SAMPLING GEAR

TRAWL NET

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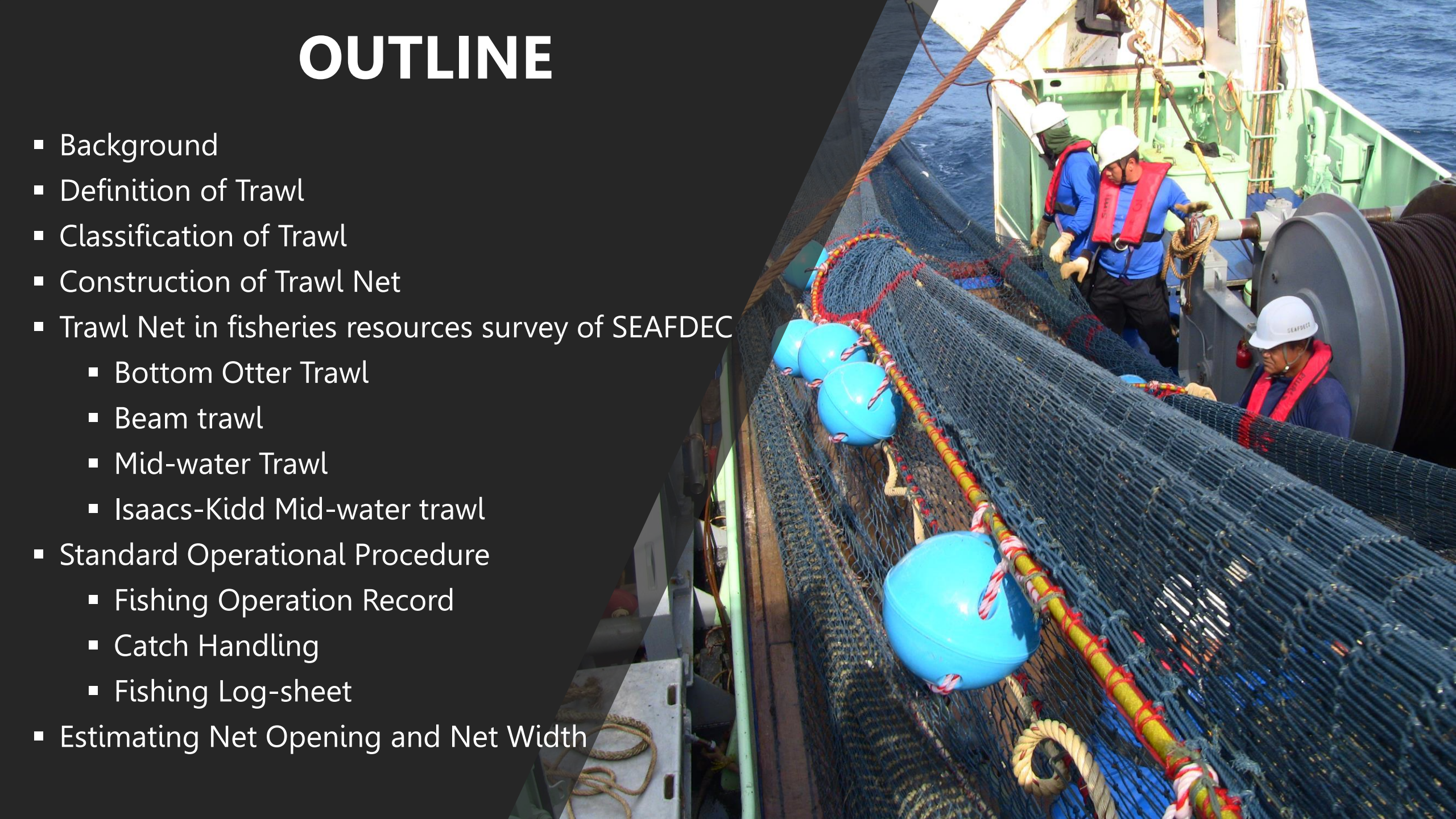


Background

- Marine Fisheries play significant roles to social and economic of the world. Marine productions provide a primary source of protein to people and contribute the livelihood to many sectors.
- In the past several decades, the growing international, regional and national demands for marine products have led to the continued development and modernization of fishing Technology and resulted in the over- exploitation of many fishery resources in the world.
- Fisheries resources data collection from cruise surveys need to improve and implement to support fisheries management to enhance sustainable fisheries resource
- Sampling gear is one of the problems to limit the efficiency of fisheries resource survey.
- Trawl net is widely use as sampling gear for investigate fisheries resource abundance and diversity
- Main objective to enhance human resources capacity building to junior fisheries officers and researchers, to conduct marine fishery resource survey by trawling.

Definition of Trawl Net (1)

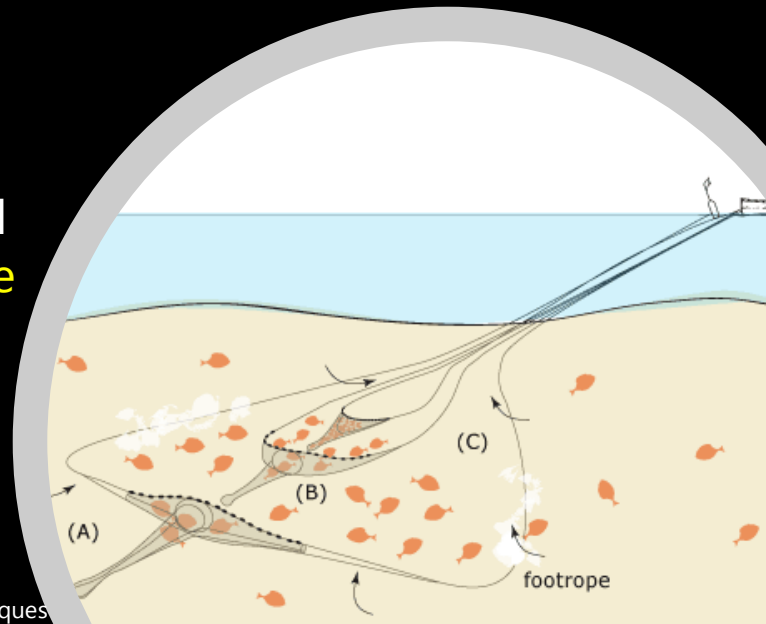

https://seafish.org/gear-database/gear/

FAO (1990) definite trawl nets are tow nets consisting of a cone-shaped body, closed by bag and cod end and extended at opening by wings.

They can be towed by one or two boats and, according to the type, are used on the bottom or in mid-water. In certain cases, as in trawling for shrimp or flatfish, the trawler can be specially rigged with outriggers to tow up to four trawls at the same time (double rigging).

Trawling in mid-water trawl is more complex than bottom trawling because of the requirement in maneuver the trawl vertically and horizontally to intercept fish school

Bundit C. (1985) refer to Baranov (1977) defines the difference between trawl and other fishing gear of the filtering class, as follow: If the length of fishing path of the gear exceed the length of the gear itself by few times (not over 5), then it is consider seine type gear. Whether or not the gear in action reaches the surface of water. If the length of fishing part of the gear is several tens or even hundreds of times (up to 1000) longer that the gear itself, this is trawl type gear.



https://www.montereyfish.com/finfish-techniques

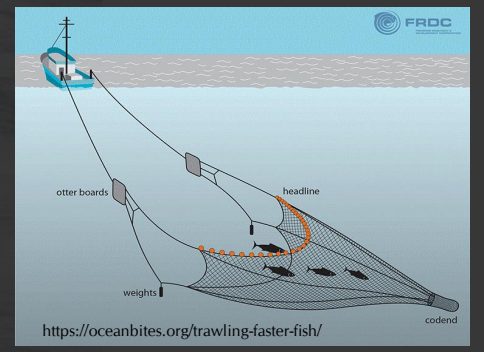
Definition of Trawl Net (2)

- Trawl Nets are **cone-shaped net** (made from two, four or more panels) which are towed, by one or two boats, on the **bottom or in midwater or at surface**. The cone-shaped body ends in a bag or coded.
- The horizontal opening of the gear while its towing is maintained by **beams, otter boards or by the distance between the two towing vessels** (pair trawling).
- Floats and weights and/or hydrodynamic devices provide for the **vertical opening**. Two parallel trawls might be rigged between two otter boards (twin trawls).
- The **mesh size in the codend** or special designed devices is used to regulate the size and species to be captured. (FAO)


https://seafish.org/gear-database/gear/


http://www.fishingforthetruth.co.uk/environment/whitefish-demersal-trawling/


http://www.cornwallgoodseafoodguide.org.uk/fishing-methods/beam-trawling.php



https://oceanbites.org/trawling-faster-fish/

Classification of Trawl Net

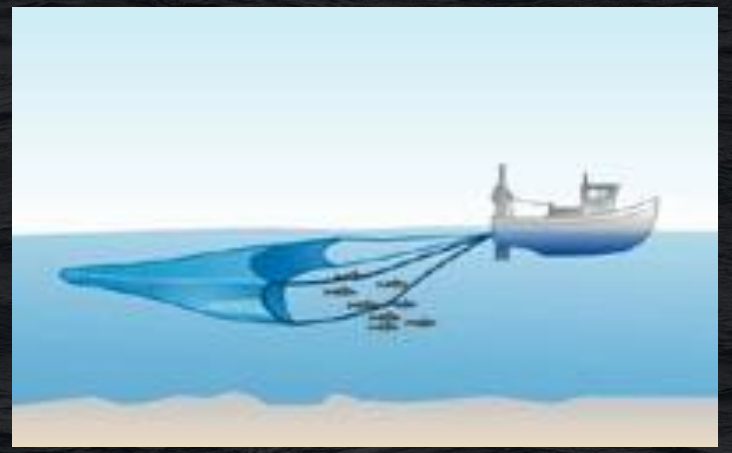
FAO (2010)
1) Beam trawls 2) Single boat bottom otter trawls 3) Twin bottom otter trawls 4) Multiple bottom otter trawls 5) Bottom pair trawls 6) Bottom trawls (nei) 7) Single boat midwater otter trawls 8) Midwater pair trawls 9) Midwater trawls (nei) 10) Semi-pelagic trawls 11) Trawls (nei)

Thailand DOF (1997)	Malaysia SEAFDEC (2002)	Viet Nam SEAFDEC (2002)	Indonesia SEAFDEC (2014)
1) Pair trawl 2) Bottom Otter Trawl a) Fish BOT b) Shrimp BOT c) Acetes BOT d) Jelly fish BOT 3) Beam Trawl	1) Bottom Beam Trawl 2) Bottom Otter Trawl 3) Bottom Double Rigging Trawl 4) Pair Trawl (Banned)	1) Bottom Beam Trawl 2) Bottom Otter Trawl 3) Bottom Otter Trawl with Boom 4) Pair Trawl	1) Bottom Trawl a) Beam Trawl b) Otter Trawl c) Pair Trawl d) Nephrop Trawl e) Shrimp Trawl f) Otter Trawl g) Pair Trawl 2) Mid-water trawl a) Otter Trawl b) Pair Trawl c) Shrimp Trawl 3) Otter Twin Trawl 4) Pukat Dorong (Push Net) (Banned Trawl Fishing)

Philippine SEAFDEC (2003)	Cambodia SEAFDEC (2007)	Brunei SEAFDEC (2007)
1) Beam Trawl 2) Otter Trawl 3) Pair Trawl	1) Bottom otter trawls with booms	1) Bottom Trawl

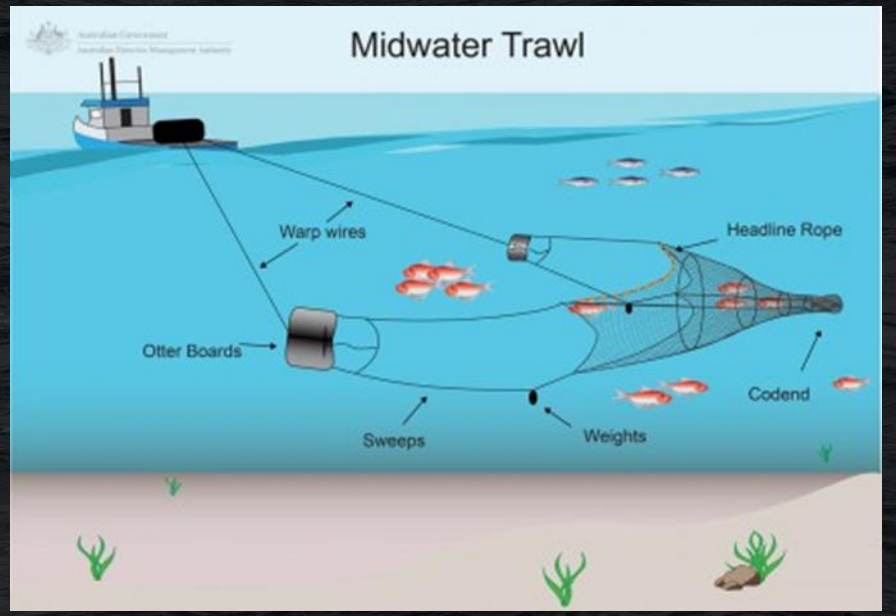
Pelagic trawl and Mid-water trawl

Pelagic trawl Trawl **designed to catch small pelagic fish such as sardine and anchovy**, this group of fish often **appear near surface** and swim slower than large pelagic fish Bundit 1985). No term of pelagic trawls are presented in fishing gear classification of trawl net by FAO, and Seafish.org has classified pelagic trawl is alternative names of mid-water trawl net.



https://www.sustainweb.org/goodcatch/pelagic_or_mid_water_trawling/

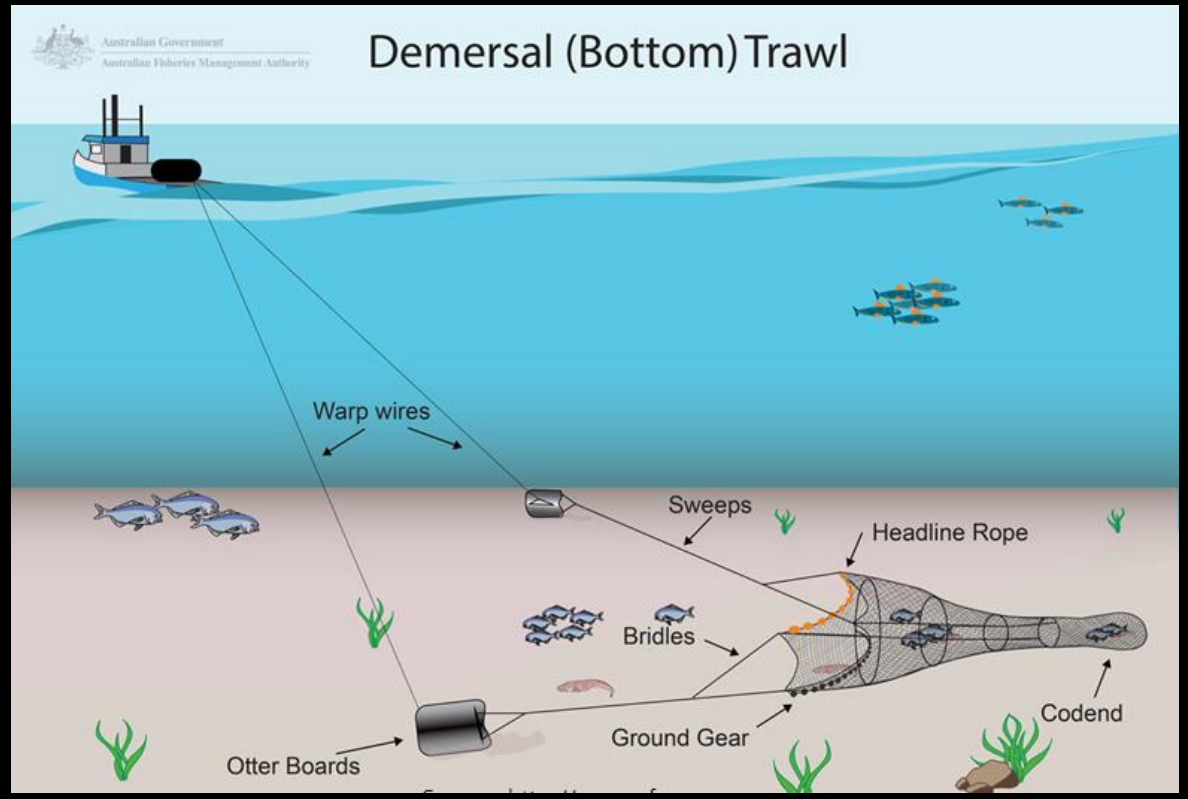
Midwater trawl operated by dragging or towing the flexible net through the water by fishing vessel, to catch pelagic fish in the middle layer (**middle layer means the water layer in between the first few meter below the surface and the first few meter above the seabed**). Usually midwater trawl is carried out on the deep-sea fishing ground. (SEAFDEC, 1985)



Source: http://www.afma.gov.au

FAO (2012) explains general structure of midwater trawl, consists of a cone shaped body, normally made of four panels, ending in a codend with lateral wings extending forward from the opening. It is usually **much larger than a bottom trawl and designed and rigged to fish in midwater**, including in the surface water. Midwater trawl can be subdivided into

1) Single boat midwater otter trawls, and
2) Midwater pair trawls



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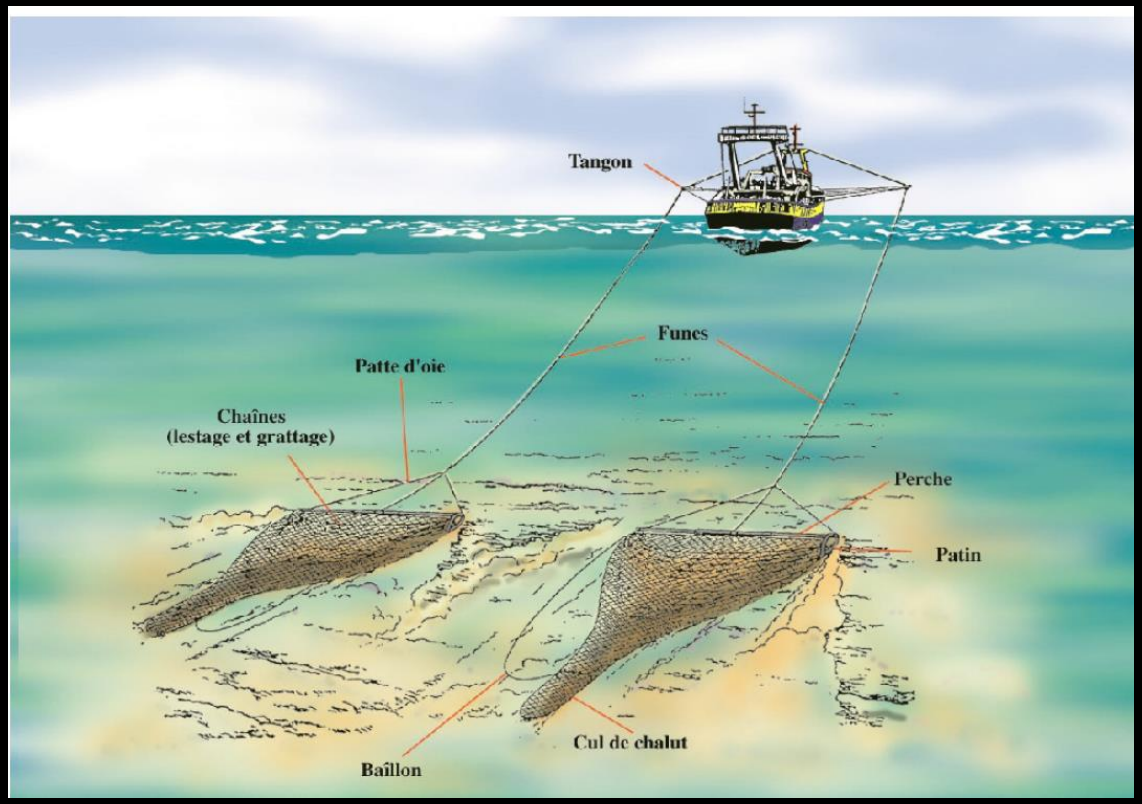
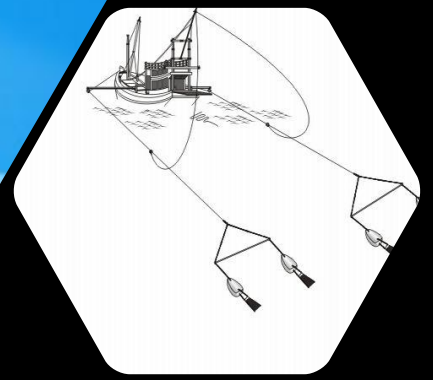


Jean Weissenberger (2015)

Bottom Trawl
Demersal Trawl

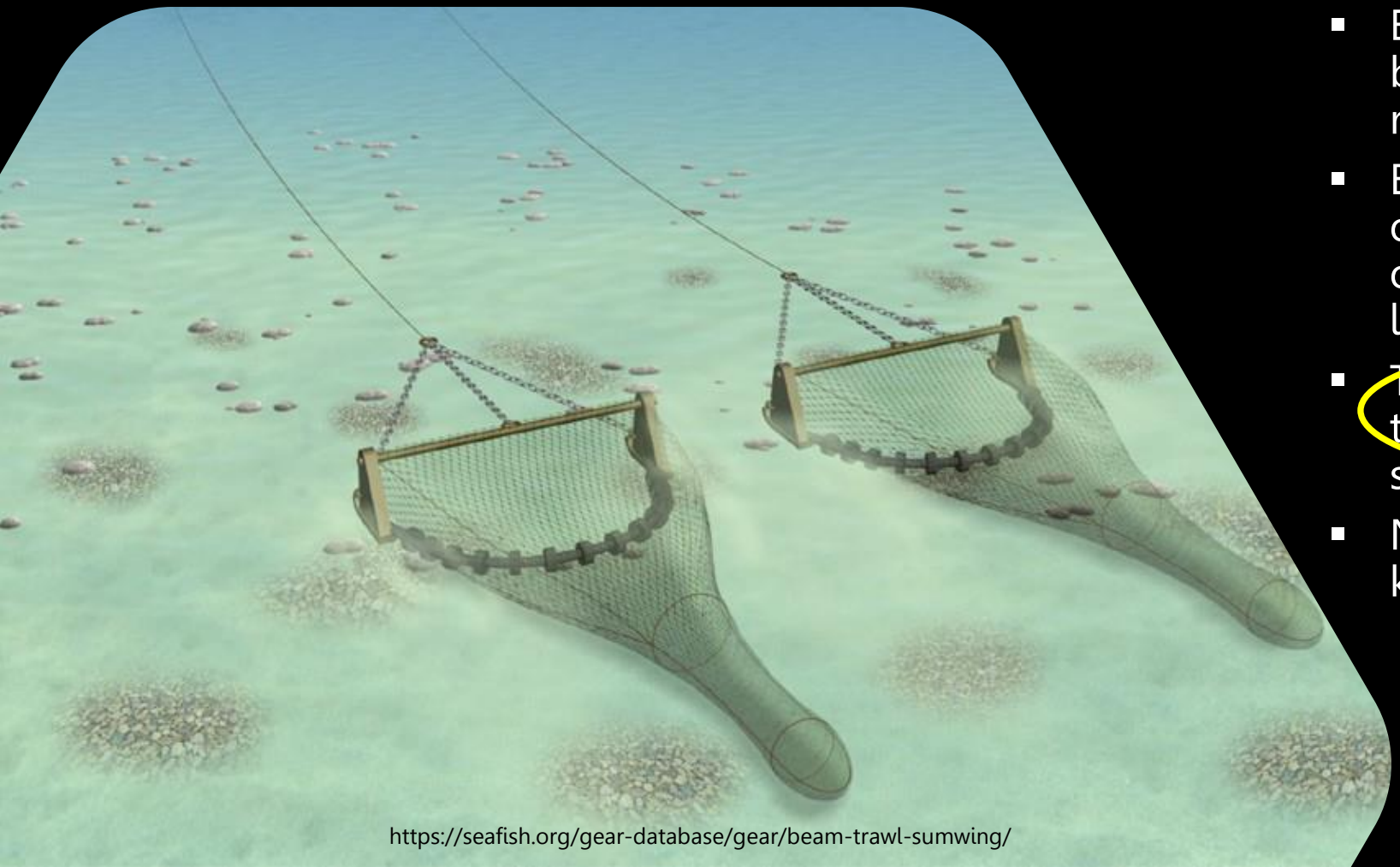
- Bottom (also called demersal) trawls are a direct descendant of the original beam trawl. A basic trawl is made up from two shaped panels of netting laced together at each side to form an elongated funnel shaped bag. The trawl is towed on the seabed, and it may be held open by a pair of otter boards (trawl doors).
- Towing by two vessels otter boards are not needed, and these are known as a pair trawl. Otter and pair trawls are usually much larger than beam trawls (Seafish 2020).
- SEAFDEC subdivides bottom trawl into 3 group 1) Bottom Beam trawl 2) Bottom Otter Trawl and 3) Bottom pair trawl.



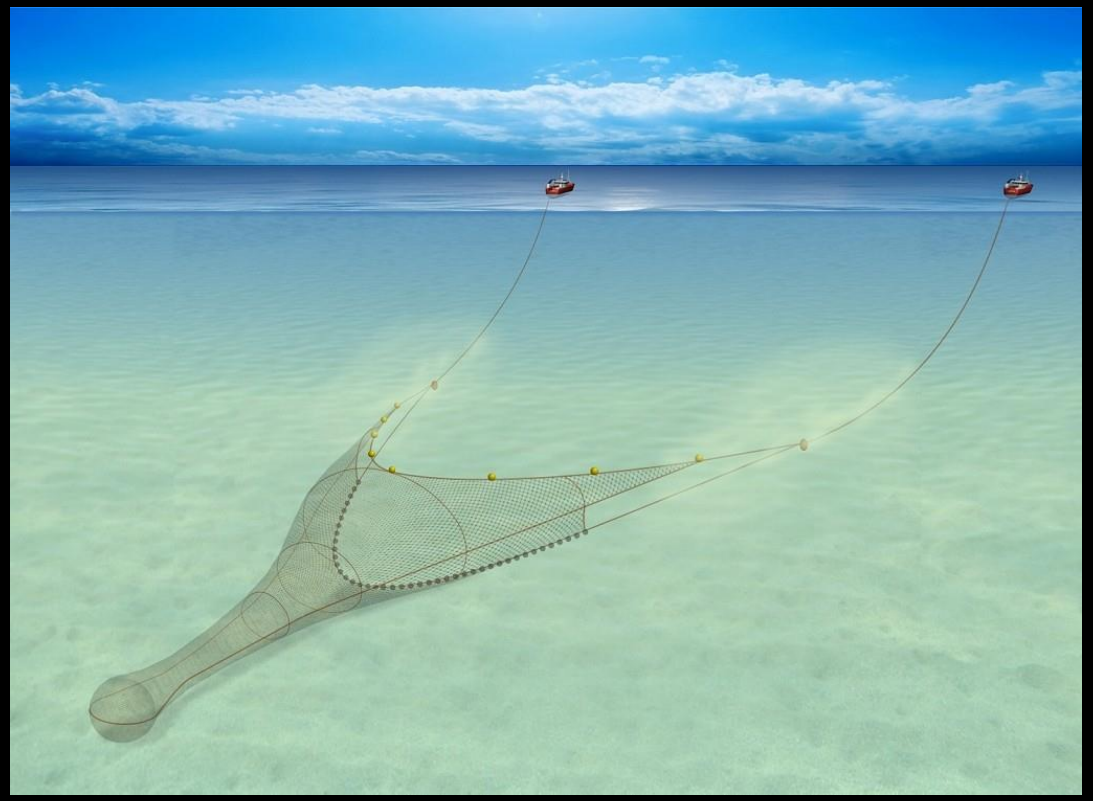
Beam trawl

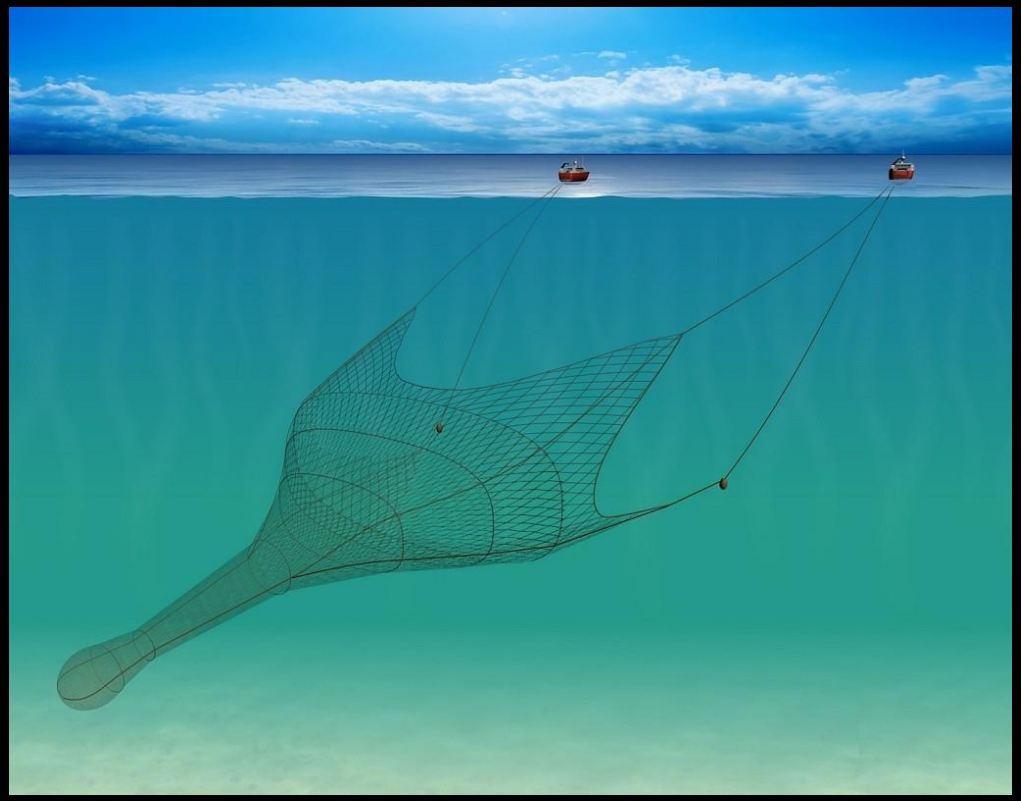
- Beam trawl consists of a cone-shaped body ending in a bag or codend, which retains the catch.
- Beam trawls have horizontal opening of the net provided by a beam, made of wood or metal, which is up to 12 m long.
- The vertically opening is provided by two hoop-like trawl mostly made from steel.
- No hydrodynamic forces are needed to keep a beam trawl open heads/ shoes

Demersal fishes e.g. Shrimp, Prawn, Crab, Mantis shrimp, Flatfish



https://seafish.org/gear-database/gear/beam-trawl-sumwing/

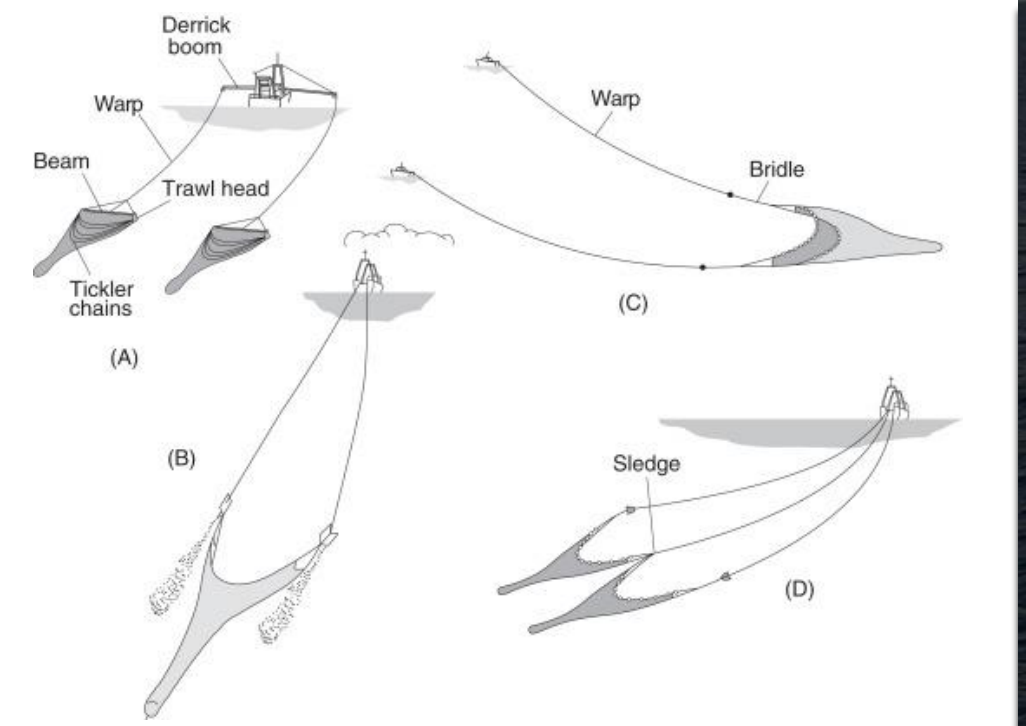


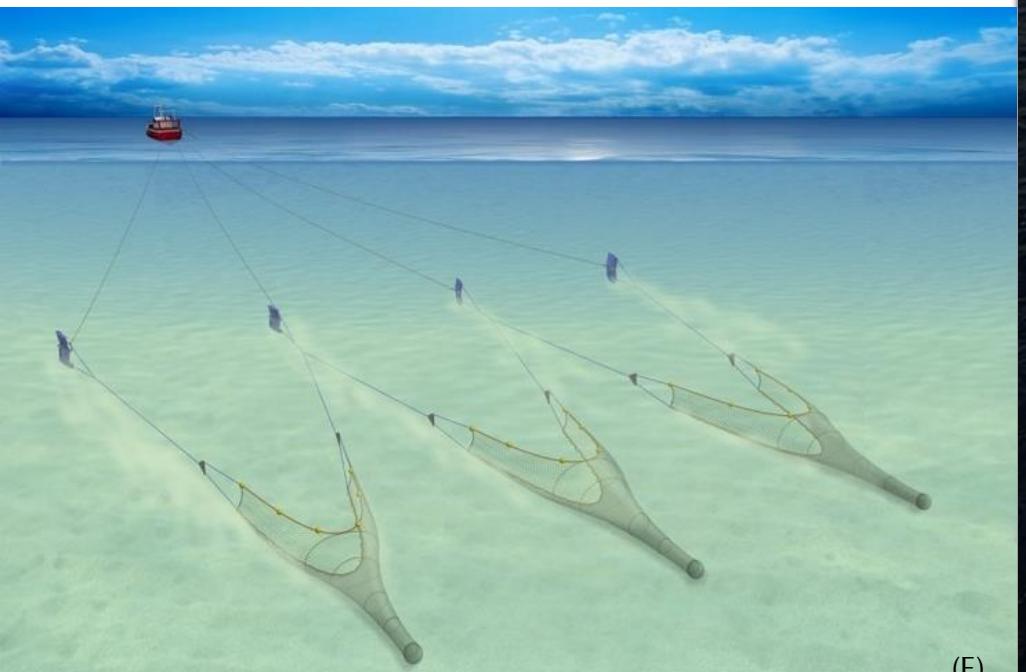


https://seafish.org/gear-database/gear/

Pair trawls

Trawl towed between two boats, either on the seabed or in mid-water, held open by the distance apart of the two vessels.



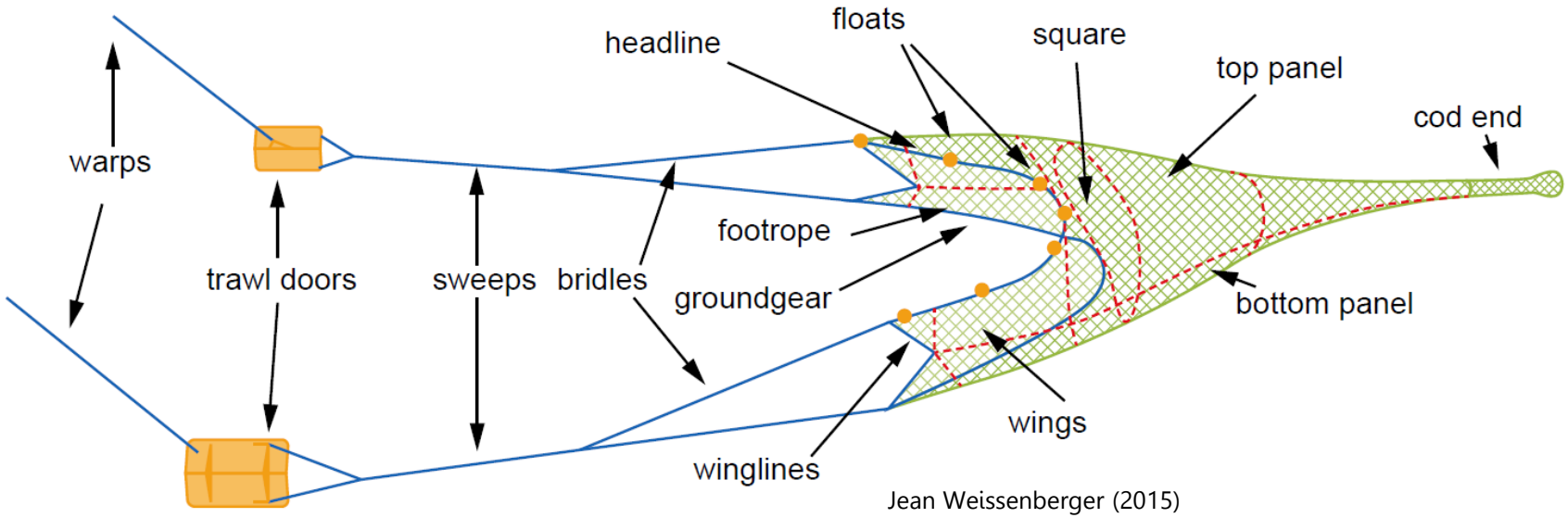


(E)

https://seafish.org/gear-database/gear/multi-rig-trawl-nephropsgroundfish-triple-rig/

Example of Trawl Type

- **Beam Trawl (A)** Trawl towed on the seabed in which the net is held open by a wood or steel beam.
- **Demersal Trawl** Trawl towed on the seabed, held open by a pair of otter boards (trawl doors: **B**). It is usually a much larger net than a beam trawl.
- **Pair Trawl (C)** Trawl towed between two boats, either on the seabed or in mid-water, held open by the distance apart of the two vessels.
- **Twin rig Trawl (**Twin bottom otter trawls: **D**) Method of towing two otter trawls side by side.
- **Multi Rig Trawl (**Multiple bottom otter trawls: **E**) Method of towing two or more otter trawls side by side.



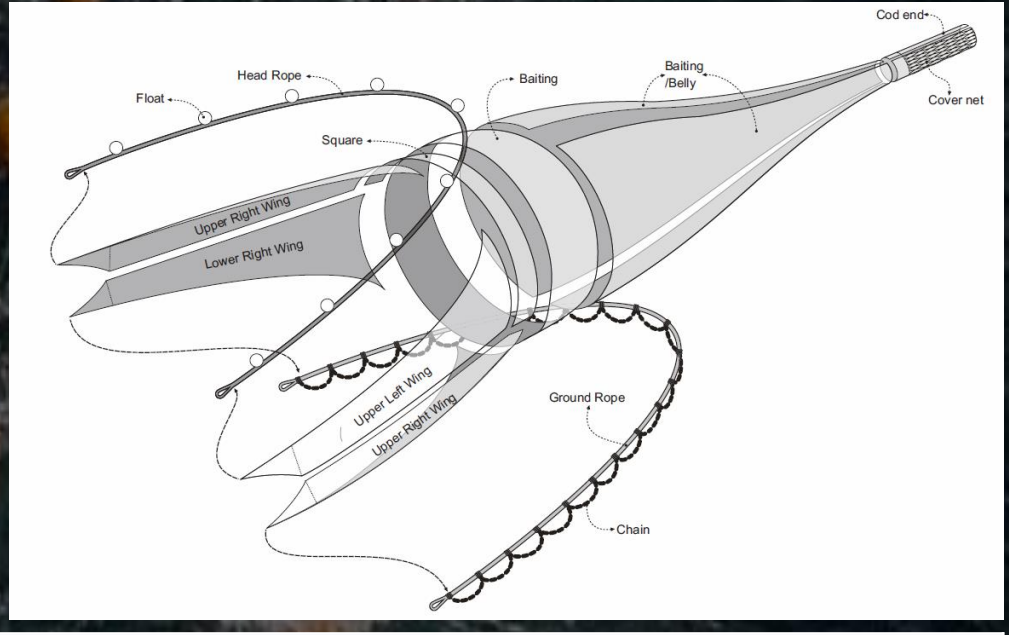
Jean Weissenberger (2015)

Anatomy of Trawl Net

Part	Definition
Towing line or Towing warp	Sections of steel wire rope or rope are used for towing trawl. They are inserted between trawler and otter board (trawl door).
Backstops	Sections of steel wire ropes or ropes between rear of otter board and sweep lines. There are 2 lines connect at upper and lower of otter board rear part. Backstops are used to adjust tilt of otter board (up and down) according to the condition.
Otter board pendant	Connection between sweep lines (sweeps) and warps when trawl door are disconnected from the gear during hauling operation.

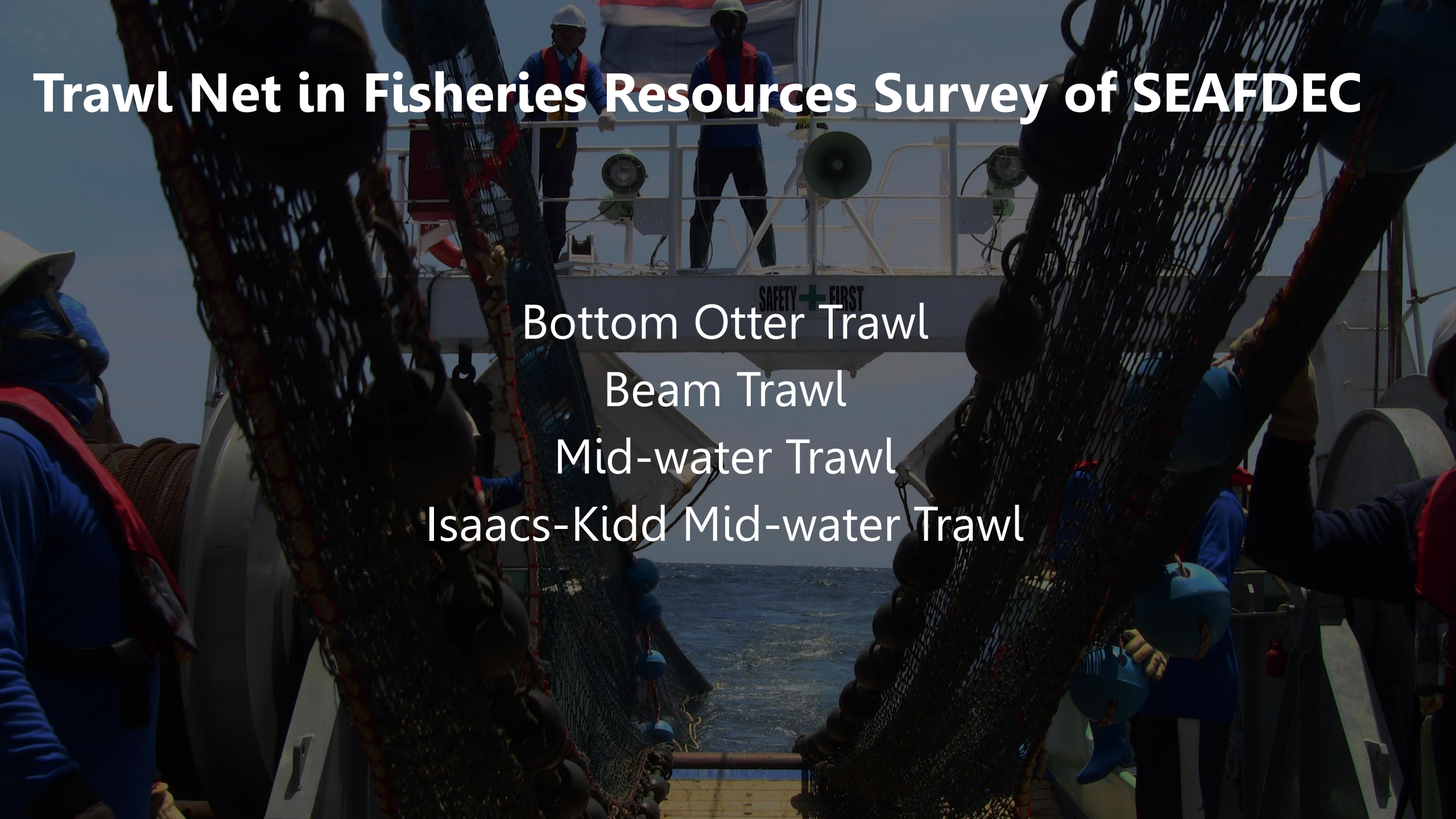
Part	Definition
Otter Board (Trawl door)	Steel or wooden boards are used primary to provide lateral spreading force and to keep the net horizontally spread as the net is towed over the seabed, but it can also contribute substantially to keeping the net sweep and bridle in contact with the seabed. There are widely variety of wooden and steel otter board used for trawling which vary in shape from simple rectangular flat plates, oval shape, rectangular cambered otter board.
Sweep line or sweep	Sections of steel wire rope or rope are insert between otter board (trawl door) and wing of the trawl net in order to widen the fishing part at the trawl.

Trawl Net Anatomy



Part	Definition
Triangle Net	• Tip of wing net. • Sometime made vertical cut (Not triangle shape) • Part that tighten with bridle rope
Wing	Foreside of net extended from net body. Wing consisted of left wing and right wing. Each wing has upper wing part and lower wing part. Upper part of wing tightened with head rope (float rope). Lower part of wing tightened with ground rope. Wing part generally is the biggest mesh size, but the twine size may the smallest
Net body	• Net body is horizontally asymmetric netting bag. Sometime upper part is larger that lower part, thus creating and overhang of netting, square. The square is designed to prevent the fish from escape upwards. • Upper part of the net body consisted of an isosceles trapezium-shaped square, Baiting, upper panel of the lengthener, and cod end part • Lower part consisted of belly, upper panel of the lengthener, and cod end. • In four-seam and six-seam side baiting will be added.
Cod end	• The end of a trawl net which retains the catch and the part of the net where most size-selection takes place. Cod end mesh sizes and structure (including cover) are usually regulated and may be preceded by a sorting grid to reduce by-catch.

Trawl Net in Fisheries Resources Survey of SEAFDEC



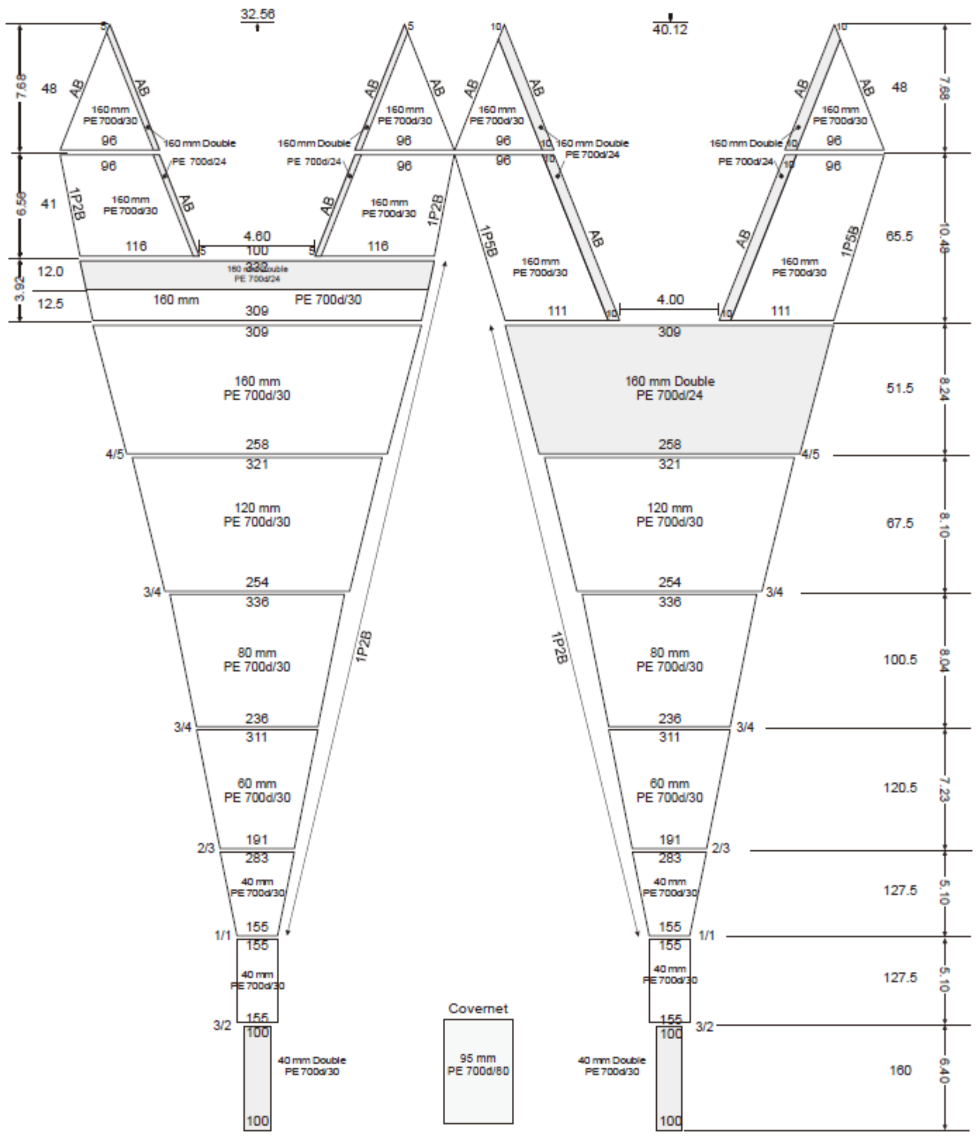
Bottom Otter Trawl

Beam Trawl

Mid-water Trawl

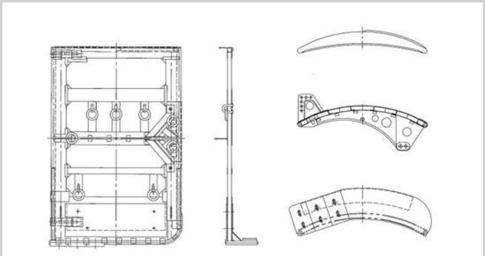
Isaacs-Kidd Mid-water Trawl

Trawl Net Plan

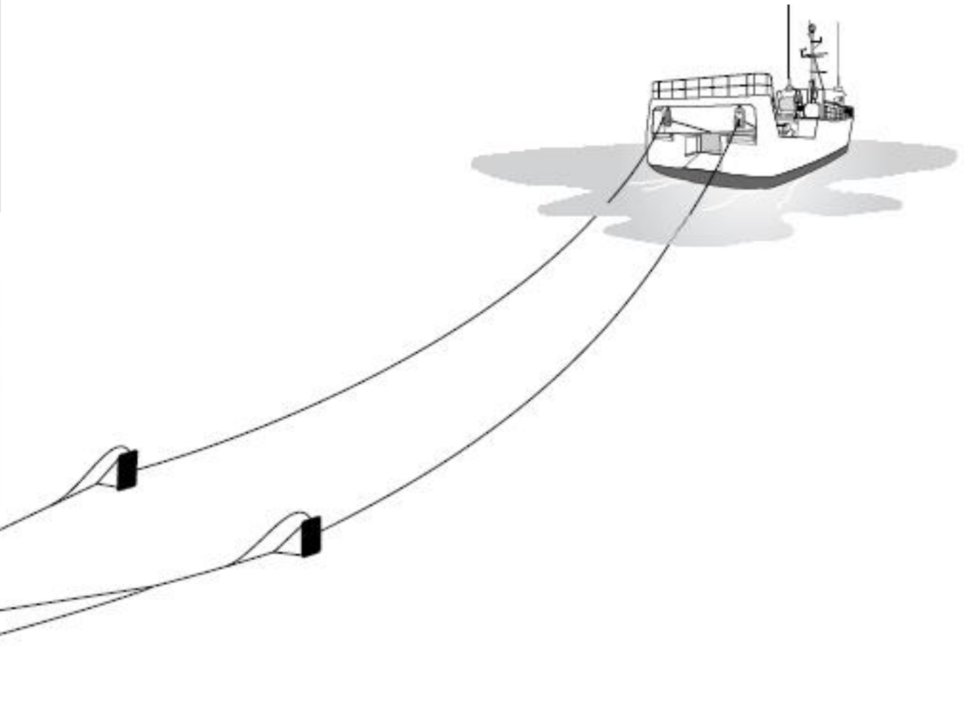


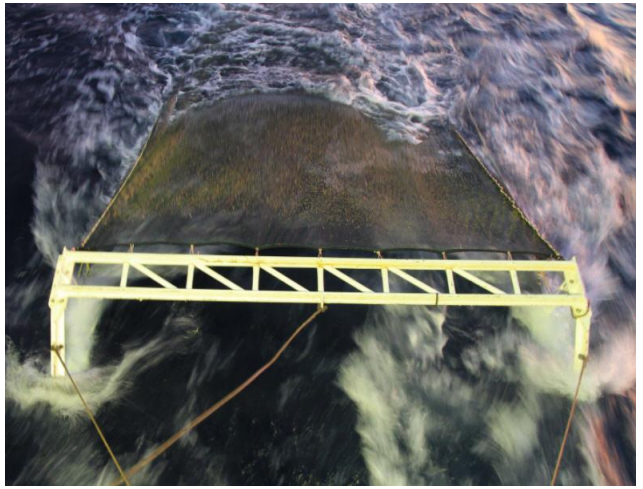
Bottom Trawl

- Trawl net is two (2) net seams
- Head rope is 32.56 m. Ground rope is 40.12 m.
- Left wing and right wing line (or side seam) is 18.16 m.
- Total circumference of net mouth is 98.88 m.
- Length from wing net to cod end part is approximately 66.37 m.
- Cod end mesh size 40 mm

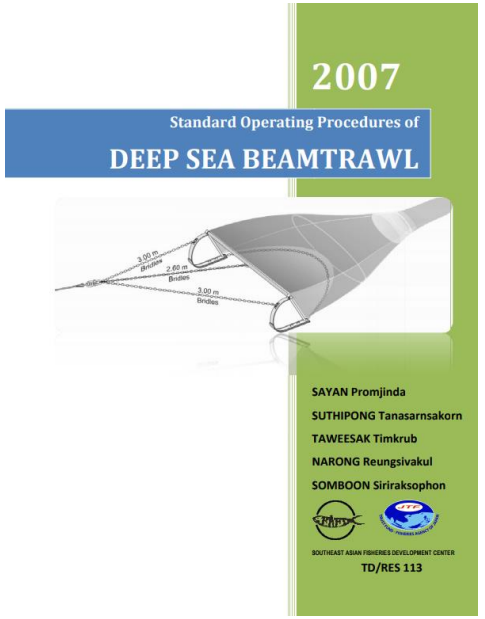


http://121.119.171.119/products/trawls/trawl_doors/003_sl_type_door.html

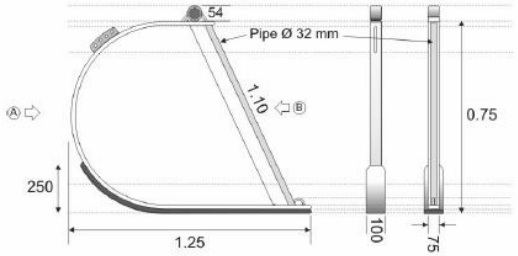


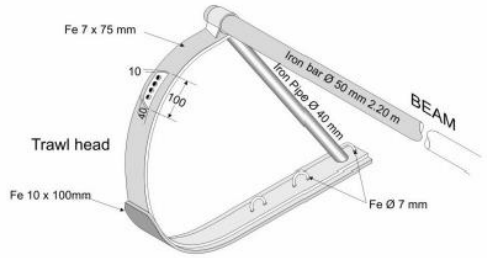


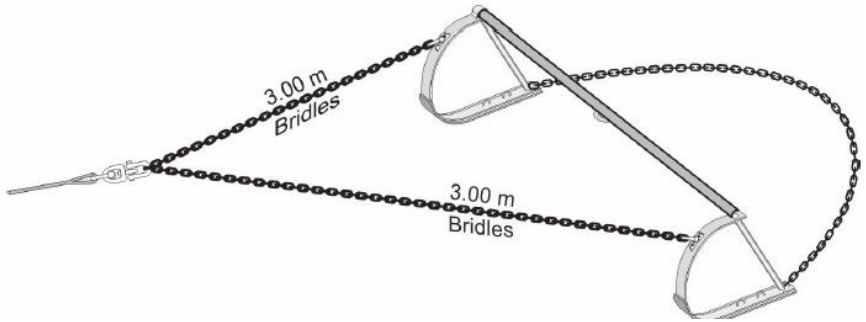
Beam trawl consists of a cone-shaped body ending in a bag or codend, which retains the catch. In these trawls the horizontal opening of the net is provided by a beam, made of wood or metal. Design of deep-sea beam trawl gear and its net were developed and modified from the fisherman in the Northern part and Northeast of the European water called Agazzi trawl.

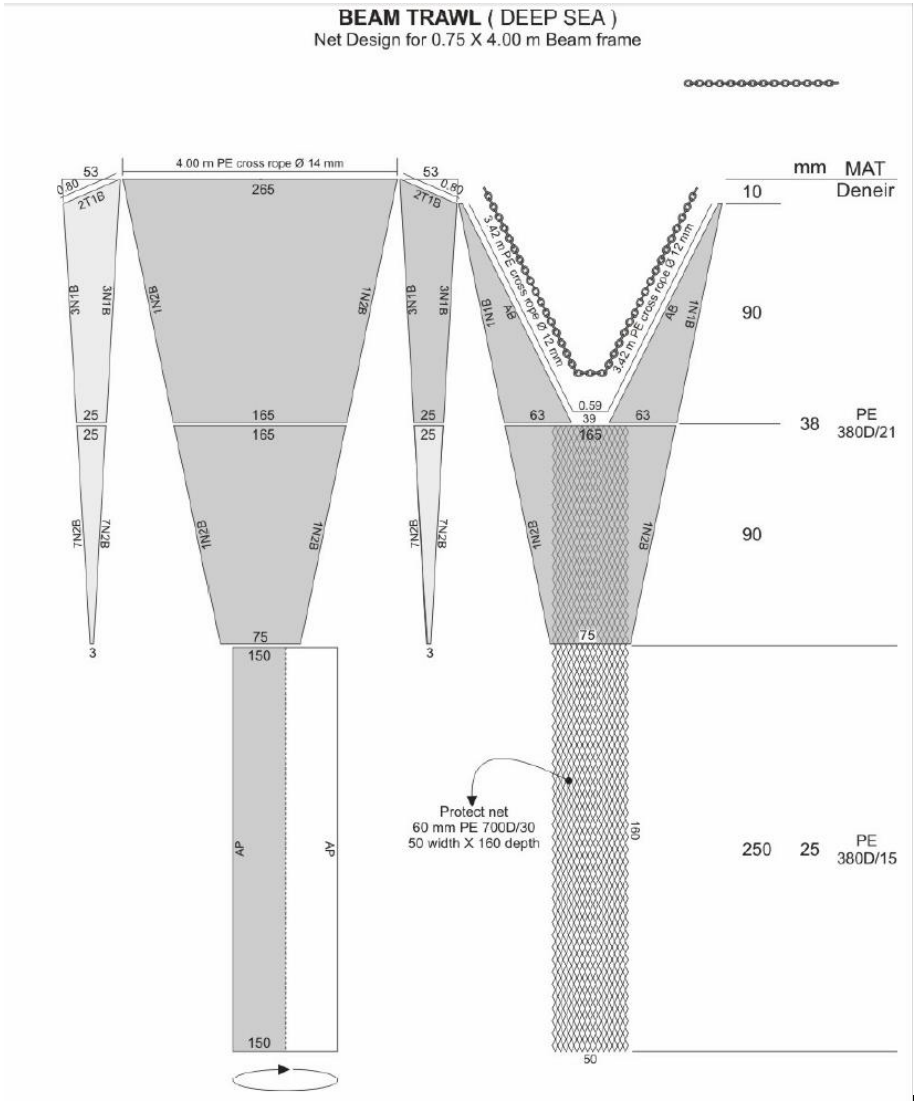


Standard Operating Procedures of Deep-Sea Beam Trawl TD/RES/113

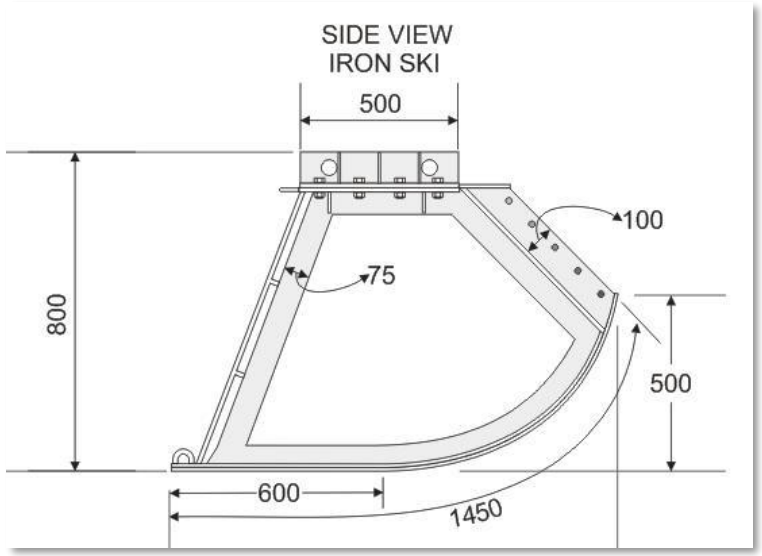


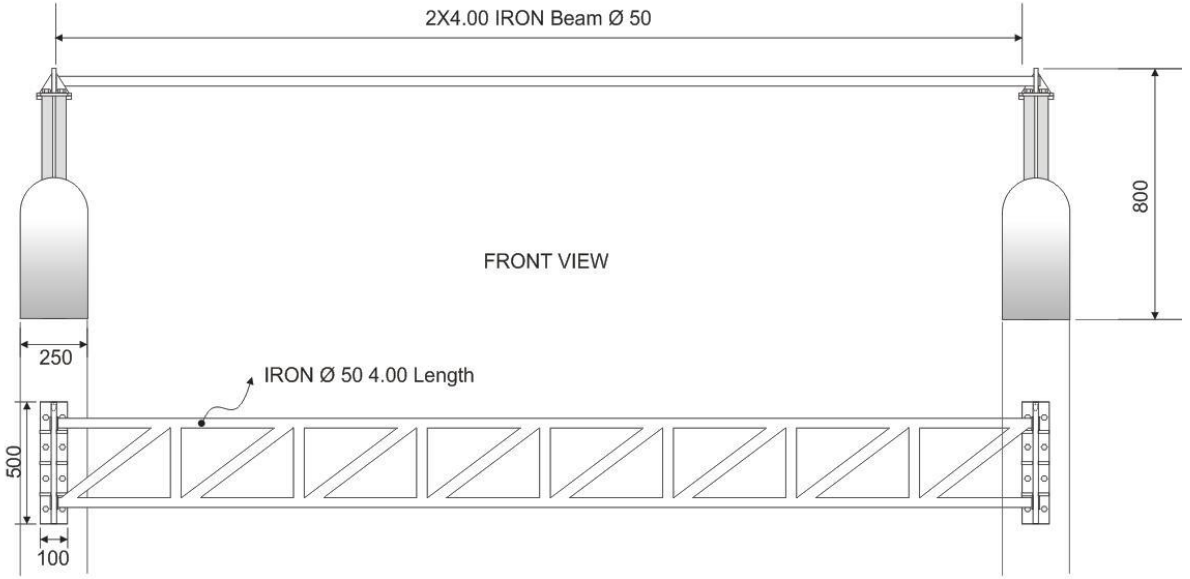




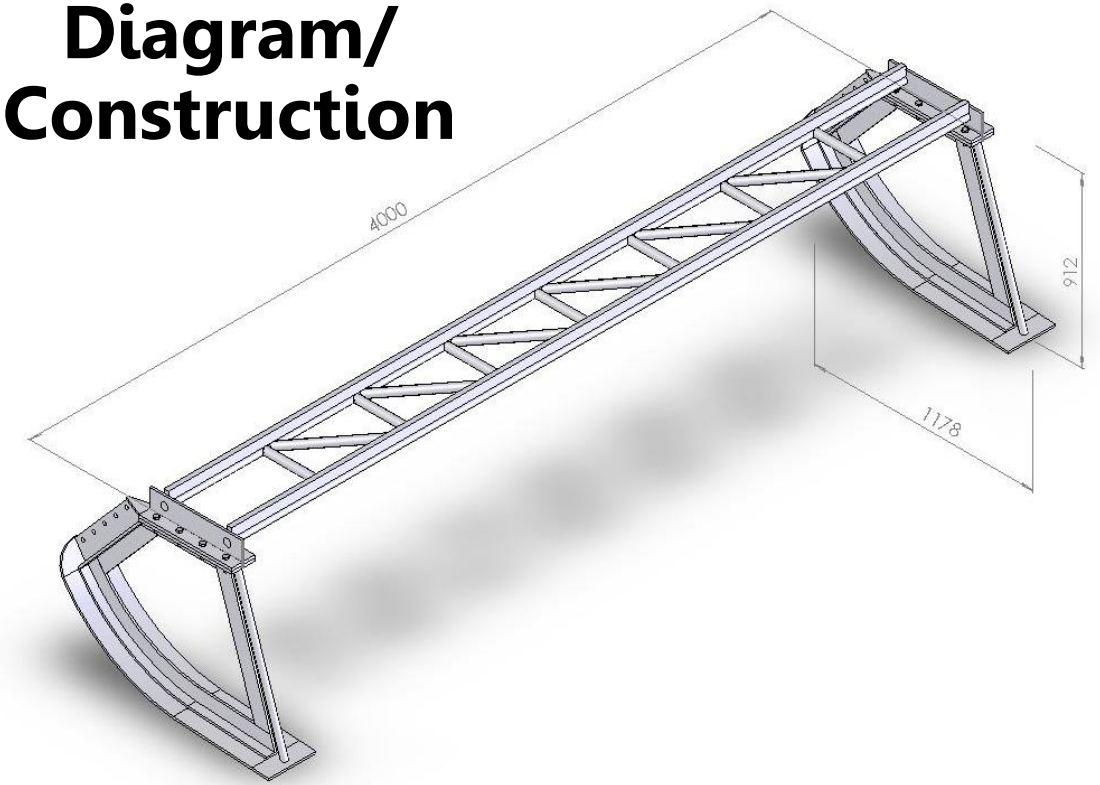


Beam trawl





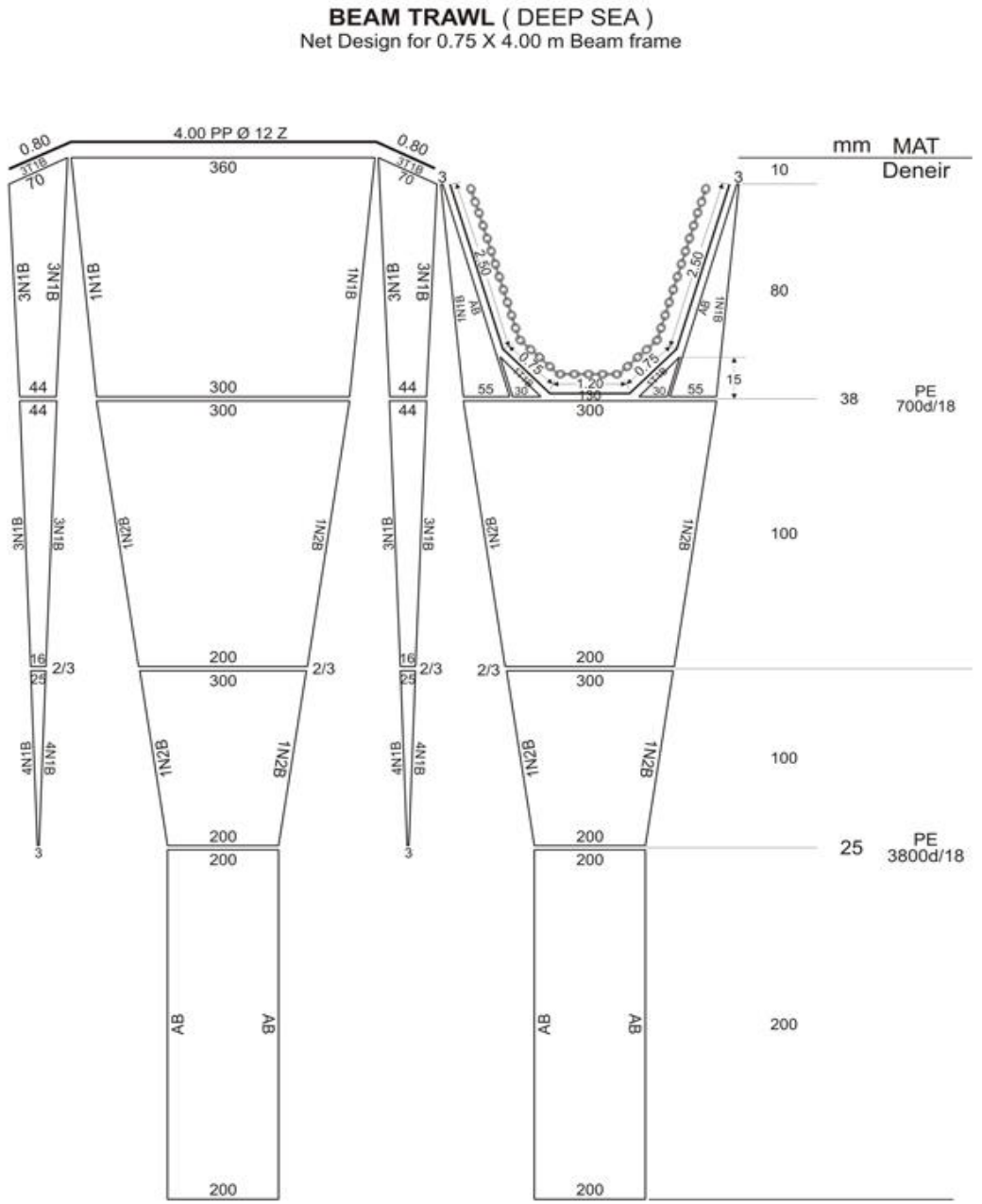
Diagram/ Construction



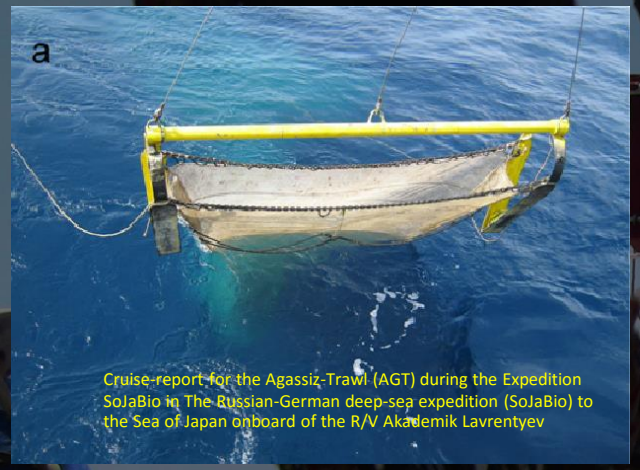
Beam trawl

- Head rope 4 m
- Ground rope 8.7 m (net spread 4 m)
- Sweep line : chain 5.5 meter
- PE 700 d/15, 380 d/15
- Mesh size 40 mm / 25 mm
- Net body is 15.1 m length

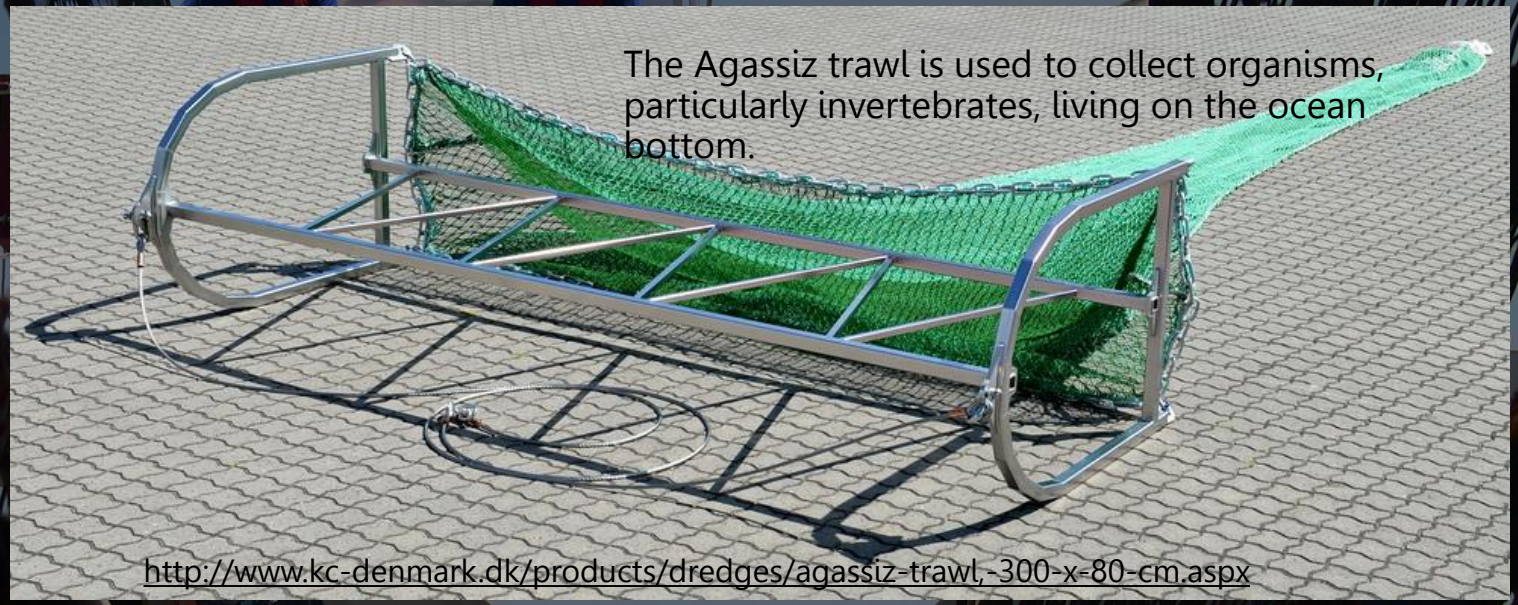

Photo by I Chanrachkij



Agassiz Trawl



(a) Typical Agassiz Trawl 350 cm x 70 cm (width x height) mesh size 10 mm

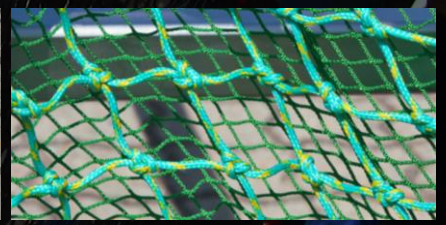


The Agassiz trawl is used to collect organisms, particularly invertebrates, living on the ocean bottom.

http://www.kc-denmark.dk/products/dredges/agassiz-trawl,-300-x-80-cm.aspx

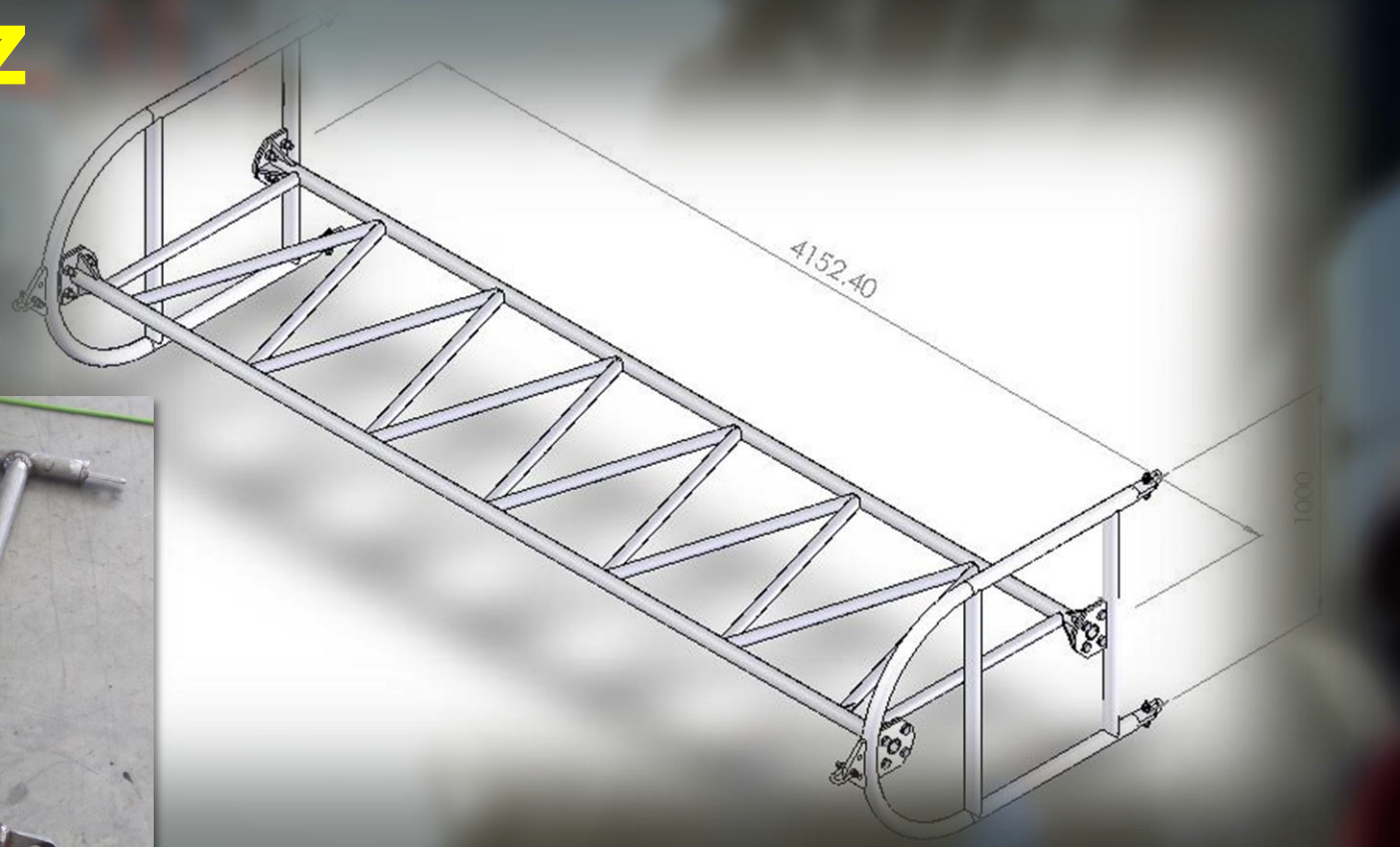
(b) Small Agassiz Trawl 135 cm x 70 cm (width x height) mesh size 10 mm

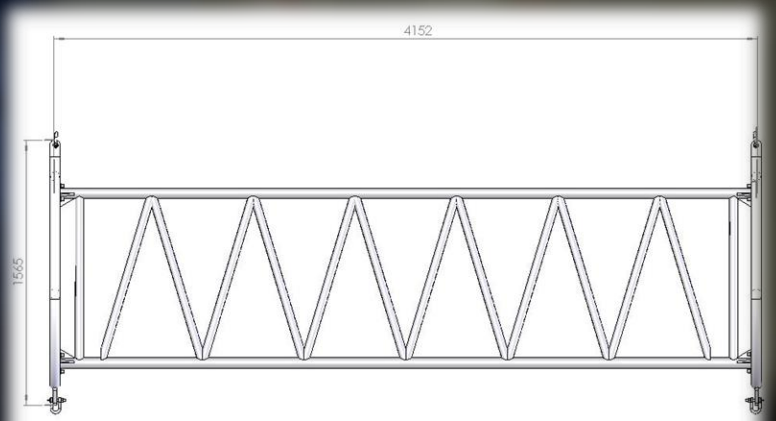
www.kc-denmark.dk



- Opening: 300 x 80 cm with chains on all sides
- Length of net bag: 600 cm
- Manufactured from AISI 316 stainless steel tubes, 40 x 40 x 4 mm
- Finish: Electro polish. On request, a painted version can be provided
- Outer net bag: Mesh size: 40 x 40 mm, Nylon, 3 mm, closed by a loop at the end
- Inner net bag (optional): Mesh size: 10 x 10 mm, knotless, closed by a loop at the end
- Steel wire, diameter 10 mm
- Length, incl. bridle: 11 m approx.

Agassiz Trawl



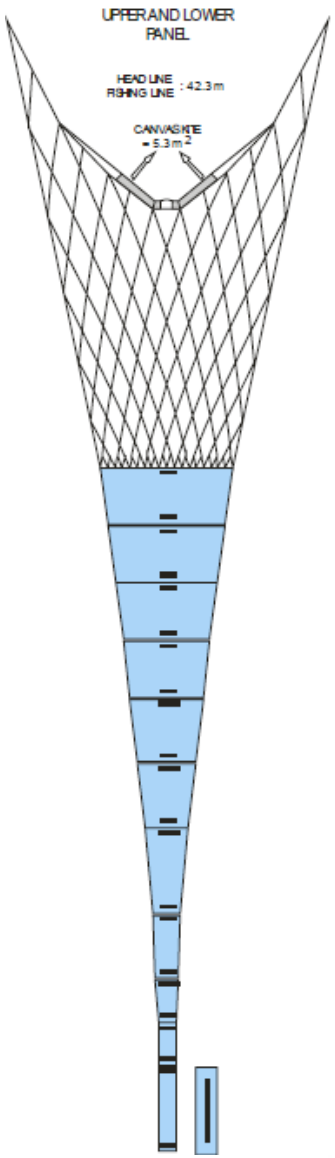


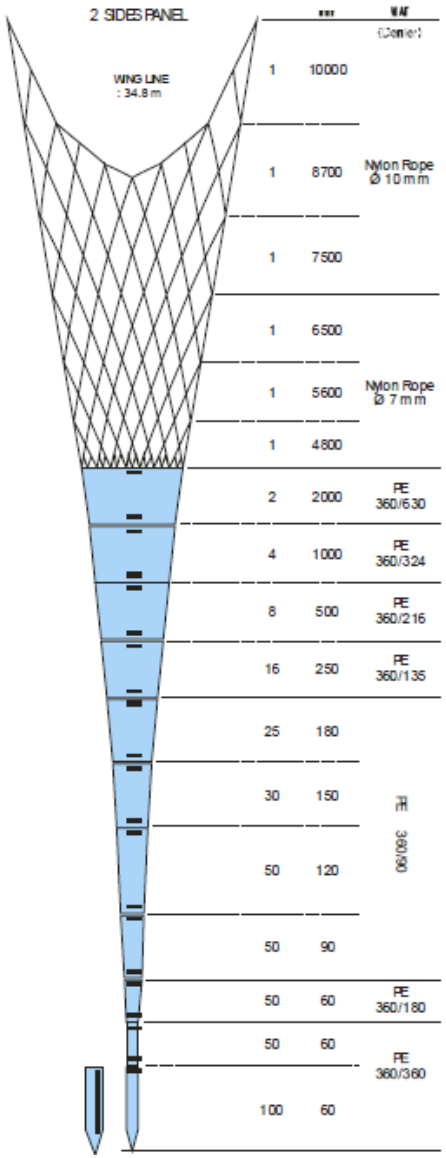
- Head rope 4 m
- Ground rope 4 m
- PE 700 d/15,
- Mesh size 40 mm
- Net body is 15 m length

Net design

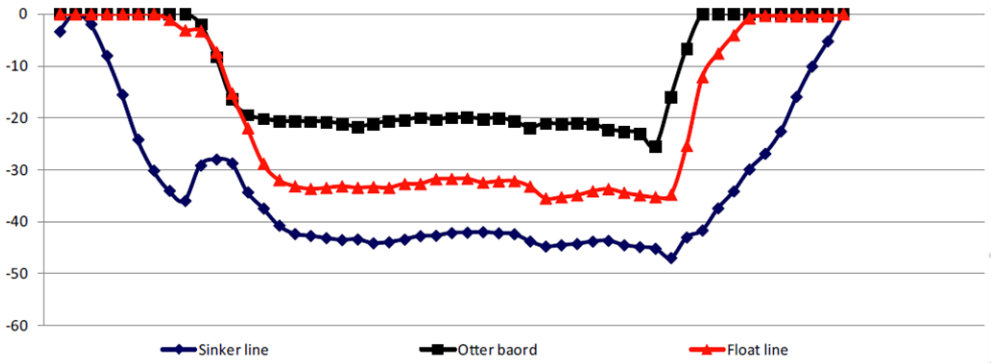
Mid-water Trawl

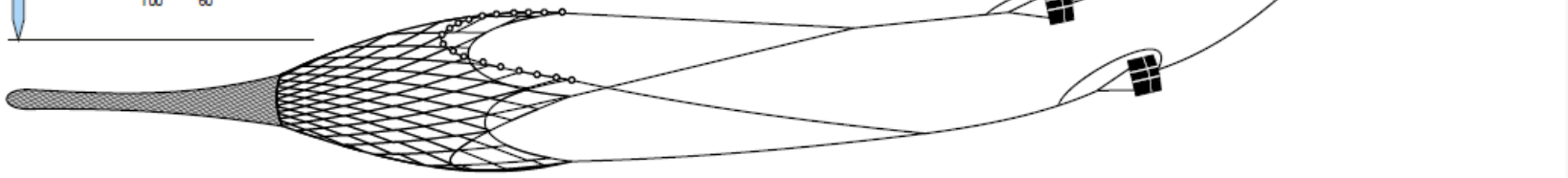
- Trawl net is four (4) net seams
- Head rope and Ground Rope is equaled as 42.3 m.
- Left wing and right wing line (or side seam) is 34.8 m.
- Total circumference of net mouth is 154.2 m.
- Length from wing net to cod end part is approximately 88 m.
- Head rope is assembled with canvas kite, area is 5.3 square meter and Ground chain diameter 19 mm. 42.3 m length (306 kg)
- Codend mesh size 60 mm





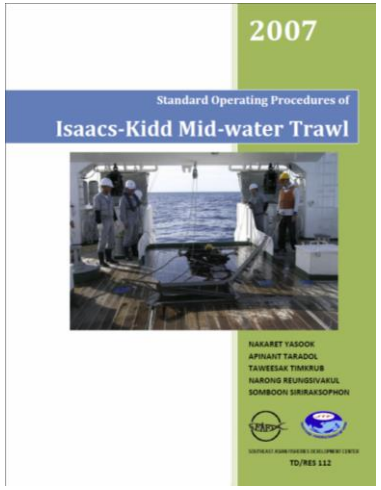
1	10000		
1	8700	Nylon Rope Ø 10 mm	
1	7500		
1	6500		
1	5600	Nylon Rope Ø 7 mm	
1	4800		
2	2000	PE 360/630	
4	1000	PE 360/324	
8	500	PE 360/216	
16	250	PE 360/135	
25	180	PE 360/90	
30	150		
50	120		
50	90		
50	60	PE 360/180	
50	60	PE 360/360	
100	60		



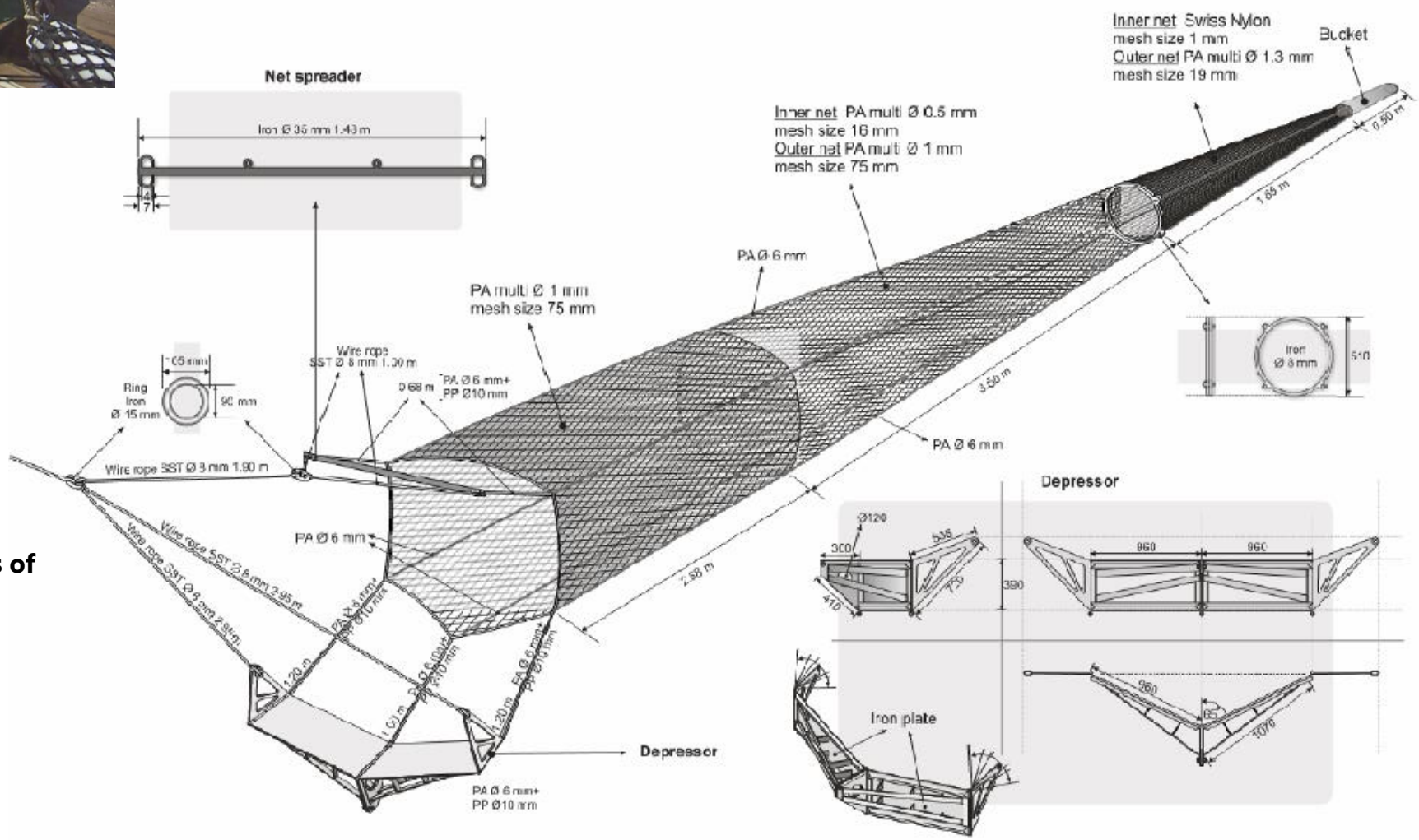


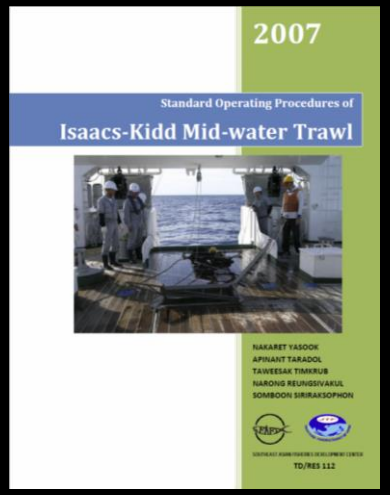
Isaacs-Kidd mid-water trawl (IKMT) is oceanography tool used to collect bathypelagic biological specimens larger than those taken by standard plankton nets.

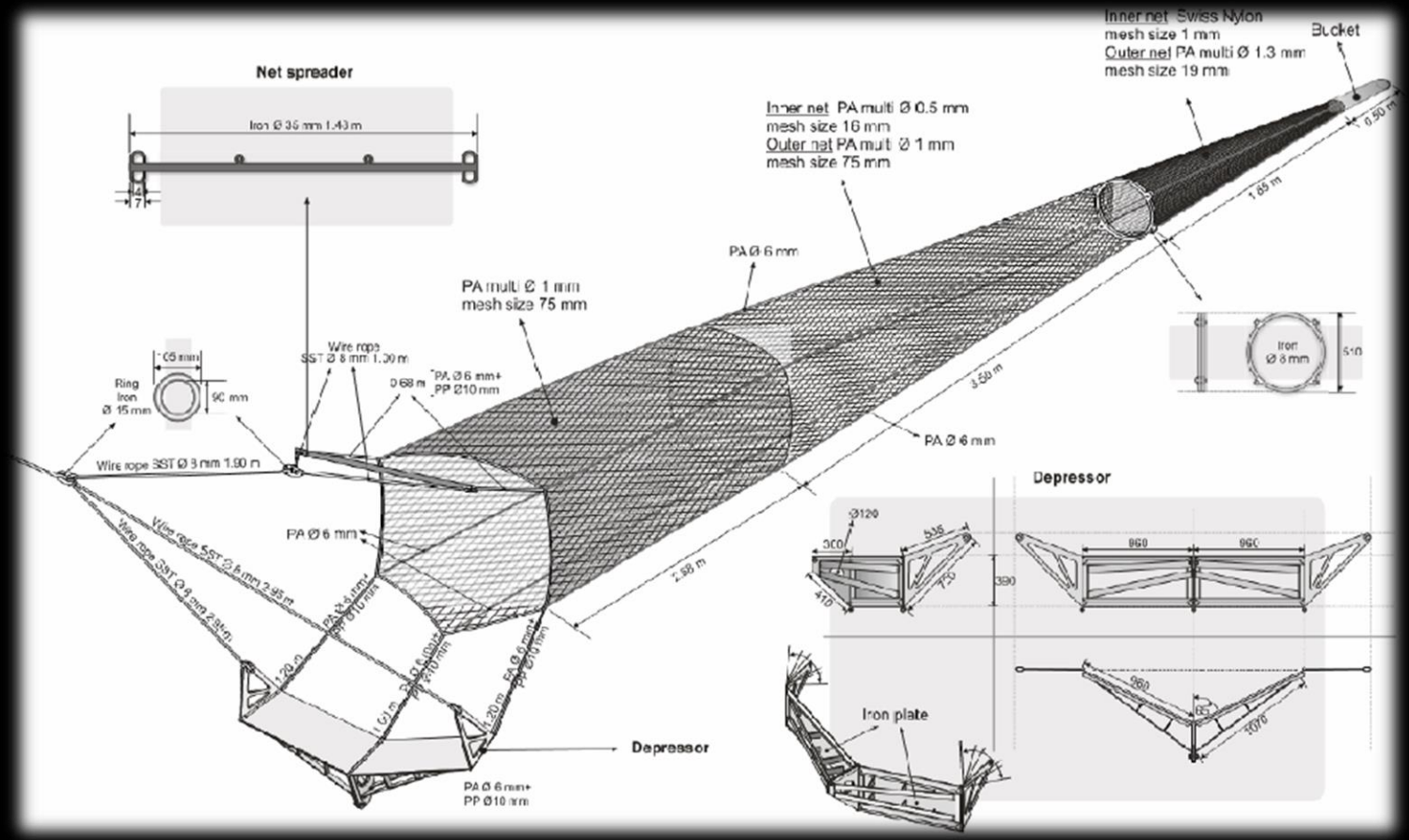
- The trawl consists of the specifically designed net attached to a wide, V-shaped, rigid diving vane sometime called a depressor. The vane keeps the mouth of the net open and exerts a depressing force, maintaining the trawl at depth for extended periods at towing speeds up to 5 knots, but the optimum towing speeds should be 2-3 knots because of the high level of drag exerted by the net in the water.
- The inlet opening is unobstructed by the towing cable.

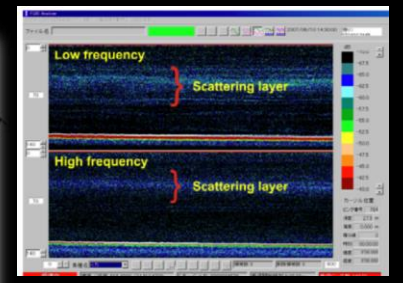


Standard Operating Procedures of Isaacs-Kidd Midwater Trawl TD/RES/112





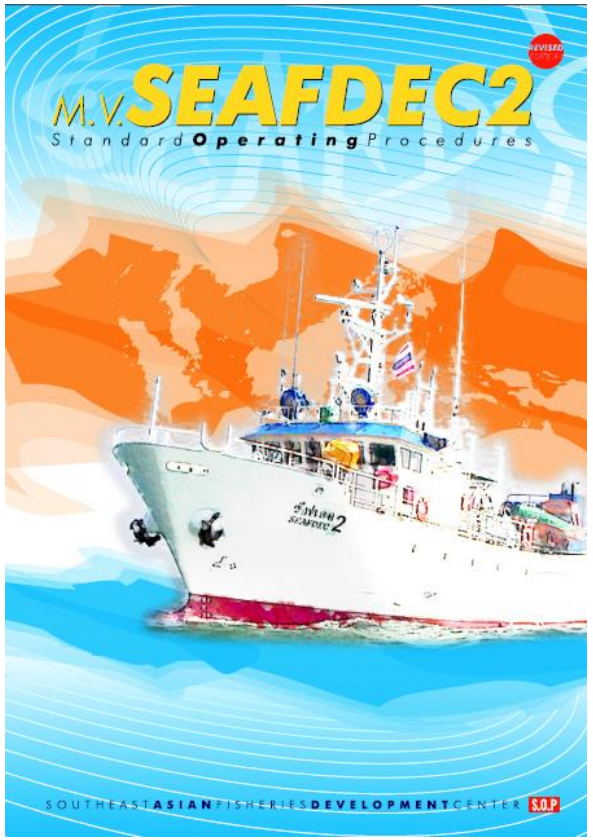




- The IKMT is a long, round net approximately 6.50 m long, with a series of hoops decreasing in size extending from the mouth of the net to the rear end (cod end), which measures an additional 2 m in length.
- The mouth of the net is 1.75 m wide by 1.30 m high and is attached to a depressor.
- The outer net is PA multifilament Ø 1 mm, mesh side 75 mm and the inner net is PA multifilament (knotless) Ø 0.5 mm, mesh size 16 mm.
- Codend part used the plankton net mesh size 1 mm and cover with PA multifilament Ø 1 mm, mesh side 19 mm net. All bridles are SST wire Ø 8 mm. **The net spreader is iron Ø 35 mm with approximately 1.50 m length.**
- The IKMT can operate in daytime and nighttime. Before start the operation, the essential information of weather and oceanographic condition are collected, in addition the target area and scattering layer could be detected by the scientific echo-sounder before and during the operation

Standard Operational Procedure

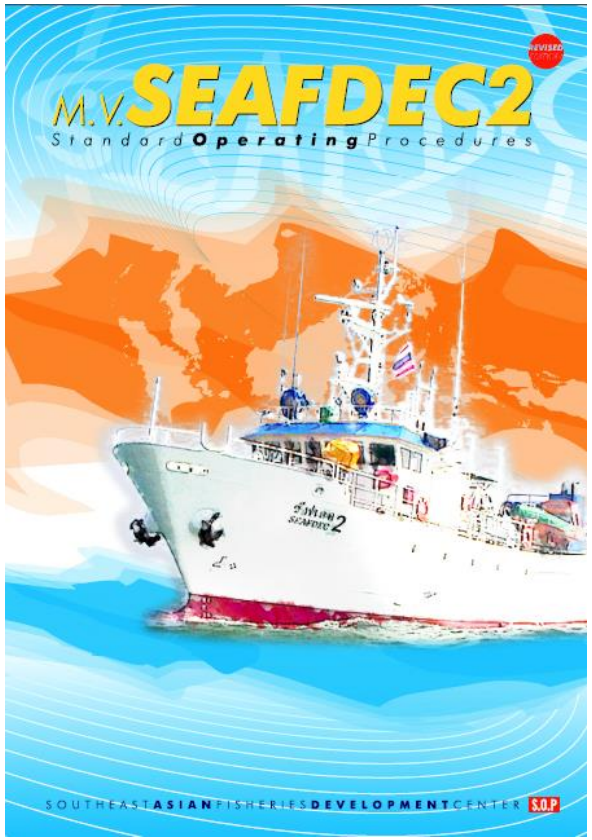
Item	Information Record
Fishing Operation Preparation	Bottom condition is detected before start fishing operation by using essential fishing finder or echo sounder and essential information of weather and oceanographic condition are collected
Depth of Operation	▪ The maximum depth according towing warp ▪ Depth shall be detected by using fish finder or echo sounder, Recommended to record characteristic of bottom topography from the starting position to finishing position of the operation and Paper echo sounder (If any) is recommended.
Speed of Operation	▪ Recommend not to adjust towing speed during fishing operation except for the recovery of malfunctioning gear. ▪ Speed of vessel over the ground compare with the actual speed over the ground during the operation, calculated by the measure towing distance compare with the towing time. Unit of speed is measured by unit of knot (nautical mile per hour)



http://map.seafdec.org/downloads/

Standard Operational Procedure

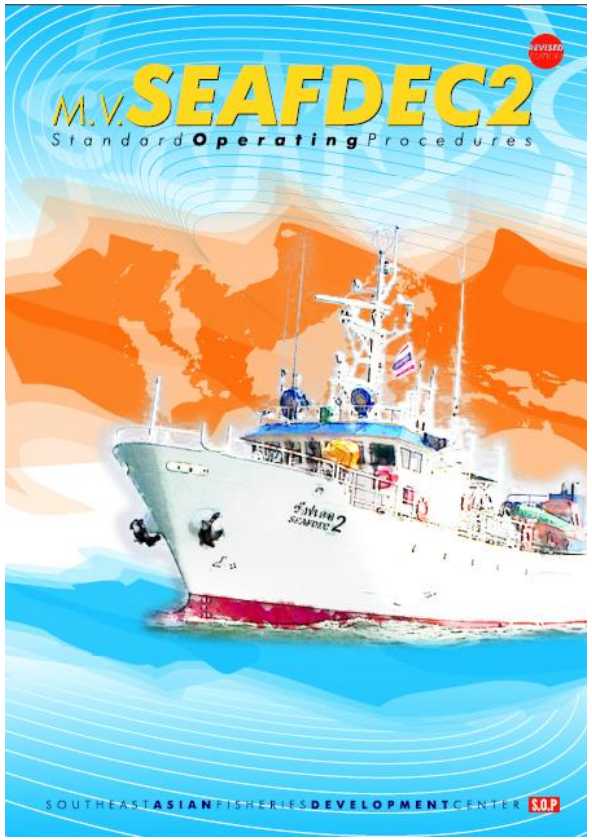
Item	Standard Operational Procedure
Towing direction	▪ Towing shall be straight direction. ▪ Recommend to avoid changing of towing direction except the towing direction is obstructed by some objects. Record the details of towing direction and time consuming of each direction.
Warp length	▪ The warp length (unit of meter: m) is recorded when the brake of trawl winch is fastened. ▪ Recommend not to adjust towing warp during fishing operation except for the malfunction of gear or operation is occurred.
Fishing Operation Preparation	▪ Bottom condition is detected before start fishing operation by using essential fishing finder or echo sounder and essential information of weather and oceanographic condition are collected
Towing Time	▪ 1 hour or shall be designed whilst the process of research survey planning. ▪ Towing time shall be recorded from finish shooting time to start hauling time.



http://map.seafdec.org/downloads/

Standard Operational Procedure

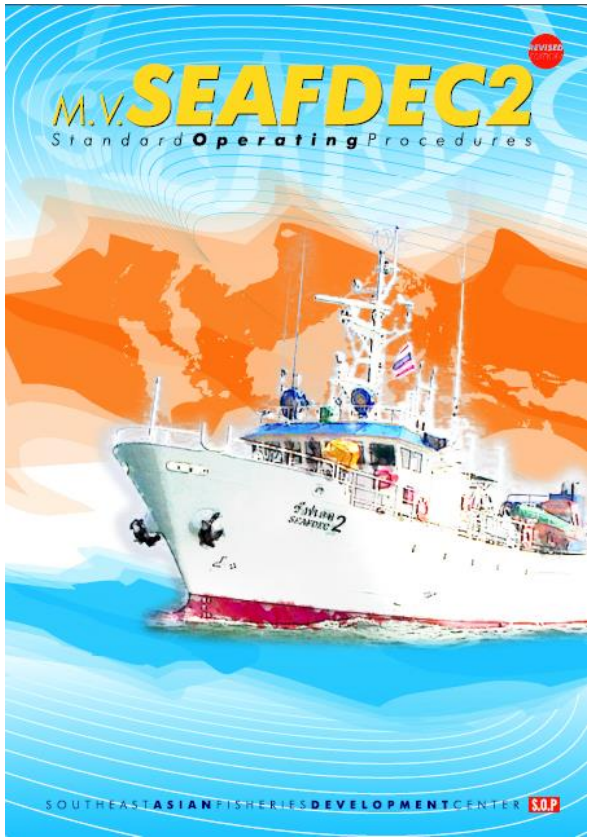
Item	Information Record
Speed of Operation	▪ Recommend not to adjust towing speed during fishing operation except for the recovery of malfunctioning gear. ▪ Speed of vessel over the ground compare with the actual speed over the ground during the operation, calculated by the measure towing distance compare with the towing time. Unit of speed is measured by unit of knot (nautical mile per hour)
Towing direction	▪ Towing shall be straight direction ▪ Recommend to avoid changing of towing direction except the towing direction is obstructed by some objects. Record the details of towing direction and time consuming of each direction
Depth of Operation	▪ The maximum depth according towing warp ▪ Depth shall be detected by using echo sounder. ▪ Recommended to record characteristic of bottom topography from the starting position to finishing position of the operation and Paper echo sounder (If any) is recommended.



http://map.seafdec.org/downloads/

Standard Operational Procedure

Item	Standard Operational Procedure
Monitoring Devices	▪ Net depth shall be detected by depth sensor; measurement is unit of meter ▪ Net spreading shall be detected by distance sensor; measurement is unit of meter ▪ In order to calculate the sweeping area, ▪ Clinometers shall be used to check the spreading of otter board by measure the warp angle using. ▪ The calculation shall be compared with the information by distance sensor. ▪ Bottom topography shall be detected by essential hydro-acoustic equipment and the detection shall be done over the whole area of fishing operation.



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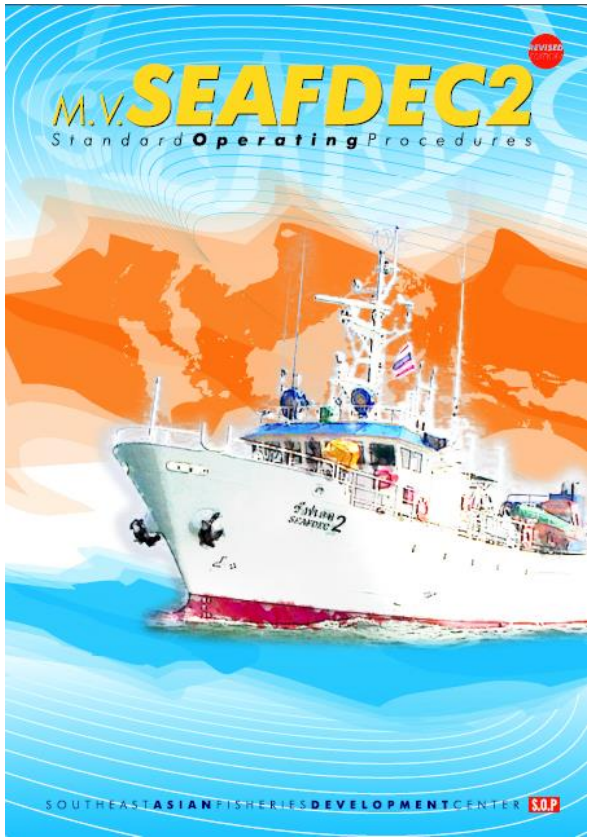
Standard Operational Procedure

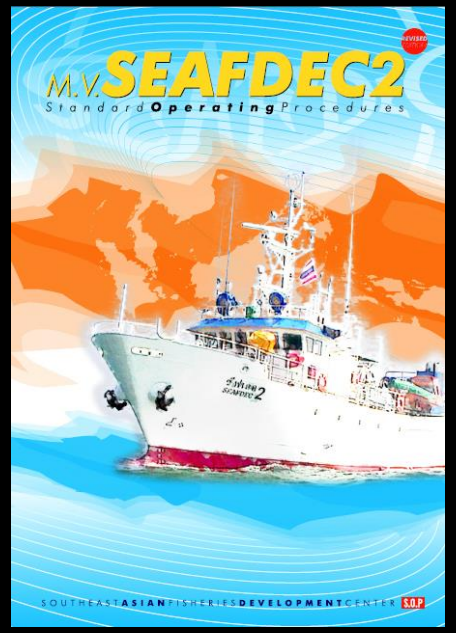
Item	Standard Operational Procedure
Information Recording (cont.)	**Start shooting time and position:** Start recording the shooting time and position when trawl net is shooting from vessel. **Finish shooting time and position:** Record finish shooting time and position when net touch bottom or the brake of trawl winch is fastened. **Start hauling time and position:** Recording time and position when trawl net is lifted from the sea bottom (trawl warp winch start hauling). **Finish hauling time and position:** Recording time and position the finishing net hauling up onboard.
Towing Distance	▪ Towing distance shall be recorded from finish shooting position to start hauling position.
Gear malfunction	▪ Cancelled and re-operate in the same area ▪ Record the malfunction of the gear or operation into the Fishing logsheet.



http://map.seafdec.org/downloads/

Standard Operational Procedure

Catch Handling



http://map.seafdec.org/downloads/

Refer to the standard operation procedure of FAO

Step1 Remove all sea snakes and other venomous or otherwise dangerous animals.

Also remove turtles and if alive, return these to sea. Record number and kind of animals removed.

Step 2 Remove inorganic debris and plant material Record type of material removed

Step 3 Remove the larger fish that are readily visible and place them in a box

Step 4 Wash the remainder of catch (Small fish) if necessary, and mixes with shovel

Step5 Put the mix catch in boxes while continuing to remove larger fish and putting them into the box mentioned in step 3. The box should be filled simultaneously, not one after the other, and it should be made certain that all boxes contain approximately the same weight of fish.

Step 6 Count the number of boxes with small fish and record.

Step 7 A rule of thumb, is to take one box out of every five at random for subsampling. Record number of boxes taken to subsampling as B1, B2, B3... Etc.

Step 8 The boxes talking for subsampling is (are) then treated as follow:

Weight total catch in B1 and record.

Place fish of B1 on sorting table and sort to species level as far as food fish and valuable crustacean (e.g. shrimps) are concern and taxonomic groupings as well defined as possible (e.g. genus , family, etc.) for other group (the non-edible fish and miscellaneous crustacean)

Repeat procedure if appropriate for the other boxes, B2, B3,... Etc.

Step 9 If more than one box was sorted, compute, for each species (or higher taxonomy group) the total weight and number in all sorted boxes.

Step 10 Multiply the number and weight of fish and invertebrate by species or higher taxonomic group) by the ratio of the number of unsorted to sorted boxes

Step 11 Weigh and count the larger fish mention in step 3 and 5 by species (Very large fish should be weighed individually and measure.

Step 12 Add, when there is an overlap (when the fish of a certain species occurred both in the sorted boxes of small fish in the large fish box) the weights and number obtained in step 11 to weights and number in step 10

Step 13 Step 12 (as well as step 11 when there is no overlap) provided estimates of total catch, both in weight and number, by species and higher taxonomic groups. Record the total, both in weight and numbers in to the appropriate the fishing log sheet and convert to catch per unit if fishing time is less or more than an hour. During surveys, this step must be complete after each haul or every evening at the latest to preclude loss of information.

Step 14 In addition to catch sampling, identifying and recording, the work of the fishery scientist general includes among other things:

Collecting length-frequency data.

Collecting miscellaneous biological information

Collecting and preserving specimens for further study onshore

Collecting oceanographic data

Standard Operational Procedure

T/V Koyo Maru

Koyo Maru Voy. 61　Catch fishes(Bottom Trawl)

DATE	TRAWL St. No.	AREA		TIME	POSITION	
2016 11/14	trawl test	Gulf of Thailand	Start	14:00	10-11.866N	102-19.820E
			Take in	15:28	10-08.697N	102-23.433E
			Towing time	30min	Depth (m)	65.8

	name			volume(count)	weight (kg)
1	カイメン	英:Sponge		8	0.45
2	ナマコ	英:Sea cucumber		6	0.40
3	ソフトコーラル①	Soft coral		-	1.45
4	ハタ①(コクテンヒレハタ)		*Epinephelus sexfasciatus*	2	0.35
5	ハタ②		*Epinephelus coioides*	4	0.55
6	ハタ③(オオモハタ)		*Epinephelus areolatus*	2	0.15
7	その他			41	5.30
8	ヤガラ		*Fistularia commersonii*	26	0.60
9	イトヨリ		*Nemipterus tambuloides*	30	2.30
10	ニザダイ科(アイゴ)	英:Acanthuridae		1	0.15
11	セイタカヒイラギ		*Leiognothus equulus*	4	0.40
12	ヒイラギ科	英:Leiognathidae		35	0.70
13	カワハギ科	Monacanthidae		2	0.20
14	ホウボウ科	Triglidae		2	0.10
15	イシダイ科(ヒメジ)	Oplegnathidae		8	0.20
16	ケンサキイカ	英:Squid①		5	0.10
17	コウイカ	英:Squid②	*Sepia esculenta*	2	0.05
18	ハリセンボン科	Piodontidae		2	0.10
19	カマス科	Sphyraenidae		1	0.15
20	エソ科	Synodontidae		3	0.30
21	サバ科	Scombridae		6	0.65
22	カニ	Crab		2	-
23	フグ(センニンフグ)		*Lagocephalus sceleratus*	1	0.09
24	アジ④ アジ科	Carangidae		3	0.15
25	イケカツオ		*Scomberoide lysan*	1	0.16
26	ソフトコーラル②	Soft coral		-	0.65
27	アジ① アジ科			1	0.05
28	アジ② アジ科	Carangidae		6	0.75
29	アジ③ アジ科			2	0.40
30					
	Total			206	16.90

Fishing Logsheet

SEAFDEC Training Department

TRAWL FISHING LOGSHEET

Recorded by
Certified by

Cruise no:	Name of Vessel				Air	
Station no:					Temp:	(℃)
Date:					Pressure :	(hPa)
Moon age:	Start shooting		Finish shooting		Humidity :	(%)
Wind	Time		Time		Water	
Direction / Speed (kt)	Latitude		Latitude		Surface temp :	(℃)
	Longitude		Longitude		Bottom temp :	(℃)
Weather condition	Start hauling		Finish hauling		Transparency:	(m)
	Time		Time		Current	
Sea condition	Latitude		Latitude		Depth (m) / Speed (kt) / Direction	
	Longitude		Longitude			
Vessel	Fishing gear					
Eng. Mode:	Type of trawl:					
Speed (kt):	Towing time:		Towing distance (nm):		Type of bottom	
RPM:	Warp angle:		Warp length (m):		Sea depth (m)	
Pitch:	Net spread (m):		Net opening (m):		Depth of capture (m)	

NR: Not be recorded

No.	Fish Species	Other Species	Length (cm)	Weight (kg)	Remark
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
		Grand total			

Standard Operational Procedure
Fishing Log sheet

T/V Koyo Maru

	Wind direction dir.(deg.)	Wind speed sp'd(m/s)	Air atomosphere (hPa)	Air temperature (℃)	Water temperature (℃)	Wether	Amount of clouds (0-10)	Significant wave height height(m)	Significant wave height period(sec)	Swell direction (16 direction)	Current direction/speed 18.55 m dir.(deg)	Current 18.55 m sp'd(kn)	Current 30.55 m dir.(deg)	Current 30.55 m sp'd(kn)	Current 50.55 m dir.(deg)	Current 50.55 m sp'd(kn)
Start	019	4.0	1012.5	28.7	29.3	bc	3	0.5	6.8	ESE	080	0.24	046	0.22	184	3.49
Take in	012	3.4	1012.4	28.5	29.2	bc	4	0.3	3.1	SE	200	0.11	053	0.19	162	0.73

Contents	Time	Log. G/W (mile)	Position Lat (deg.)	Position Lat (min.)	Position Long (deg.)	Position Long (min.)	Course (deg)	Speed SOG (kn)	Speed STW (kn)	Pro-pitch angle (°)	SHP (kw)	Depth (m)	Depth of net (m)	Height of net (m)	Warp length P/S (m)	Tension of warp (kN) Right	Tension of warp (kN) Left	Width of wing-net (m)
Start casting net	8:50	22261.4 22421.5	10	23.792	102	41.308	195	6.9	7.3	9.0	499	53.8						
Surface Otterboad	9:05	22262.6 22422.7	10	22.502	102	41.061	190	4.4	5.3	11.0	772	55.8						
Warp length 110m	9:20	22263.5 22423.6	10	21.654	102	40.935	190	3.1	3.5	9.0	638	55.6	45.8	7.4	110	38.0	36.0	17.0
Warp length 120m	9:23	22263.7 22423.8	10	21.441	102	40.908	190	3.2	3.8	9.0	637	56.0	46.9	7.3	120	38.0	35.0	19.0
Middle of time(15 min)	9:35	22264.2 22424.3	10	20.861	102	40.895	193	3.2	3.6	9.0	637	55.0	46.3	7.1	120	36.0	33.0	-
Heaving in net	9:50	22265.1 22425.2	10	20.046	102	40.902	183	3.2	3.6	9.0	641	55.3	47.1	7.1	120	35.0	33.0	-
Got off the bottom	9:53	22265.2 22425.3	10	19.882	102	40.902	183	2.9	3.5	7.0	565	55.2	30.0	14.1				
Surface Otterboad	9:55	22265.3 22425.4	10	19.805	102	40.901	183	2.6	2.9	5.0	457	54.6						
Take in cod end	10:16	22265.8 22425.9	10	19.323	102	40.993	169	1.0	1.5	2.0	386	54.4						

Towing time (min)	Engine revolution (rpm)	Towing distance over the ground (mile)	Towing distance through the water (mile)	Towing direction (deg.)	Remark
30	167	1.6	1.6	180	

Standard Operational Procedure
Fishing Logsheet

https://www.boblme.org/documentRepository/Nansen%20ecosystem%20survey%20Myanmar%2013%20November%20-%2017%20December%202013.pdf

Fishing Log-sheet

R/V Fridtjof Nansen

R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 1
DATE :15/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°36.90
start stop duration Lon E 92°44.65
TIME :02:28:52 02:59:08 30.3 (min) Purpose : 3
LOG : 9576.16 9577.82 1.7 Region : 10310
FDEPTH: 92 92 Gear cond.: 0
BDEPTH: 92 92 Validity : 0
Towing dir: 0° Wire out : 250 m Speed : 3.3 kn
Sorted : 71 Total catch: 70.97 Catch/hour: 140.67

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Rastrelliger kanagurta	74.83	729	53.19	1
Sphyraena barracuda	28.74	254	20.43	2
Upeneus moluccensis	8.78	389	6.24	
Seriolina nigrofasciata	6.32	14	4.49	4
Pomadasys maculatus	5.37	109	3.82	3
Rachycentron canadum	3.55	4	2.52	
Saurida elongata	2.48	57	1.76	5
Nemipterus japonicus	1.80	77	1.28	
Snail	1.55	0	1.10	
Tetraodon sp.	1.45	10	1.03	
Sardinella sp.	1.27	24	0.90	
Sepia sp.	1.13	2	0.80	
Metapenaeus sp.	0.63	83	0.45	
CLUPEIDAE	0.59	10	0.42	
Selaroides leptolepis	0.56	6	0.39	
Platycephalus sp.	0.40	12	0.28	
Mene maculata	0.30	12	0.21	
Cynoglossus sp.	0.22	24	0.15	
Leiognathus brevirostris	0.22	28	0.15	
Terapon jarbua	0.16	2	0.11	
Naucrates ductor	0.08	2	0.06	
Pentaprion longimanus	0.04	2	0.03	
PORTUNIDAE	0.04	34	0.03	
Loligo sp.	0.02	6	0.01	
MURAENIDAE	0.02	2	0.01	
SCORPAENIDAE	0.00	2	0.00	
Priacanthus sp.	0.00	4	0.00	
Total	140.54		99.90	

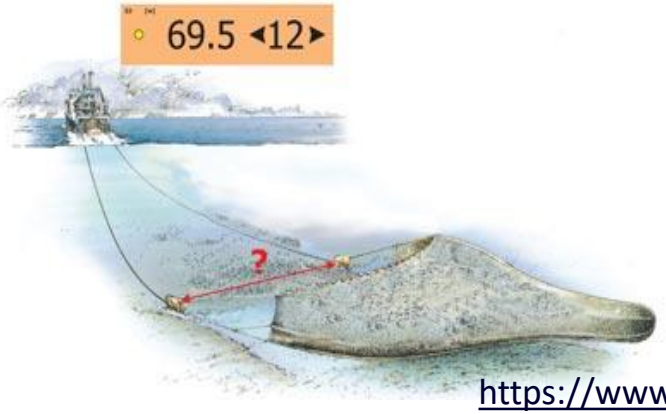
R/V Dr. Fridtjof Nansen SURVEY:2013409 STATION: 3
DATE :15/11/13 GEAR TYPE: BT NO: 25 POSITION:Lat N 19°35.04
start stop duration Lon E 93°17.04
TIME :11:10:53 11:32:28 21.6 (min) Purpose : 3
LOG : 9625.06 9626.13 1.1 Region : 10310
FDEPTH: 28 32 Gear cond.: 0
BDEPTH: 28 32 Validity : 1
Towing dir: 0° Wire out : 100 m Speed : 3.0 kn
Sorted : 25 Total catch: 25.34 Catch/hour: 70.45

SPECIES	CATCH/HOUR weight	CATCH/HOUR numbers	% OF TOT. C	SAMP
Lepturacanthus savala	16.71	0	23.72	
Plotosus canius	9.06	3	12.87	
Scomberomorus guttatus	6.28	8	8.92	
Ilisha elongata	5.51	192	7.81	
Metapenaeus sp.	4.39	0	6.24	
Parapenaeus sp.	3.17	0	4.50	
Upeneus sulphureus	3.11	0	4.42	
Apogon sp.	3.06	0	4.34	
Pennahia anea	2.78	0	3.95	
Leiognathus sp.	2.50	0	3.55	
Thryssa setirostris	2.34	0	3.31	
Congresox talabon	2.22	6	3.16	
Pomadasys argenteus	1.67	8	2.37	
Cynoglossus bilineatus	1.39	0	1.97	
Sepia sp.	1.00	0	1.42	
Loligo sp.	0.78	0	1.10	
Penaeus monodon	0.72	14	1.03	
Pampus argenteus	0.61	3	0.87	
Terapon jarbua	0.61	19	0.87	
Gerres filamentosus	0.56	8	0.79	
Megalaspis cordyla	0.50	3	0.71	
Sphyraena jello	0.50	6	0.71	
Sardinella gibbosa	0.33	6	0.47	
Lactarius lactarius	0.28	14	0.39	
Nemipterus japonicus	0.22	3	0.32	
Johnius belangerii	0.11	6	0.16	
Trypauchen microcephalus	0.03	3	0.04	
Total	70.45		100.00	

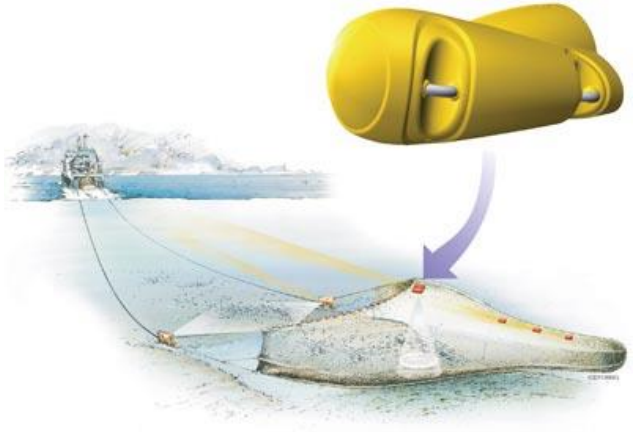
Estimated Opening of Bottom Trawls Electronic

Depth sensor

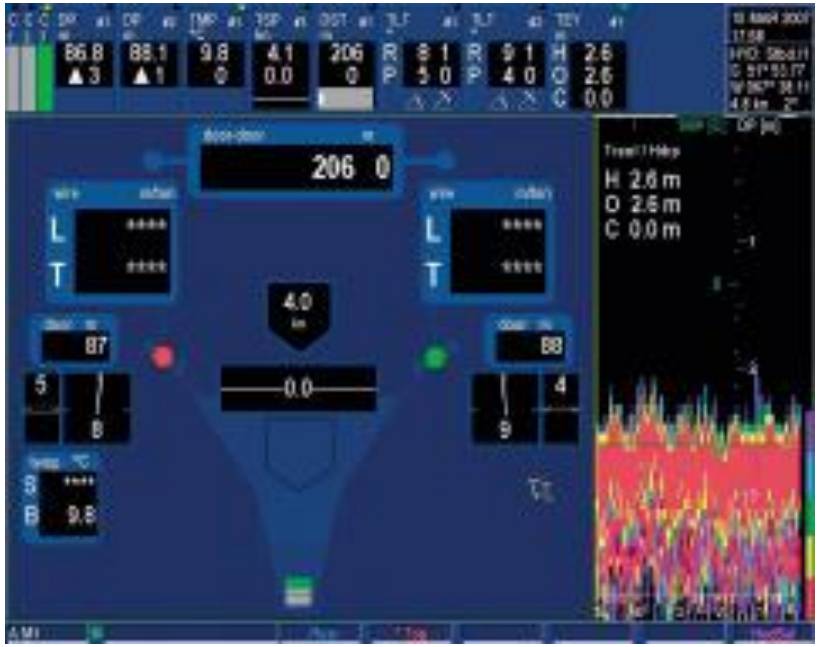
Door Sensors



Catch sensor

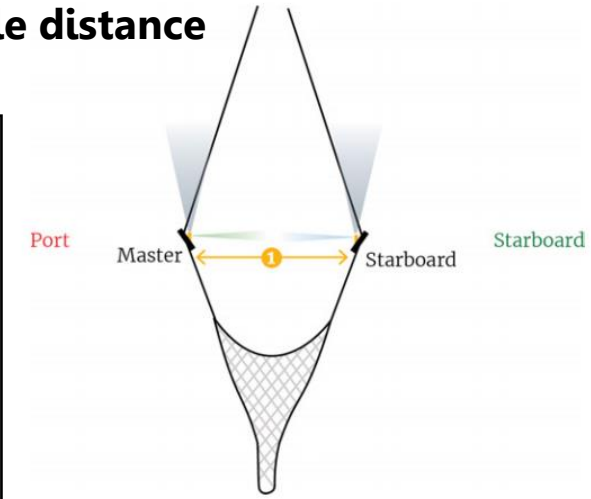


https://www.scanmar.no/sensors/



Spread Sensors in Different Modes

Single trawl with single distance

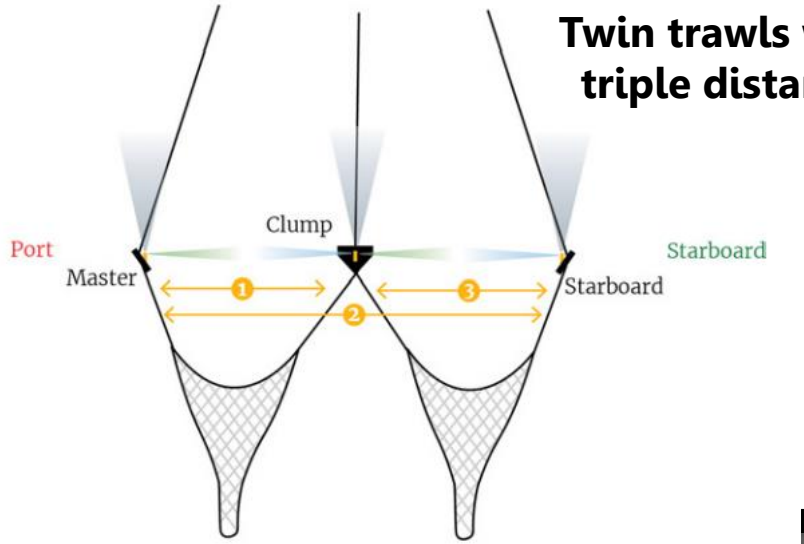


Asks for answer

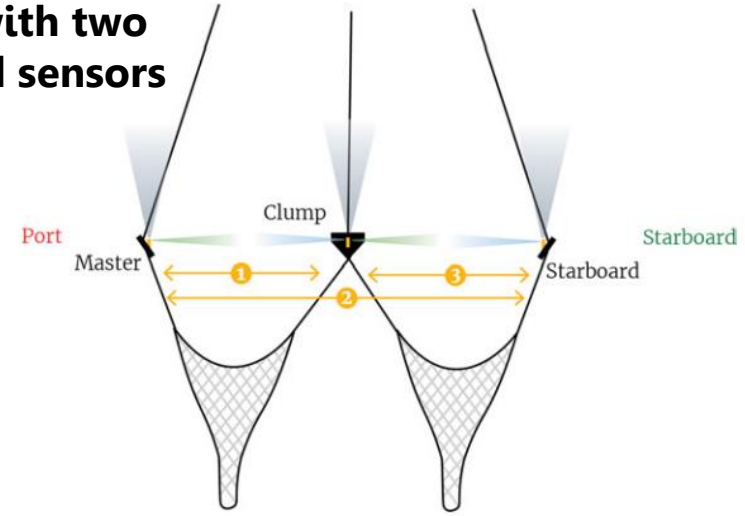
Answers

Sends data (door spread distance, bearing, pitch and roll, depth...) to the receiver

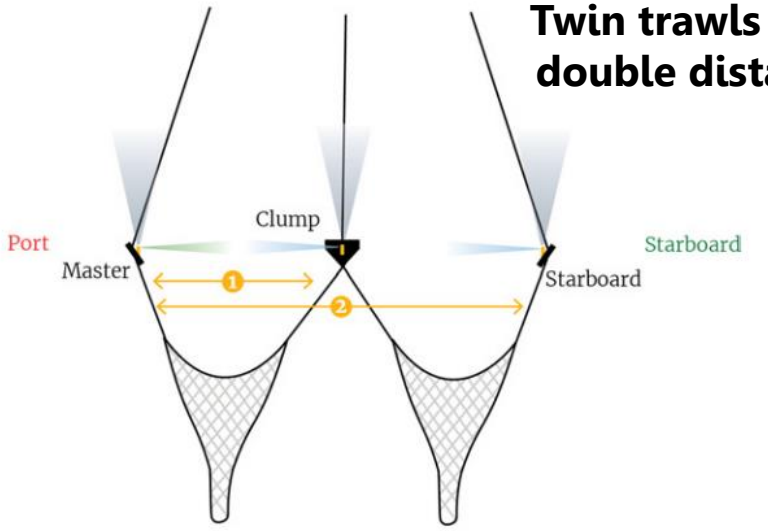
Twin trawls with triple distance



Dual trawls with two sets of spread sensors

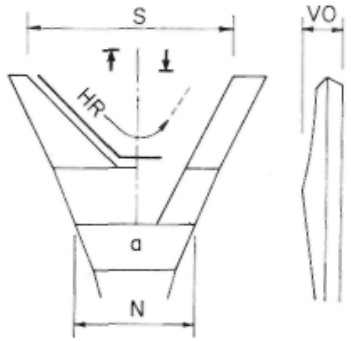
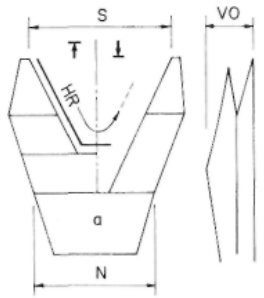


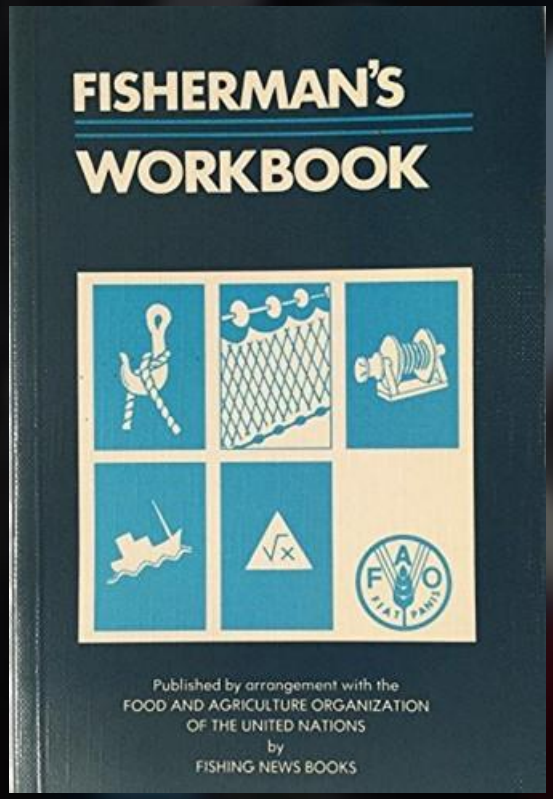
Twin trawls with double distance



(http://www.marport.com/pdf/TrawlPositioning_UserGuide_en_V2.pdf)

Estimated Opening of Bottom Trawls (FAO 1990)

Trawl Type	Figure	Net Height	Net Width
Bottom trawl		VO ~ 2 x N x a x 0.05 to 0.06	S ~ HR x 0.50
High-opening bottom trawl		VO ~ 2 x N x a x 0.06 to 0.07	S ~ HR x 0.50 HR: Head Rope



N or n = width in number of meshes of front edge of belly (seams not included)

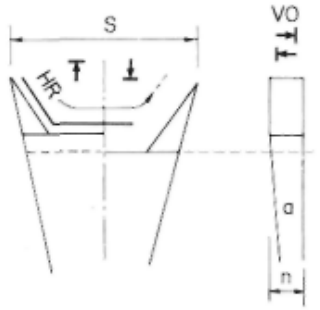
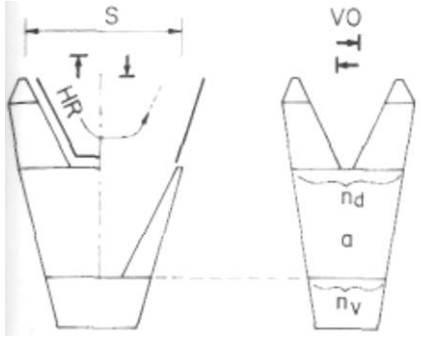
a = mesh size, length in metres of one stretched mesh at the part of net considered

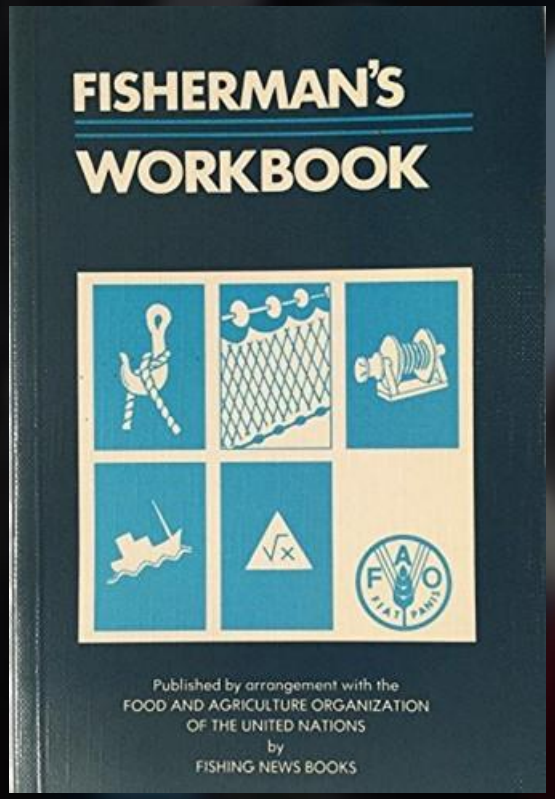
VO = approximate vertical opening of net mouth (metres)

S = approximate horizontal spread between ends of wings (metres)

HR = length in metres of headrope

Estimated Opening of Bottom Trawls (FAO 1990)

Trawl Type	Figure	Net Height	Net Width
Shrimp trawl (flat or semi balloon)		VO ~ 2 x N x a x 0.05 to 0.06	S ~ HR x 0.50
High-opening, 4-panel bottom trawl		1) Fork Rigging VO = [(nd + nv)/2] a x 0.5-0.6 2) Bridle rigging VO = [(nd + nv)/2] a x 0.4	S ~ HR x 0.60 S ~ HR x 0.50



N or n = width in number of meshes of front edge of belly (seams not included)

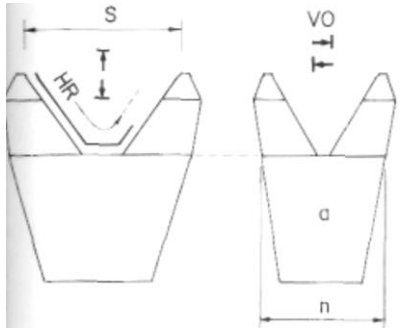
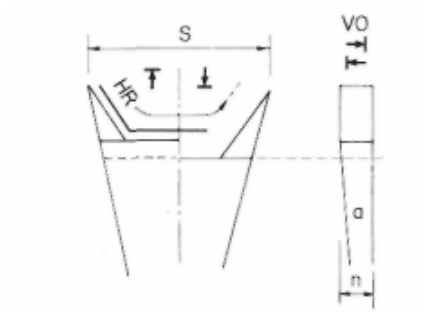
a = mesh size, length in metres of one stretched mesh at the part of net considered

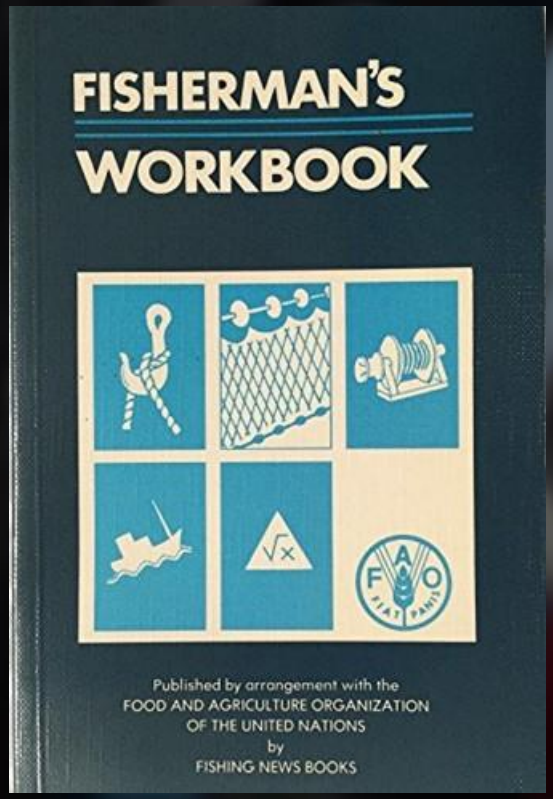
VO = approximate vertical opening of net mouth (metres)

S = approximate horizontal spread between ends of wings (metres)

HR = length in metres of headrope

Estimated Opening of Bottom Trawls (FAO 1990)

Trawl Type	Figure	Net Height	Net Width
Shrimp trawl (flat or semi balloon)		VO = n x a x 0.25 to 0.30	S ~ HR x 0.50 to 0.60
Mid-water pair trawl		VO = n x a x 0.25 to 0.30	S ~ HR x 0.60



N or n = width in number of meshes of front edge of belly (seams not included)

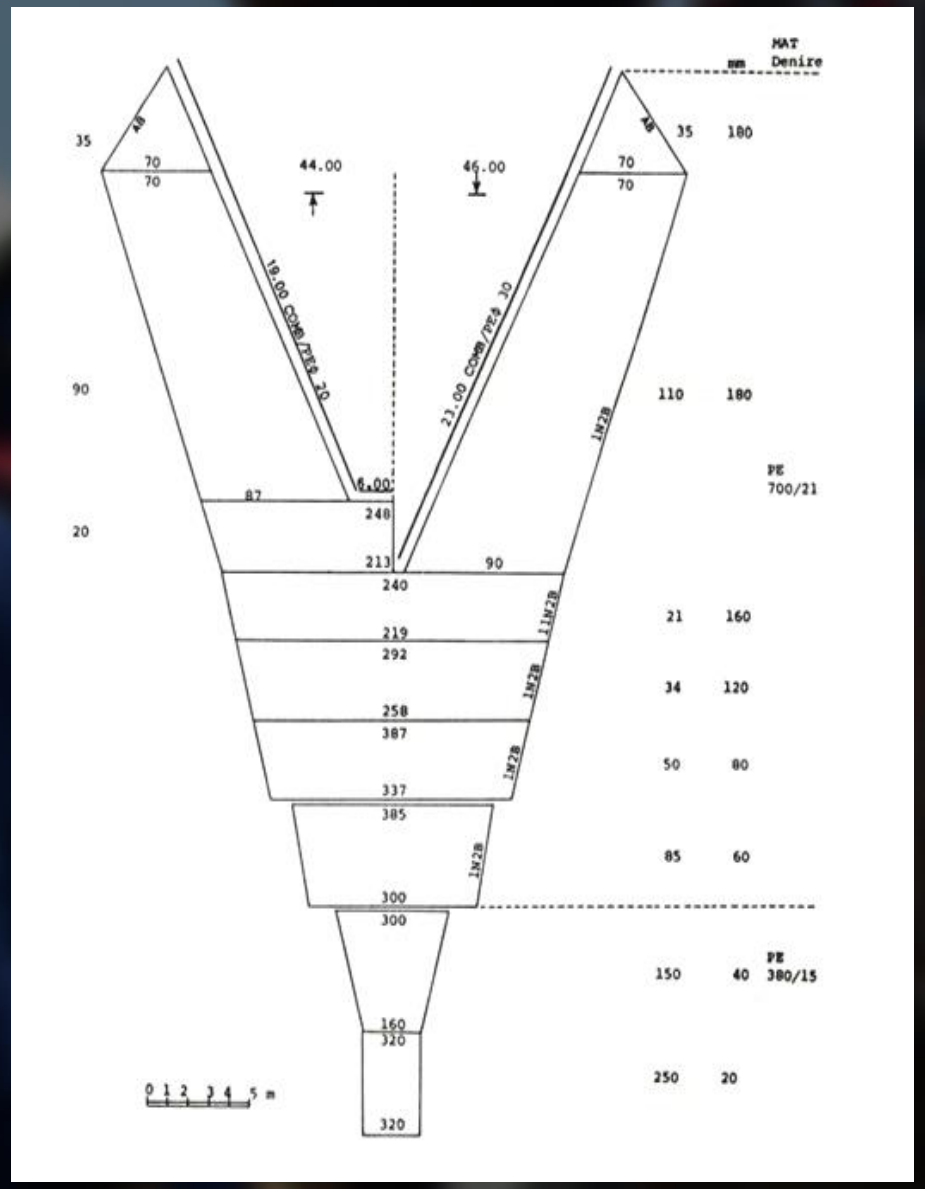
a = mesh size, length in metres of one stretched mesh at the part of net considered

VO = approximate vertical opening of net mouth (metres)

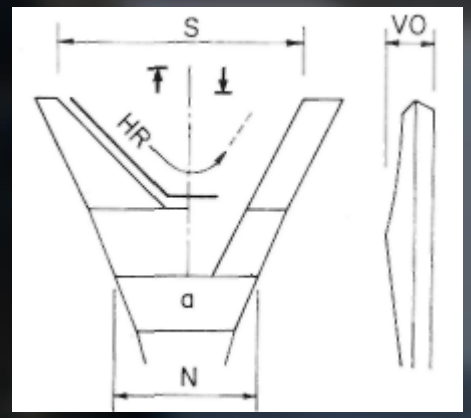
S = approximate horizontal spread between ends of wings (metres)

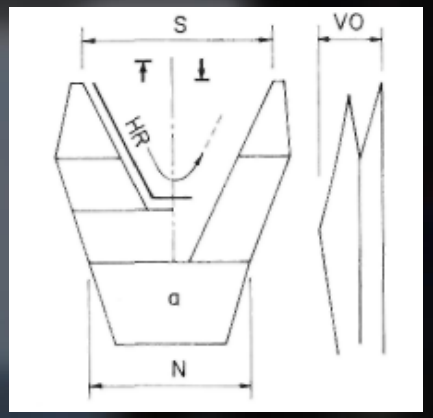
HR = length in metres of headrope

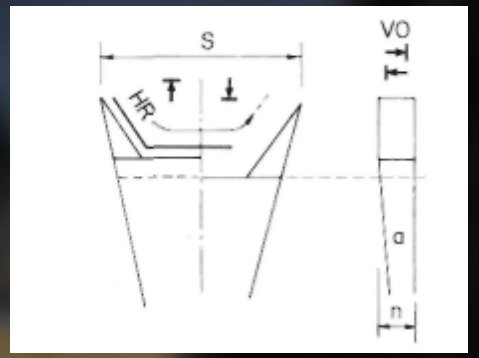
Example Estimated Opening of Bottom Trawls (FAO 1990)

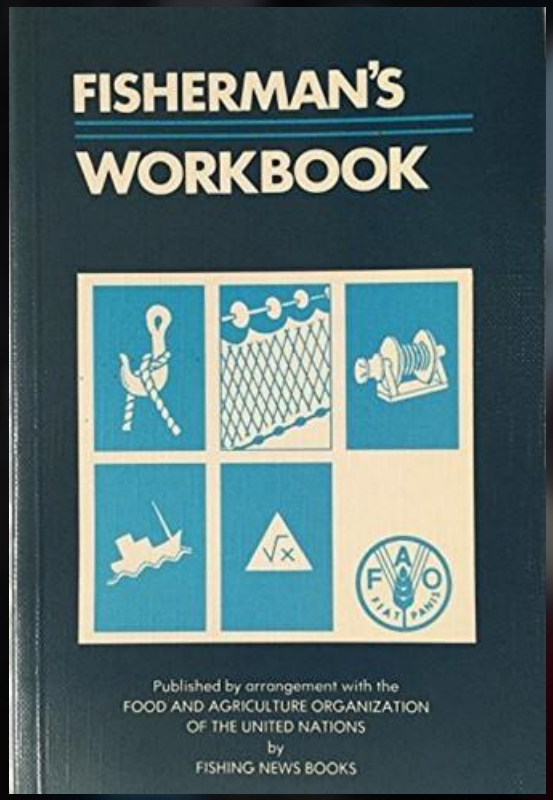


Net Height	Net Width
2 x 219 x (180/1000) x 0.06 (or 0.07) = 4.73 - 5.52	= 44/2 ม. = 22 ม.



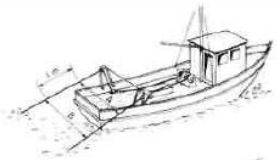




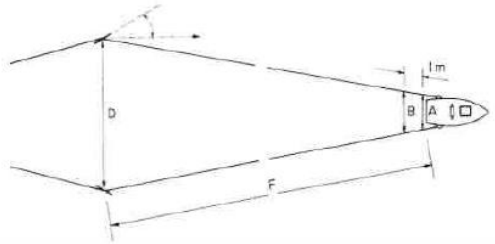


Example Estimated Opening of Bottom Trawls (FAO 1990)

Estimating the spread of otter boards (doors)



$$D \simeq [(B-A) \times F] + A$$



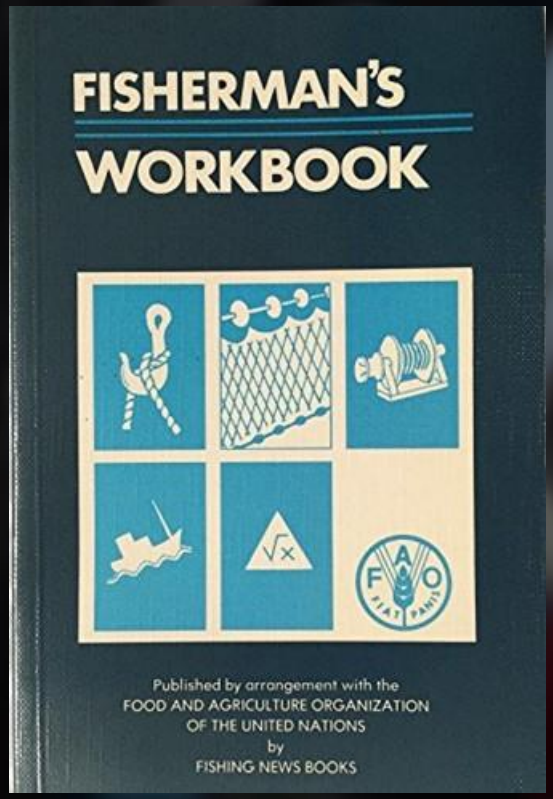
Example: On the vessel above, if :

A = 4.00

B = 4.18

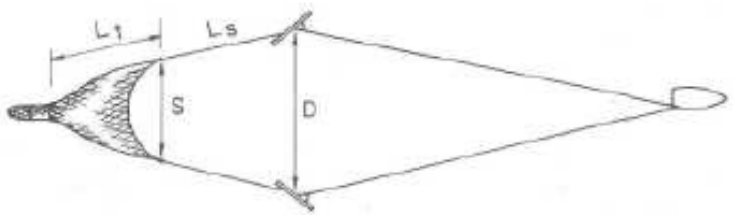
F = 200

Then D = [(4.18 - 4.00) x 200] + 4 = 40 m (spread at otter boards)



Estimating the horizontal net opening

$$S \simeq (D \times L_1) / (L_1 + L_S)$$



Example: Given a trawl of 25 m in length (without bag)

rigged with sweeps of 50 m and otter board spread of 40 m, then spread of trawl wing ends :

$S \simeq [40 \times 25] / [25+50]$

$S \simeq 13.3$ m

(D) Spread of Otter board
(L_1) Length of Trawl without Bag
(L_s) Length of Sweep line

INDICATOR OF ABUNDANCE (FAO 1990)

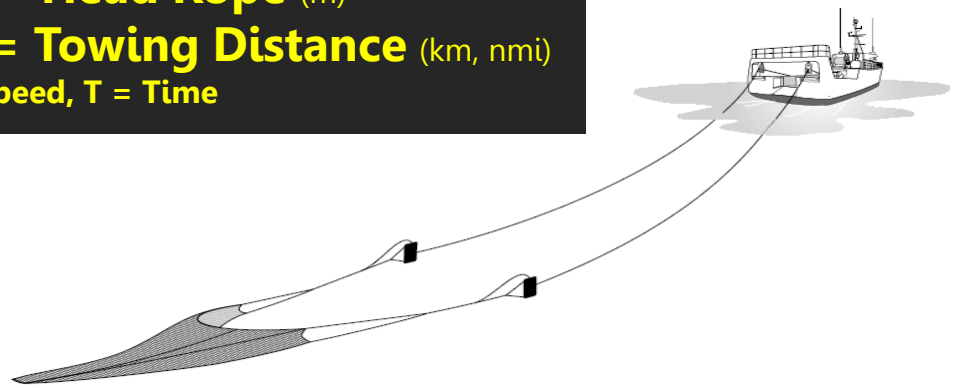
Catch Per Unit Effort (CPUE) >>>> Kilogram/Hour (kg/hr)

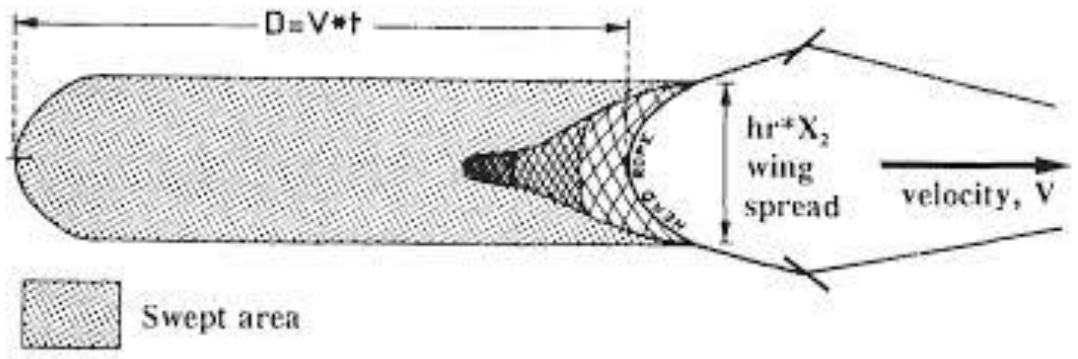
Catch Per Unit Area (CPUA) >>>>> Kilogram/Square Nautical mile (kg/nmi²)

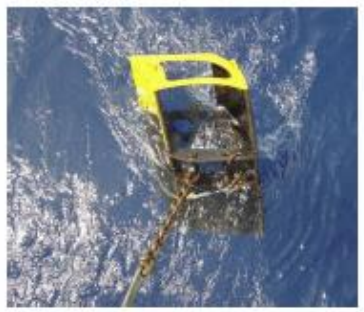
Kilogram/Square Kilometer (kg/nmi²)

CPUA = (HR/2) x D

HR = Head Rope (m)
D = Towing Distance (km, nmi)
V = Speed, T = Time

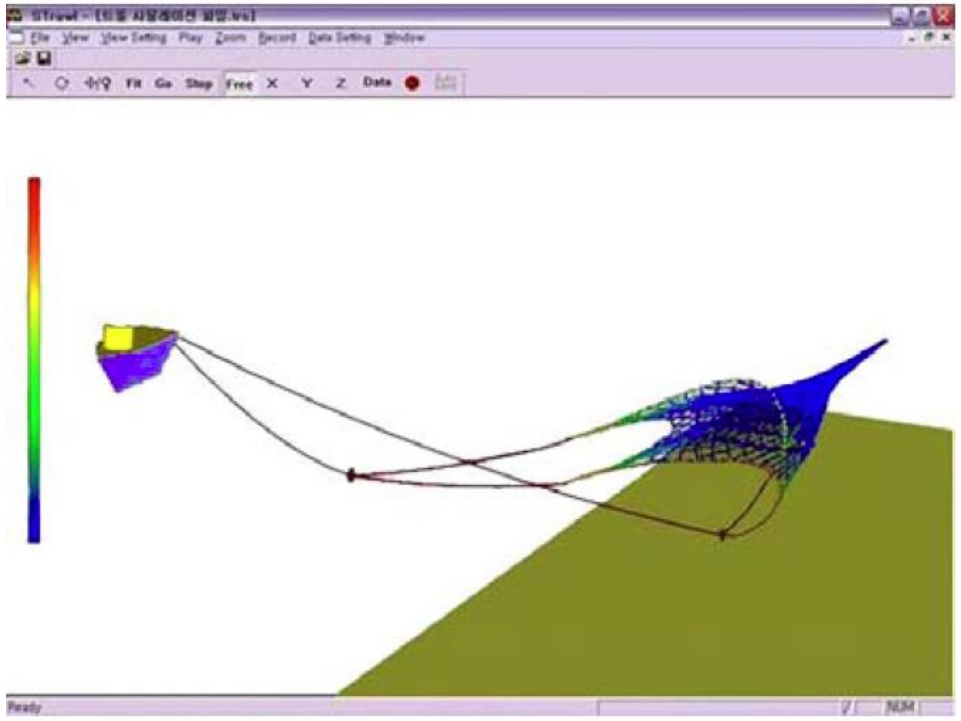




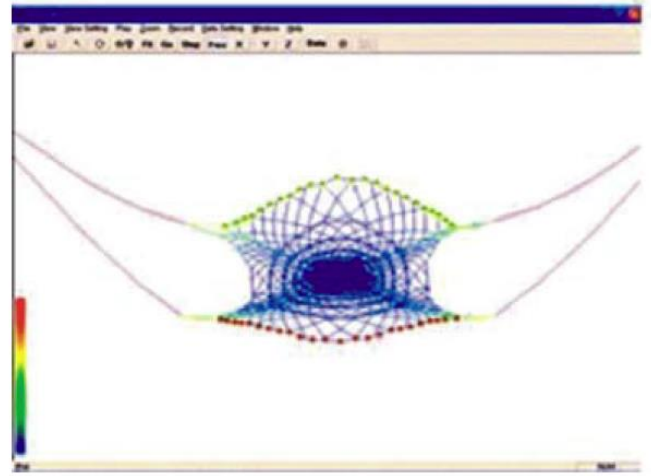


INDICATOR OF ABUNDANCE of MID-WATER TRAWL

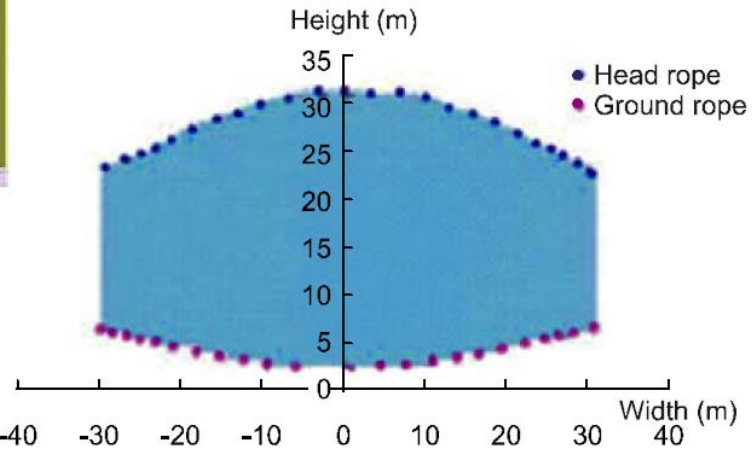
- The shape of the net mouth for a midwater trawl is almost oval.
- The herding effect by the bridles and trawl doors was not considered the position and coordinates of the head and ground ropes during a mid-water trawl



Underwater shape of the midwater trawl gear simulated on a computer



Net mouth shape



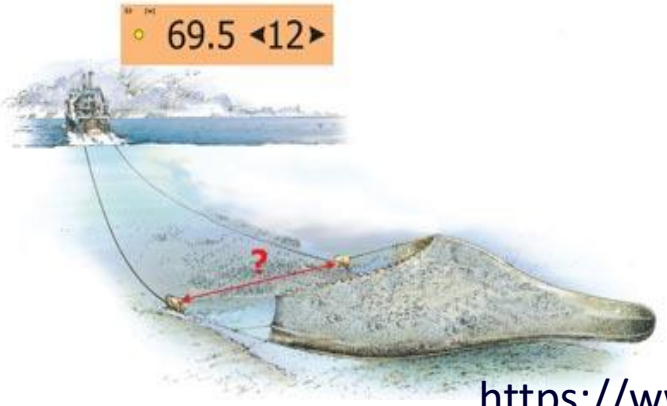
Head rope and ground rope in the midwater trawl.

Applying Fishing-gear Simulation Software to Better Estimate Fished Space as Fishing Effort
Jihoon Lee, et.al. (2011)

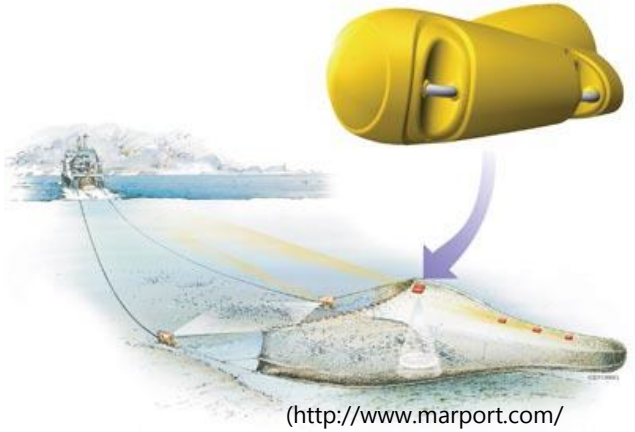
Estimated Opening of Bottom Trawls Electronic

Depth sensor

Door Sensors

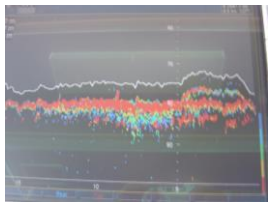


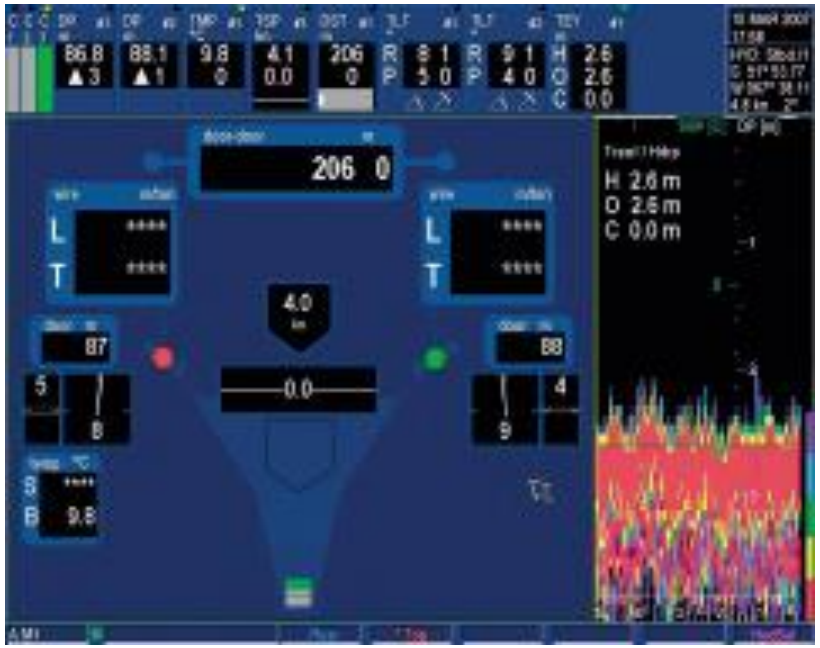
Catch sensor



https://www.scanmar.no/sensors/

(http://www.marport.com/

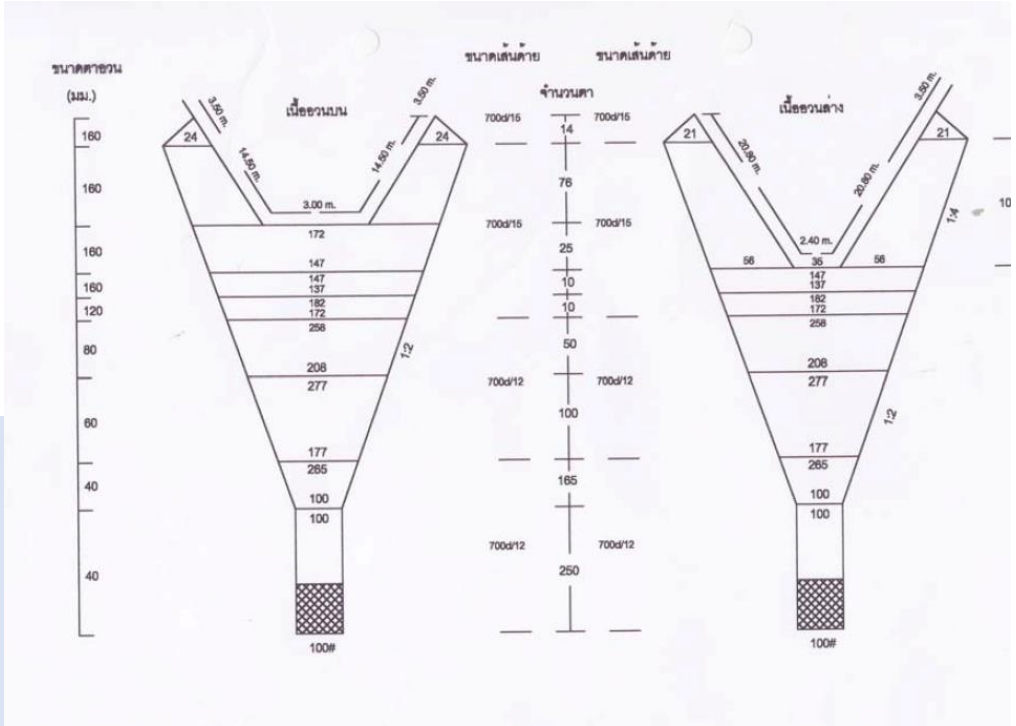




Survey with Different Research Vessel

- Different research vessel
- Similar engine power
- Similar net design
- Similar fishing gear accessories e.g trawl doors, towing warps, sweep lines, and etc.

Standardization were determined by statistical comparing catch per unit effort (CPUE) from the standard otter board trawler with same mesh size.




https://www.fisheries.go.th/mf-emdec/


http://oknation.nationtv.tv/blog/


https://www.siamchonnews.com/

Comparison of Catch Per Unit Effort of Marine Resources From Research Vessels In the Gulf of Thailand
Wirat Sanitmajjaro, Et.Al. (2011)

Reference

Bundit C. 1985. Basic knowledge of trawl and trawling. Training Department, Southeast Asian Fisheries Development Center, Thaialnd.

Fisheries and Aquaculture Department of FAO. 1990. Definition and classification of fishing gear categories, Fisheries Technical Paper. No. 222 (Revision 1).

Jean Weissenberger. 2015. Understanding fisheries technical rules. European Parliamentary Research Service. European Union.

Jihoon Lee, et.al. 2011. Applying Fishing-gear Simulation Software To Better Estimate Fished Space As Fishing Effort

Joël Prado. 1995. Fisherman's Workbook. FAO.

Nakaret Yasook, et.al. 2007. Standard Operating Procedures of Isaacs-Kidd Midwater Trawl (TD/RES/112). SEAFDEC Training Department

Sayan Promjinda et.al. 2007. Standard Operating Procedures of Deep-Sea Beam Trawl (TD/RES/112). SEAFDEC Training Department

SEAFDEC/TD. 1988. Fishing Technology Outline (TD/RES45). SEAFDEC Training Department

SEAFDEC/TD. 2005. Standard Operation Procedure of M.V. SEAFDEC2. SEAFDEC Training Department

SEAFDEC/TD. 2013. Some Technical Aspects on Midwater Trawl Operations Lesson learnt from the Operation of M.V.SEAFDEC2 around Viet Nam Waters. SEAFDEC Training Department

SEAFDEC/TD. 2002, 2003, 2007. Fishing Gear and Method in Southeast Asia II, III, IV, V, VI. SEAFDEC Training Department

Sparre, P. and Venema, S.C. Introduction to tropical fish stock assessment - Part 1: Manual FAO Technical Paper No.306/1 Rev 2. FAO. Rome. Italy

Taito Seiko Co. Ltd. 2004. Test Result of Fishing Gear for M.V. SEAFDEC 2. Taito Seiko Co., Ltd. Tokyo, Japan.

Widodo, S. Pi, et.al Indonesia Catalogue of Fishing Gear Design. Ministry of Marine Affair and Fisheries, Republic of Indonesia.

Wirat Sanitmajjaro, et.al. 2011Comparison of Catch Per Unit Effort of Marine Resources from Research Vessels in the Gulf of Thailand. Department of Fisheries Thailand.

http://www.fao.org/fishery/geartype/103/en

https://www.scanmar.no/sensors/

http://www.marport.com/pdf/TrawlPositioning_UserGuide_en_V2.pdf

https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/571313/EPRS_IDA(2015)571313_EN.pdf

https://seafish.org/gear-database/gear/

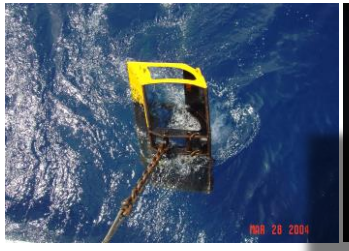
http://www.oknation.net/blog/



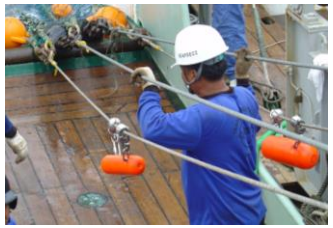


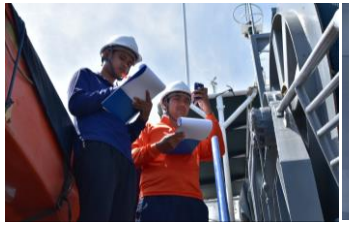




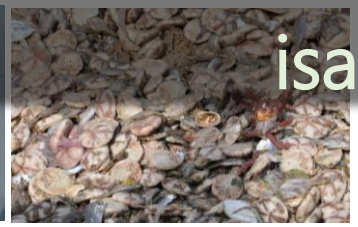



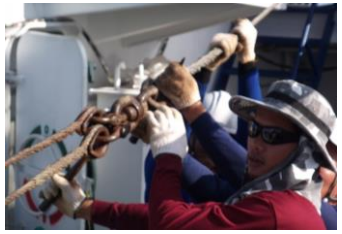
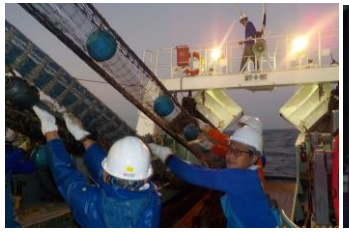
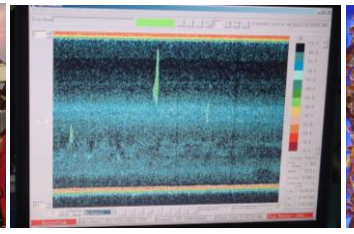










Sampling Gear

Trawl Net

Presenter: Isara Chanrachkij
isara@seafdec.org)