute (FTI) of Terengganu also closely cooperated with the SEAFDEC staff during conduct the training activity.
- 2) Two unexpected incidents occurred during the training on fishing technology for fishermen in Kuala Teriang.
 - 2.1 A member of the fishermen group in the village passed away on 9 August 2004, and almost all fishers attended his funeral. Few fishermen came late for the training in the morning. Furthermore, in the afternoon some fishermen left the class early so that the training could not cover all the planned subject matters. Thus, the training was not able to achieve the expected goals.
 - 2.2 Due to the shrimp boom during the period of the training activity, almost all participants preferred to go shrimp fishing than attend the training. Some of the fisherman left the morning session and some unlisted fishermen attended the afternoon practice session. This made it very difficult to make all fishermen understand the details of the training program. The same problem also occurred during the fishing operation session. Some fishermen who attended the fishing gear construction did not participate in the fishing operation session while some fishermen who participated the fishing operation session did not attend the session on fishing gear construction.
 - 2.3 On the second day, no fisherman attended the fishing operation session because most of them left the village for shrimp fishing and since the Malaysian coordinator and instructor did not expect them to return on time the training activities had to be cancelled.
- 3) The researchers recommended that a more suitable training location be arranged because the office of KEN was located in the fishermen's village and the fishers could leave the class anytime they want to.
- 4) The training methodology should be carefully selected in order to capture the interest of the fishermen.
- 5) Because of the unexpected problems combined with the unsuitable training location, the fisheries training program in Langkawi was not 100% successful. The improvement of the training method should take into consideration an understanding of the living and daily activities of the fishermen.
- 6) The evaluation of the training for fishermen in Langkawi based on the instructors' observation is shown in the table below:

Collapsible crab trap

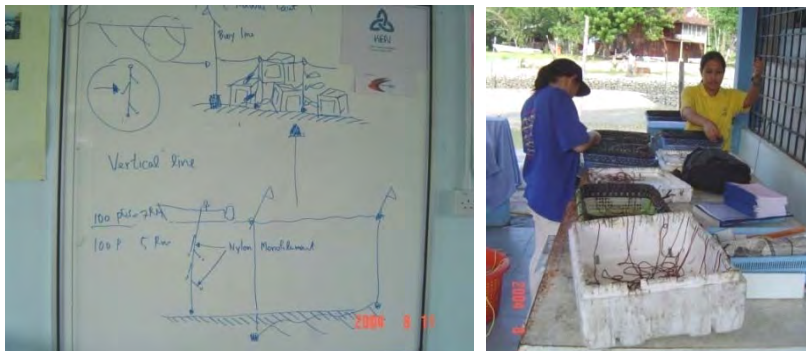
- 1) Fishermen participants were able to construct, repair collapsible crab traps and conduct the fishing operations by themselves.
- 2) The fishermen indicated their interest to further try the collapsible crab trap fishing operation and requested SEAFDEC to arrange for the traps at the fishermen's expense.
- 3) Due to the limitation of practical time, the construction of collapsible trap frame could not be practiced. Although the Instructor prepared some frames from SEAFDEC/TD, the fishermen requested the SEAFDEC instructors to teach them how to make the collapsible trap frame. The Instructors recommended to the local fishermen to copy the frame of the traps by themselves.



Practical training on collapsible crab trap construction and operation
(Photo by Research Division, SEAFDEC/TD)

Bottom vertical longline

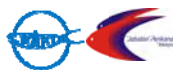
- 1) Bottom vertical longline was not strengthened during the practical session because there was not much time available for the practical construction. Fishing operation was conducted only once because the second operation had no fisherman participating, and the fishermen had already acquired skills and experience for bottom longline fishing operation.
- 2) Marine catfish was the dominant species for the BVL during this trip. Although it was not the main target for this fishing gear, it confirmed the efficiency of BVL in Langkawi fishing ground. However, it was also noted that the BVL design needs modification for fishing operations around the ARs/FADs.



Practical training on Bottom Vertical Longline construction
(Photo by Research Division, SEAFDEC/TD)

Ivory whelk trap

- 1) Fishing operation of Ivory whelk trap had been practiced during the training for fishers because the construction of Ivory whelk trap is not complicated. The fishermen could easily copy the prototype of an Ivory whelk trap.
- 2) It was confirmed that the Ivory whelk fishing ground has been discovered off the break-wave of Pantai Kok. However, the abundance of the Ivory whelk should be investigated and monitored in a longer term. It was also essential to search for other Ivory whelk fishing grounds if the fishers would like to harvest this resource in the future.
- 3) Marketing of Ivory whelk was a major problem for the promotion of harvesting this resource.



List of Instructors

- 1) Dr. Seiji Etoh from SEAFDEC/TD (Chief of Project and Program Consultant)
- 2) Issara Chanrachkij from SEAFDEC/TD
- 3) Pratakphol Prajakjitt from SEAFDEC/TD
- 4) Mr. Hussin bin Abdul Rahman from Fisheries Training Institute (FTI), Terengganu
- 5) Mr. Mustafa bin Bidin from Fisheries Training Institute (FTI), Terengganu
- 6) Ms. Toko Nakajima from SEAFDEC/TD

List of Participants

- 1) Mr. Mansor bin Ali
- 2) Mr. Archad bin Ramli
- 3) Mr. Anura bin Taib
- 4) Mr. Mohamad Zul bin Putih
- 5) Mr. Ahmad bin Hamid
- 6) Mr. Osman bin Anustafa
- 7) Mr. Azman bin Chepa
- 8) Mr. Saad Sirun
- 9) Mr. Che Won Sood
- 10) Mr. Roz Ismail
- 11) Mr. Ramli Hassin
- 12) Mr. Roslizan Razali
- 13) Mr. Hassin Ismail
- 14) Mr. Chepa Bakar
- 15) Mr. Yusuf Saleh

TRAINING FIBER REINFORCED PLASTIC (FRP) WORKS (23-26 May 2005)

A serious disaster in Southeast Asia and South Asia on 26 December 2004, the Tsunami that occurred along the Coast of Andaman Sea, generated by an earthquake around Aceh in the northern part of Sumatera Island of Indonesia, led to a massive tidal wave. The powerful tidal wave destroyed infrastructures, fishing villages and fishing facilities along the shores from Indonesia to the coasts of Africa. Malaysia was one of the countries directly affected by that Tsunami and according to the information released by the Department of Fisheries Malaysia, Kuala Teriang was one of the fishing villages in Langkawi Island directly affected by the Tsunami, where houses, jetties, fishing boats including fishing gears had been badly damaged.

SEAFDEC as an intergovernmental organization established in Southeast Asia, is responsible for the promotion of sustainable fisheries in the region. Based on its technical competence in various disciplines of fisheries, SEAFDEC over the past almost 40 years, has played a significant role in fisheries development in the region. One of the activities of SEAFDEC mobilized by the SEAFDEC Training Department is on ship construction and marine engineering. This was part of elements promoted during the rehabilitation process of the concerned Tsunami-damaged area in Kuala Teriang.

With this reason and while responding to the request from the Kuala Teriang fishermen, SEAFDEC collaborated with the DOF Malaysia, KEN and LKIM (Malaysia Fisheries Development Authority) in Kedah State, in the conduct of a training program on the use of Fiber Reinforced Plastic (FRP) materials for ship parts repair, for the local fishermen in the affected area. The training program is part of the sub-activity Fishing Gear Technology Improvement under the ICFM-PL project.

Objectives

To develop human capacity in repairing minor damages to wooden fishing boats during the tsunami wave and the possibility of replacing the wooden parts with FRP materials.

Expected outcome of the activity

- 1) The fishermen gaining basic knowledge and techniques in fiberglass materials for repairing minor damages to wooden boats.
- 2) The fishermen resuming their fishing activities after completion of the repairs to their fishing boats.

Training contents

23 May 2005

Morning session

Thirteen (13) participants attended the meeting for the training course arrangements. Ms. Sabidah informed the meeting on the objectives of SEAFDEC's mission in Langkawi, which was to train fishermen on FRP for repairing the fishermen's boats. The arrangements included the training period (0900 to 1600 hrs from 24 to 26 May 2005), program and regulations on allowance payment. The participating fishermen collaborated with organizers in preparing two old fishing boats as training tools.

Afternoon session

SEAFDEC team prepared some equipment and materials, e.g. wood, plywood, saw, electric hand drill, electric grinding machine, roller, etc.

24 May 2005

Morning session

Training activities started at 0900 hrs at the meeting room of KEN's office, where Ms. Sabidah informed the participants on the objective of the training course, that is the knowledge gained from the training would help the fishermen repair some parts of their fishing boats by themselves, and to some extent to make some parts of a fishing boat, e.g., roof of engine, seat in boat, etc.

Mr. Sutthipong lectured on the following:

- 1) What is fiberglass and what it is made of,
- 2) Benefits and advantages of using fiberglass,
- 3) Samples of fiberglass products,
- 4) Materials of fiberglass,
- 5) Methods and ratio of fiberglass,
- 6) Calculation of FRP materials, and
- 7) Pre procedure before boat repair

Afternoon session

All participants moved from the lecture room to practical session in the camp. There were two boats for repair and for making fiberglass parts. One boat was repaired and its cabin constructed, and the other boat had also its cabin constructed. Training on the repair of the first boat started by checking the damaged areas which were then repaired, the second step took off by repairing the damages parts, and the third step was to copy the old parts of boat using new plywood as materials. The three steps took too long to complete so that the training could not be finished within one day. The repair of the second fishing boat was started by cleaning the old color around the boat, and preparing the plywood for the cabin.

25 May 2005

Morning session

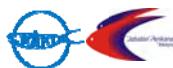
The participants continued to prepare new parts of the boat using plywood, a step which was difficult and took long time to finish because this would make use of a carpenter's knowledge.

Afternoon session

When the replacement of old parts by new parts using plywood was finished, Mr. Sutthipong explained on the value of fiberglass used per surface area. The first layer of fiberglass would be applied, after the structure of the boat was finished. The second step would lay up the glass fiber and cover with polyester resin again. All work should be left to dry.

26 May 2005

After all parts had dried up, work on the surface was made by electric drill for the third layer coating, which should be applied two or three times to make the surface smooth.



Conclusion and recommendations

- 1) The fishermen understood the area or parts of the boat to be repaired and how to replace such area or parts.
- 2) The fishermen understood the four (4) major steps of fiberglass works.
- 3) The fishermen requested second training on construction of fiberglass boats for the members of KEN. However, the materials from Thailand was not enough for this training because the first plan was intended for demonstration only, such as making some parts of the boat or ice box but the fishermen wanted to make cabins for the two boat, so much of the materials would be used.
- 4) The instructors for this training were not sufficient to take care of all participants.

Training coordinators

Ms. Sabidah BT Saleh, Extension Officer, DOF, Langkawi

Ms. Sumitra Ruangsivakul, Head a.i., Socio-economic Section, Research Division, SEAFDEC/TD

Instructors

Mr. Sutthipong Tanasarnsakorn: Head, Marine Engineering Section, SEAFDEC/TD

Mr. Thaweesak Thimkrup: Instructor, Marine Engineering Section, SEAFDEC/TD

Participants

The beneficiaries who are fishermen in the project area:

Mr. Ismail Jaman	Batu Ara
Mr. Dali Murad	Kg. Ranggut
Mr. Hashim Ismail	Kuala Teriang
Mr. Roslah Othman	Batu Ara
Mr. Saad Siran	Batu Ara
Mr. Hj. Pazil Din	Kuala Malaka
Mr. Musa Ahmad	Kg. Ranggut
Mr. Lazim Hashim	Kg. Paya
Mr. Osman Awang	Kuala Teriang
Mr. Baharam Sharif	Kg. Ranggut
Mr. Rozi Ismail	Kg. Ranggut
Mr. Ismail Taib	Kuala Teriang
Mr. Musa Taib	Kg. Ranggut

CONCLUSION OF THE PROJECT ACTIVITIES ON FISHING TECHNOLOGY IMPROVEMENT IN LANGKAWI ON 18 NOVEMBER 2005

The workshop on Fishing Gear Improvement in Langkawi was held at the Aquaculture Project Office Meeting Room, Langkawi Fisheries Office on 18 November 2005. The workshop was aimed to review the previous activities and seek for solutions to the problems encountered during the implementation of the various sub-activities such as introducing fishing gear and fishing operation as well as arrangements for the future programs required by the local fisherman in project area. The following contains the report of workshop including the outcomes of the discussions with the fishermen and local fisheries officers.

Details of discussion

The Chairman of Meeting, Mr. Sei Etoh, expressed his gratitude to all local fishermen and the Malaysian fisheries officers who came and welcomed them to the meeting. He briefly presented objectives of the meeting i.e., to review the work on fishing gear technology improvement in Langkawi, to analyze the problems in implementing the four introduced fishing gears and operations, and to discuss the plans for 2006. The background of the *Fishing gear improvement in Langkawi* activity was reviewed as well.

The conclusion of the activities conducted under the Fishing Gear Improvement in Langkawi included the following:

1) Fishing Gear Improvement.

1.1) The purpose of the activity on materials improvement was to look for appropriate materials that could be used for a longer time.

Progress: Fishing gear materials, e.g. Non-rusty hook, Ethylene Vinyl Acetate (EVA) float for gillnet are not available in domestic fishing stores. Such materials had to be ordered from foreign countries such as Thailand, Vietnam, Taiwan and Korea. The process therefore, was difficult to conduct.

1.2) Finding out new sources of materials supply for the fisher groups under the cooperative mechanism.

Progress: The activities involved the local fishing stores in order that the source of the low price of nets could be facilitated by ordering the materials from net making factories in Thailand. This needed further agreement from the local fishermen.

1.3) Improving the fishing gear storage in order to extend the life span of the gear.

Progress: Not implemented because fisherman had proper storage of their fishing gear.

2) Based on the results of the fishing gear survey in the project area, and the fishing trials I and II, fishing gears had been selected for the fishing trials as shown below:

1) Bottom vertical longline (BVL)	Done/satisfactory
2) Collapsible crab trap	Done/satisfactory
3) Collapsible Fish trap	Done/satisfactory
4) Ivory whelk Trap	Done/satisfactory
5) Trolling line for pelagic fish	Done/satisfactory
6) Squid trap	Done/incomplete
7) Trolling line for squid	Not tried because of lack of experts

3) Improvement on deck machineries and installations

Progress: Local hauling devices for gillnet was found suitable for large inboard gill net fishing boats. The introduced new devices for small-scale fishing boats, however, should be imported from foreign countries because most of boats were outboard equipped, which is not proper for long term investment.

4) Improvement on mechanical techniques

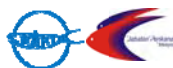
Progress: Practical training on mechanical targeting the outboard engine maintenance was conducted with the collaboration of the Department of Fisheries Malaysia, KEN and LKIM (Malaysia Fisheries Development Authority) in Kedah State, and SEAFDEC/TD marine engineers.

5) Improvement on Fiber-Reinforcement Plastic (FRP)

Progress: Practical training was conducted with the collaboration of the Department of Fisheries Malaysia, KEN and LKIM (Malaysia Fisheries Development Authority) in Kedah State, and SEAFDEC/TD marine engineers. The local fishermen had requested the chairman for practical training on FRP fishing boat construction.

6) Improvement on fish handling and preservation techniques

Progress: SEAFDEC/TD promoted the use of fish containers on-board fishing boats in order that the fishers could improve the quality of their catch before landing.



After the meeting, the conclusion related to the activity on Fishing Gear Improvement in Langkawi could be described as follows:

Collapsible crab trap

Problems/Constraints	Suggested Solutions
1) Fishermen were concerned that the bottom trawl fishing activities in their fishing ground might damage the collapsible crab traps	1) Zoning arrangement shall be introduced in 2006. The zoning policy can prevent the fishing activity conflict between bottom trawl fishing and the fishermen in the concerned zone.
2) The investment needs certain amount of money. The fishermen requested SEAFDEC to support some fishing gears.	2) No comment from SEAFDEC side on the subsidies in terms of fishing gears and accessories.
3) The introduced fishing gears <u>may</u> disturb the drifting nets.	3.1) Fishermen did not consider this as a serious problem however the collapsible crab trap could be possibly set only in the daytime. 3.2) Fishing gear can operate close to the ARs/FADs to prevent any disturbance with the drifting nets.

Bottom vertical longline

Problems/Constraints	Suggested Solutions
1) Fishing ground is very limited corresponding to the several ARs/FADs.	1) The fishermen suggested that the operation of BVL could be implemented after the 10 ARs/FADs are installed in 2006. 2) BVL should be promoted as it showed fishing efficiency by catching some demersal fishes on the flat bottom topography in the fishing ground out off the ARs/FADs.

Ivory whelk Trap

Problems/Constraints	Suggested Solutions
1) No market	1) SEAFDEC was asked to establish a program on marketing promotion.
2) Specific and limitation in terms of number of fishing grounds	2) Investigate more fishing grounds in order to sustain the catch in the future.

Squid trap

Problems/Constraints	Suggested Solutions
1) Fishermen were concerned on possible disturbance caused by the drifting net.	1.1) No discussion on the possible solution. 1.2) Fishing gear can be operated close to the ARs/FADs to prevent any disturbance with the drifting net.

Collapsible fish trap

Problems/Constraints	Suggested Solutions
1) Fish traps could be stolen by other fishermen.	1) No discussion on the possible solution.
2) Fishermen were concerned that bottom trawl fishing activities in their fishing ground may damage the collapsible fish traps.	2) Zoning arrangement shall be introduced in 2006. The zoning policy can prevent any fishing activity conflict between bottom trawl fishing and the fisherman in the concerned zone.
3) Fishing gear <u>may</u> disturb the drifting net and bottom gillnet in coral reef area.	3.1) Fishing gear can operate close to the ARs/FADs to prevent any disturbance with drifting net. 3.2) Limit the fishing ground of trap within the area of the Kuala Teriang ARsFADs.
4) Cost of fishing gear construction is high. The fishermen requested SEAFDEC to support some fishing gears.	4) No comments from SEAFDEC side on the discussion on subsidiaries in terms of fishing gear and accessories.

Regarding the future plan for 2006, the meeting discussed and concluded to conduct activities, the details of which appear in the following table:

Items	Results of Discussion
1) Improvement of Mechanical technique	The Fishermen <u>agreed</u> to conduct training on marine outboard engine. The training shall be conducted by requesting technical assistance from the Fisheries Development Center in Penang, Malaysia. SEAFDEC shall take the responsibility of paying the allowances for the fishermen participants, lunch as well as coffee break. The Fisheries Development Center of Penang shall be responsible for the transportation costs, accommodation expenses and allowances of instructors. The training methodology shall be detailed during the further discussions.
2) Improvement of fish handling and preservation techniques 1.1) Mobile freezing unit and basic knowledge on refrigerator system 1.2) Mobile air pump unit for live marine catches	Activities on the improvement of fish handling and preservation techniques have been <u>disagreed</u> because 1) The fishermen commented that they were not interested in the mobile freezing unit because it is too big for their vessels and ice box is proper for their land preservation. 2) The fishermen have already invented air pump for live marine catches
3) Training on safety for small scale fishing boats	The fishermen <u>agreed</u> with the training activity. The training shall be conducted by requesting technical assistance from IPN, Terengganu. Training place and methodology shall be detailed during the further discussions.
4) Responsible fishing approach by using selectivity fishing gear i.e., introduction of shrimp bottom drift gillnet for reducing by-catch from shrimp fishing by trammel net	1) The fishermen showed <u>interest</u> in the shrimp bottom drift gillnet and a fishing gear technologist shall prepare the necessary fishing gear for trial next year.
5) Rehabilitation of mangrove area in the project site	Mr. Etoh had already planned the activity on the rehabilitation of mangrove area in the project site in 2006.

List of participants at the fishermen's workshop

SEAFDEC/TD

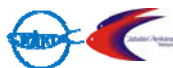
1. Mr. Sei Etoh
2. Mrs. Sumitra Ruangsivakul
3. Mrs. Penchan Laongmanee
4. Mr. Isara Chanrachkij
5. Ms. Saivason Klinsukhon

DOF, Malaysia

1. Mr. A. Krishnasamy, DOF, Kuala Lumpur
2. Mr. Dzulkifli b. Husain, IPM
3. Mr. Choong Kah Tung, DOF, Pulau Penang
4. Mrs. Sabidah Saleh, DOF, Langkawi

Fishermen

1. Mr. Rozi Ismail
2. Mr. Azman Chepa
3. Mr. Roslah Othman
4. Mr. Hashim Ismail
5. Mr. ABD Halim Hussain
6. Padzil Bin Din
7. Xansor Bin Xnan
8. Osman Bin Itan
9. Murai Bin Osman



FINAL DISCUSSION ON FISHING TECHNOLOGY IMPROVEMENT IN LANGKAWI

Since the first activities on fishing gear improvement in Langkawi had been approved within the *Locally Based Coastal resources Management – Palau Langkawi (LCBRM-PL)*, fishing gear experts from the Department of Fisheries Malaysia and SEAFDEC/TD had collaborated to carry out diverse activities for the purpose of enhancing the fishermen skills and experience on various fishing technologies, e.g., FRP technique, outboard engine and fishing practices. The first sub-activity had been carried out from March 2004 to May 2005. The final project discussion related to the fishing technology improvement concluded as follows:

- 1) According to the catch results, the marine resources in Langkawi, i.e. Banana shrimp, swimming crab and grouper, appeared abundant. Fishing gears, e.g. Trammel net, drifting gillnet, bottom gillnet were used with impressive catching efficiency. However, such kinds of gears are limited in terms of their selectivity features. In order to sustain the long-term fisheries resources, stock assessment on the resource abundance should be conducted through proper scientific methods. Any fishing gear implemented in Langkawi fishing ground should be limited in terms of their fishing capacity, e.g. size, number or type of gear or open access only for local fisher groups. Fishers and fishing gear registration should be strengthened in order to continue monitoring the local fishing capacity for sustainable fisheries resources.
- 2) Fishing gear capable of enhancing responsible fishing, i.e. collapsible fish trap, collapsible crab trap through diverse methodologies, e.g. crab bank, juvenile release, landing size control, and etc, should be promoted with proper responsible practices. Fishing technology promotion aimed to harvest the marine resources should be avoided in order to prevent over fishing in the future.
- 3) In order to harvest squids, handy cast net operated with lamp should be approved. Handy cast net and limitation of lamp can control low fishing capacity. However, giant cast net should not be allowed until the investigation on the impact of light fishing in the area is concluded.
- 4) Local fishermen in Langkawi have very good skills and experience on fishing gear maintenance and fishing operations. Further skills improvement should focus on marine engineering and fishing boat maintenance. Introducing alternative energy e.g. sailboat, engine modification for combusting by LPG (Liquid Petroleum Gas) should be introduced to local fishermen to prepare them to face the impact of the fuel crisis.



**Outboard engine with LPG (left) and fishing boat using sail (right)
(Photo by Capture Fisheries Technology Division, SEAFDEC/TD)**

- 5) Local fishermen should be grouped, then establish appropriate safety measures system for coastal fishing activities by small vessel as well as continue monitoring the illegal fishing boats that encroach the local fishing area. Communication or collaboration methods between the small scale local fishermen and patrol officers should be established.



**Bamboo markers to indicate underwater concrete blocks ARs (left) and illegal trawler (right)
(Photo by Research Division, SEAFDEC/TD)**

- 6) Improvement of fish handling and preservation techniques should focus on the live catch market in order to add income value for the fishermen. Live catches can supply the hotels and Chinese restaurants at Langkawi Island, Penang Island or in Hadyai, Thailand.
- 7) Coastal fisheries management by zoning policy should be introduced to protect marine resource destruction by bottom trawls. An agreement with other local fisher groups, however, should be established and clarified through announcements. strengthened in order to continue monitoring the local fishing capacity for sustainable fisheries resources.

