Some Technical Aspects on Midwater Trawl Operations
Lesson learn from Operations by M.V.SEAFDEC2 around Vietnam Waters

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Abstract

Twelve (12) midwater trawl fishing operations are operated by M.V. SEAFDEC2 around Central part of Viet Nam Waters during 5-26 June -18 July 2012. Study aims to obtain data of midwater net vertical opening. Depth recorders i.e. Net sonde and Depth loggers are set with trawl net. Net Sonde is installed to record the real-time and monitor depth of ground rope. Two (2) sets of Depth loggers are set at ground rope and float rope to record depth of capture and vertical opening. Result of fishing operation is revealed that vertical opening of net is 8 to 15 m. Obviously that weather condition and sea current causes trouble to fishing operation and safety of fishing crews. Sea depth should not be shallower than 40 m. Modification of midwater trawl net, i.e. reduce scale of net, change some lighter weight material, should be priority to study in the future. In addition, to enhance performance skill of deck crew, midwater trawling should be frequency operated.

Keyword: Midwater trawl , Vertical Openning, Vietnam Waters

What is Midwater Trawl?

Midwater trawl is a type of trawl net, operated by dragging or towing the flexible net through the water by fishing vessel, to catch pelagic fish in the middle layer (middle layer means the water layer in between the first few meter below the surface and the first few meter above the sea bed). Usually midwater trawl is carried out on the deep sea fishing ground. (SEAFDEC, 2005)

Midwater trawl Net of M.V.SEAFDEC2

Midwater trawl net what installed with M.V. SEAFDECs is manufactured by Taito Seiko Fishing Company, Japan. Trawl net is structured by four (4) net seams with head rope and fishing rope (or ground line) is equaled as 42.3 m. Left and right wing line (side seam) is 34.8 m. Total circumference of net mouth is 154.2 m. Length from wing net to codend part is approximately 88 m. Head rope is assembles with canvas kite, area is 5.3 square meter and fishing rope is assembles with chain diameter 19 mm.

Additional set of floats

1) Additional set of floats attach with head line.

In order to obtain higher lifting force, two set of additional floats is required to assemble at head line, on top of the kite. Each set of additional floats is composed with 10 ABS-floats, size 24 cm diameter (Commercial code CB-248B). Each float is buoyancy 6.2 kgf. Total of all additional set of floats are 124 kgf. Each set of ten floats are fixed by 2 Vinylon Compound Rope (CPR) diameter 16 mm, and covered by PE nylon net sheet.

2) Additional set of floats attach with net pendants.

Additional lifting force is also attached with, each side of net pendants. Each set of additional floats is composed with five (5) ABS-floats (Code. CB-368B), diameter is 360 mm. Each float is 31.0 kg buoyancy force. Total of both additional sets of floats are 310 kgf. Each set of five floats are fixed by two (2) pieces of Vinylon Compound Rope, diameter 16 mm.

Additional Sinker

a) Iron chain fixed with ground rope.

Material of sinker of trawl net is iron chain size 19 mm diameter. Total length of chain is 42.3 m. Weight of chain is 7 kg/m, Total weight assemble with ground rope is approximately 306 kg.

b) Additional weight fix with net pendants.

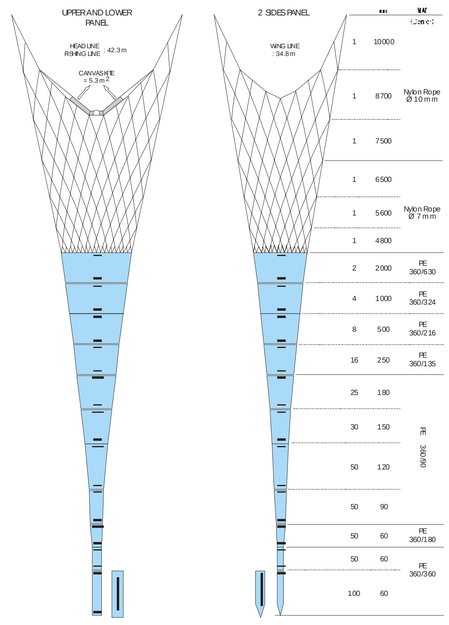
There are 2 set of additional weight, worm-liked shape. They made by combination material, i.e. iron chain, iron sinkers and pieces of punch tire. Iron chain is diameter 19 mm. 2.5 m, length. Iron weight is 5 kg/piece, 8 pieces. Punch tire diameter 150 mm, 80 pieces. Total weight is approximately 80 kg/set.

Otter board

Otter board of midwater trawl of MV SEAFDEC2 is Biplane design. The design is standard design of Japanese midwater trawl. Its dimension is 1,650 mm in height and 750 mm in length with double vertical boards. Weight in air of otter board body is 402.5 kg and weight in water is 350 kg.

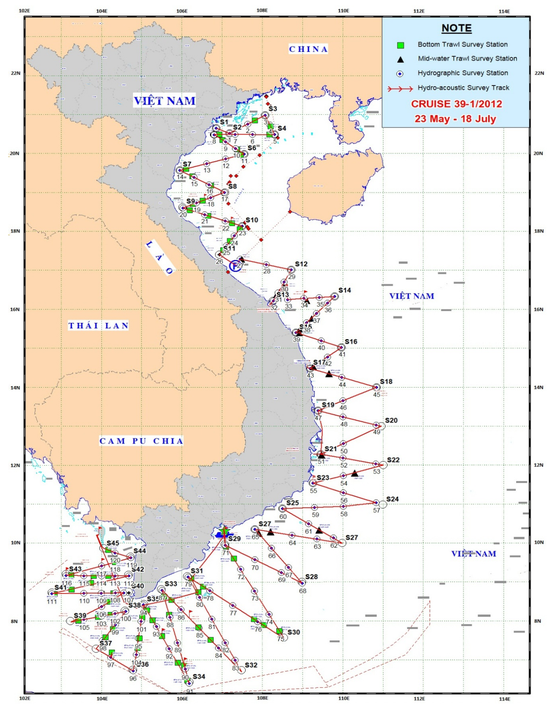
There are six (6) iron plates, assembled as additional weight. Each plate is 25 kg. Total weight in air of otter board body with additional weight is 574.7 kg and weight in water is 500 kg. Attacked angle is from 19 to 34 degree depended on otter board pendant setting.

Midwater trawl plan



Area of Sea Trial Operation

The operations are conducted Central part of Viet Nam Waters, South China Sea. Twelve (12) midwater trawl fishing operations, including with one (1) sea trial, are operated from station 11 to station 27. Midwater trawl fishing positions are shown by triangle symbol ( ) at Chart.



Method

1) Review secondary data is method to obtain basic information of midwater trawl install onboard M.V. SEAFDEC2. Report of Fishing gear inventories published by Taito Seiko Fishing Company, Japan, is described construction and fishing operation of M.V. SEAFDEC2.

Fishing gear handbooks (1990) published by Food and Agriculture Organization (FAO) and fact sheet on webpage of FAO-Fisheries is key reference to understand midwater trawling of the world.

2) Ten (10) Fishing operation including with 2 sea trial operations of Midwater trawl are conducted around Viet Nam Waters during June-July 2012. Information of midwater trawl net is emphasized on (1) depth of capture, (2) net opening and fishing operations in related with different criteria e.g. current condition, fishing gear structures by using kite and without kite.

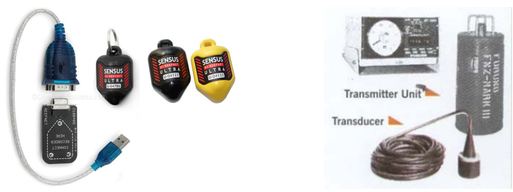
All fishing operation, Net Recorder (Net Sonde) Furuno FNZ-40 has been assembled at center of head line. Three (3) sets of depth loggers are fitted with head line, fishing line and otter board.

Material

1) M.V.SEAFDEC2 included with fishing finding system and deck machineries for trawling 1) 1) Midwater trawl net

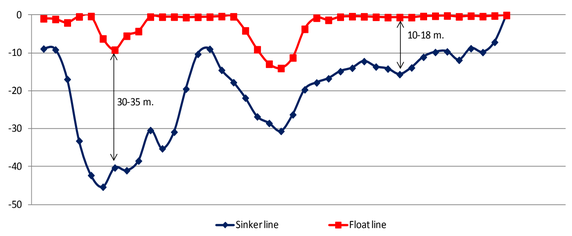
2) Depth loggers ReefNet Model Sensus Ultra

3) Net Sonde (Net Monitor) Furuno Model FNZ-40 with receiver and display



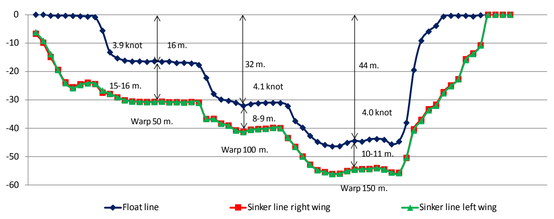
Left: Depth loggers Brand name ReefNet™ Model Sensus Ultra
Right: Net Sonde Furuno™ Model FNZ-40 with receiver and display

Result (1)
Operation No.1 and No2 is designed for sea trial and fishing gear arrangement target to enhance human capacity of deck crew and to maneuver practice of trawl fishing operation. Regarding to the limited depth as 60 m. Length of paid out towing warp is 150 m.
Net depth is different in regarding to the deployed of additional sinker. In case of additional sinker is fixed at lower net pendant, sinker line is deeper than 30 m but depth is decreased to 10-15 m while not setting of additional sinker are fixed.



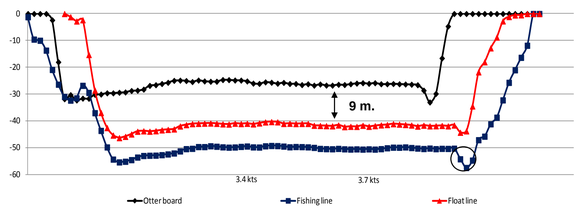
Result (2)

Sea trial on deployment of towing warp and fishing speed is operated by using 3 warp lengths, i.e. 50, 100 and 150 m respectively. Towing speed is used with 3.9-4.1 knot.
Result shows that warp length 50 m, depth of head line is 16-17 m and depth of fishing line is between 30-31 m. Net opening is between 15-16 m. Warp length 100 m. can control the depth of head line is 30-31 m and depth of fishing line is between 39-40 m. Net opening is between 8-9 m. Warp length 150 m. can control the depth of head line is 44-46 m and depth of fishing line is between 54-55 m. Net opening is between 10-11 m.

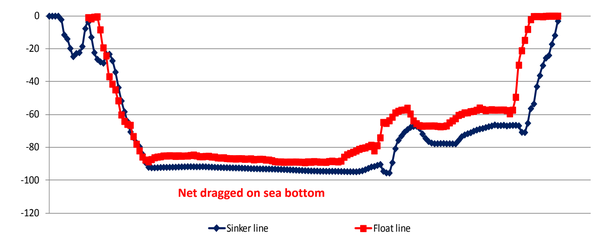


Result (4)

The second operation aims to investigate the net setting against the strong current. Regarding to current condition, 1.1 knot, setting net against current direction found that net opening is decrease from the regular opening of 10-11 m to 9 m (Figure).
It is observed that before hauling operation, vessel need to reduce speed to 1-2 knot to compensate with the hauling action. Trawl net in particular the fishing line is always descent 5-10 m in regard to speed of towing warp winch. By this reason, net setting to close sea bottom is caused accident of net get stuck with sea bottom in particular rocky of rough bottom structure (Circle Point).

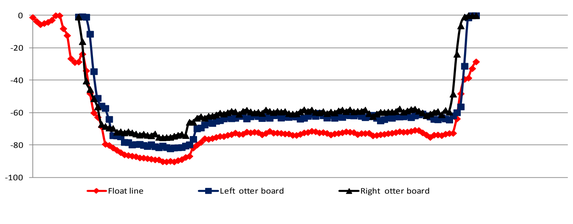


Result (3)
The operation has conducted without additional float at head line. Sea depth is 94 m. Towing warp is paid out at 300 m in length for 40 minutes but shortened to 250 m after 40 minutes. Estimate the depth of Head line at first 40 minute is 85 m and fishing line is touched the bottom at 94 m. Therefore net opening at the first 40 minute is 6 meters. After 40 minute fishing line is above sea bottom so net opening is expanded to 11 m. Observed by catch result found bottom fishes e.g. *Prioacanthis* sp. and etc. Catch result presumes sinker line reach sea bottom.

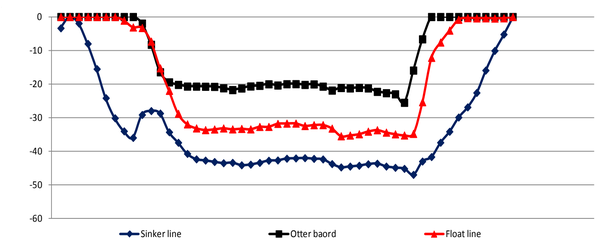


Result (5)

In case of net is affected trawling across current direction, towing lines are not in the point out with opposite angle between starboard towing block and port side towing block (See figure). Both towing warps intend to same direction depended on direction of current. By this phenomenon, otter boards are not in same depth layer because angle attack is different by current force. The operation No. 9 shows different of otter board layer 3-12 m.

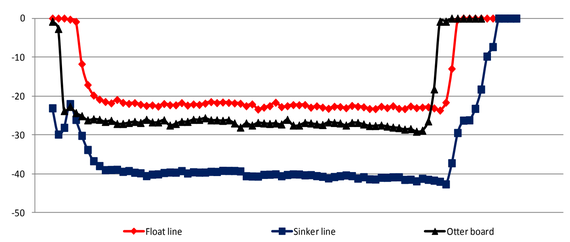


Result (6)
Result of setting midwater trawl net by otter board without additional weight is found the unsatisfied level of otter board. FAO (1990) refers that otter board level should be same level as net opening. The trial without additional show otter board is more than 10 m higher than head line. It is seem to effect of kite is make higher tension or dragging force at towing line than weight of otter board. (Lifting force by kite is more than sinking force) It is impact to angle attack and making net smaller net width.
The operation No. 3 and No.5 show the otter board setting without additional weight. Both of operations show otter board levels are higher than head rope approximately 10 m compare and more than center of net opening approximately 20 m.



Result (7)

Result of setting midwater trawl net, operation No.10 what conducted by using otterboard with additional weight shows the level of otter board is nearly center of net opening. Depth of Otterboard level is above the fishing line (ground rope) approximately 16 m, but lower than head line approximately 5 m. It is seem to effect of kite is closely to balance with weight of otter board. (Lifting force by kite is close to sinking force)



Result (8)

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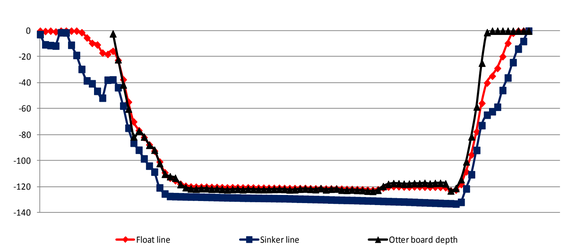

1. To investigate fishing efficiency, midwater trawl performance and pelagic resources abundance, Real-time depth sensors, e.g. net sonde, net recording etc., and depth logger is essential to record depth of capture and vertical opening.eration.
2. Net Sonde installed with midwater trawl net is only real-time depth sensor used for this cruise. The accuracy is found error at the depth less than 20 m. As well as trawl eyes sensor and wing net sensor found malfunction. All data of net depth is recorded by depth logger, attached at ground rope and float rope. During the trip, 2 depth loggers are lost because ground rope is dragged on sea bottom. Recommend to prepare accuracy net recorder and wing net sensor for midwater trawl operations.
3. Weather condition is one of the major hindrances affected to fishing operations during the cruise survey. Wind force level five (5) makes trouble the vessel maneuvering and danger to deck crew. It is found whist the vessel drifts more than 2 knot or wind force is stage 5 (25-40 km/hr). That is impossible for setting the net because speed of vessel during shooting net cannot be controlled. If shooting operation is success, strong wind directly affects to towing speed both follow wind and against to wind direction.
4. Regarding to weather and sea condition, speed of vessel is not able to operate more than 4 knot. That made midwater net performance is less than the sea trial by Taito Seiko Co., LTD. Japan, in year 2004.
5. Setting across strong wind or current cause otterboard layer is different between port and starboard as well as the dangerous to otter board turn up side down during shooting operation/ Setting across wind and current is dangerous to deck crew during setting and hauling net because trawler can not keep ship heading constant.
6. Refer to sea trial undertaken by Taito Seiko Co., LTD. Japan, midwater trawl net vertical opening is approximately 30 m. it is similar to operate whist additional sinkers are attached at lower net pendants. The operations without additional sinkers, however, are found 8-15 m vertical opening.
7. Refer to sea trial undertaken by Taito Seiko Co., LTD. Japan, midwater trawl net spread is approximately 20 m. Regard to the trouble of distance sensors, data of wing spread is not able to obtain during this experiment.
8. Depth is important for safety operation of MV SEAFDEC2 should not shallower that 40 m. However bottom characteristic need to investigate in the shallow water fishing ground before fishing operation. It is noted that net setting on the shallow fishing ground used very short towing warp and fish school may be frightened and defragged by vessel or propeller noise. There is possible to zero catch whist operate in shallow water fishing ground. High opening bottom trawl is option for area what sea depth less than 40 m.
9. Modification of midwater trawl net for more convenient for operation e.g. slightly reduce scale of net, change lighter weight fishing material.
10. Additional weight should be fixed at otterboard. Result of experiment show the similar position as experiment undertaken by Taito Seiko Co., LTD. Japan as otterboard depth is 5 m lover than float line.
11. In order to obtain the accuracy and performance skill of deck crew, midwater trawling should be frequency operated.

Acknowledgment

Authors would like to express sincerely appreciation to all crew of M.V. SEAFDEC2 and Vietnam researcher for their kind cooperation . Authors also express thanks to Government of Japan for kindly financial supporting the study through Japanese Trust Fund of SEAFDEC as well as Government of Vietnam for kindly collaborate on the sea trials and allow to promote result of experiment. The authors are also grateful to, Dr. Worawit Wanchana (PhD.) Head of Capture Fisheries Technology Division and Secretary-General and Chief of Training Department of SEAFDEC, dr. Chumnarn Pongsri (PhD.) for his comments on the report of Some Technical Aspects on Midwater Trawl Operations Lesson learnt from the Operation of M.V.SEAFDEC2 around Viet Nam Waters.

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