NOAA FISHERIES

Harvesting Systems

Cable Grid Testing
2018
Panama City Beach
Trawl Diving and TED Testing

TIII Evaluation with NEFSC Flounder Trawl

TII Evaluation with Kites

TI Video Documentation

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The following is a brief summary of the results found trawl diving on fish trawl sorting devices made out of cable installed in commercial fishing gear and modified to maximize catch retention while excluding sea turtles.

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Introduction

In 2018 a chartered fishing vessel FV Capt Wick and trawl divers were used to video and test four fish trawl sorting grids made out of cable. Two grids referred to as a Type III (TIII) cable grid were made for the Northeast US flounder (Paralycthis dentatus) fishery. A Type II (TII) grid currently being tested in the Suraminese reef fish trawl fishery (TII) and a Type I (TI) grid that has completed field testing in the US Flynet croaker (Micropagodus undulatus) fishery (TI) were evaluated as well.

Method and Equipment

The FV Capt Wick was used because it was equipped with a net reel for storage and deployment of fish trawls. The cable grid concept is the best fit for fisheries that use net reels. The Wick's crew was onboard to assist the trawl dive team.

Two types of fish trawls that utilize net reels were used in this series of dives. To test the flounder grids (TIII)a flounder trawl provided by the NESC was used. There were two flounder trawls on site. One was used as a control in comparison testing and the second was equipped with a TIII grid tested in 2017 for Dive 2. Both trawls were made to the same specifications. The second fish trawl used was a Flynet commonly found in the US mid-Atlantic croaker fishery.

Vee Doors and 30 fathom bridles (1/2 inch stainless steel cable) were used with both trawls. The scope varied between the first sets because there were no marks on the wire. The depth ranged from 24- 38' feet depending on the amount of visibility.

The first five dives focused on TIII development for the northeast flounder fishery. The first dive was used to look at the control (trawl without a cable grid) used in NEFSC TIII catch retention comparisons conducted on commercial fishing boats out and around Rhode Island and Long Island NY in 2016-17. Dives six through nine used the flynet and focused on documenting the shape of the TII in its current configuration and possible options for modification. The last dive (10) was used to document the final tested configuration of the TI used in field testing.

Results

Dive 1 Control, NEFSC test flounder Trawl (Ta)
This dive was used to establish the bench marks to determine how the cable grids impact the shape of the trawl. Measurements were taken by an acoustic reader of the height of the trawl at certain section seams and at times the height of the trawl off of the bottom. The footrope was found making good contact with the bottom and the acoustic reading of the head rope height was 6.65 feet. The seams are where belly panels are sewn together. The first seam measures 134 meshes across (either top or bottom not in total around). The second seam is 75 meshes across and is where the lead webbing installed ahead of he grids is installed in the trawl. The section of the belly between the 75 mesh seam and the following 35 mesh seam at the end of the bellies is removed from the trawl equipped with TIII grids. The width of

a mesh at the top and one at the side of each seam meshes, and a few meshes ahead of the seams, are measured with calipers. This measurement helps find the distribution of mesh opening variations found in this two seam flounder trawl. This should help predict characteristic of installation sites (IS) in comparable two seam trawls.

Dive 2 Experimental Trawl (Tb), TIII 2017

This dive focused on measuring the TIII grid and preceding webbing ahead of it, referred to as the transition piece, use in comparison trawls in 2017. The same measurements taken from the control trawl were collected from this test trawl. There was a notable increase in headrope height that may have been directly related to the weight and/or resistance of the grid and transition in the test trawl, but unfortunately there was an unmeasured influence of change in the scope of the warps. In order to navigate the Wick easier, the scope was shortened for the second tow. Considering the shallow depth and long bridles, if the doors were drawn together by the shorter scope then the head rope would end up higher on the second dive, with or with out the cable grid's influence.

The TIII tested in 2017 did not look that bad. Although in the comparison tests the grid lost more than 40% of the target catch it appeared to have a light flap seal, a tall upright grid and sufficient sorting area. The light flap seal may be compromised when the gear is towed under commercial conditions such as speeds of 3.2-3.5 instead of the trawl dive speed of 2.5 knots as well as the continuous flow of bycatch such as skates that would not otherwise fit through the grid slots (the openings of the grid framed by bars and back straps that allow catch to pass through).

Dive 3 Ta, Transition Piece 2018 (TP1) and TIII 2017

This dive introduced new gear for 2018. A new concept for the TP1 was looked at sewn to the lead end of the 2017 TIII. TP1 had side panels similar to the transition piece used in 2017 but removed the outer side panels (used to transition the 2 seam trawl into a 4 seam trawl) which no longer served any function. Between the bellies side panels were sewn on a taper that lead closer to the middle of the belly towards the apex of the grid rather than down the sides of the bellies. At the end of the panels smaller meshed panels are sewn to form flaps that cover the TIII side openings. This was designed to reduce the amount of catch that was lead to the grid openings and was lost. A slower taper (3:1) was used on the edges of the top and bottom panels. The outside tapers were gored to ¾"gore ropes to help define the length of the transition and increase tension on the grid lead ring (LR). These changes helped straighten out the LR. Bends found in the LR on Dive 2 would result in lower (below 45°) grid angles and fish loss.

Dive 4 Tb, Transition Piece with funnel 2018 (TP2) and TIII 2018

This dive introduced a new TIII concept (TIII 2018) as well as another transition piece for testing. This transition piece (TP2) is comparable to TP1 where it has no side panels (which allows the limited water flow down the side of the trawl to interact with the TIII's side shooting flaps to help seal the opening) gore ropes to hold tight to the LR and the beginning of the internal side panels. The big difference is the tail half of the internal panel are no longer gored into the bellies. Instead along the midline of the bellies, between the panels, a smaller version of the top and bottom bellies, with half the mesh count found within this section of the belly midline is sewn to the bellies. The side edges (with the same tape as the bellies) are gored to the side panels. The four resulting gores/ panels form a funnel where the top and bottom of the funnel are secured around the center of the grid at the LR. The side panels terminate with smaller meshed panels that form the flaps to seal the side openings.

It was interesting to see how the changes made to TIII 2018 produced a better looking LR and resulting greater sorting area. TP2 also helped draw the flaps up well onto the face of the grid. This was no a light seal. This was potentially too good.

There was still some question about how the top sides of the LR and grid extension drooped down and why there were some areas of webbing pockets but these changes were not only substantial, they lead to significant improvements.

Dive 5 Tb, TP2 and TIII 2018, alternative float configuration.

This dive used the same gear configuration but looked at floatation adjustments. In Dive 4 eight-inch floats were used, one at the apex, one at the middle of each panel and three on each wing end. This put 15lbs. of floatation on each wing end and 45 lbs. of floatation total. On Dive 5 a lot of attention was given to the wing ends. 11-inch floats were used on the wing ends which have 18lbs of floatation compared to 5lbs. for the eight-inch. Two 11’s were used on the wing ends and moveable eight inch were hooked into the centers of each grid panel for 32lbs. of flotation in each wing end and 74lbs total.

This configuration looked best of all. The LR was straight and the corners never looked better. There was still some issue with webbing pockets and the side panel of the funnel looked excessive but overall it looked like it would retain catch well.

Dive 6 Flynet and Suriname Type II five-inch bar spacing grid (TII)- top shooter

The flounder trawls were swapped out and the flynet was brought on board for Dive 6. This first grid to test in the flynet was the TII grid. The TII has a round LR with the quarter of it removed from the area just ahead of the opening cut. This was done to allow a smaller grid to expand to discharge larger sea creatures or debris. This dive looked at the TII made five feet in diameter with five-inch wide bar spacing. This excessive bar spacing was requested by the Surimanese trawl fishery that wanted to incorporate a device that could help protect sea turtles from fish trawls. The TII was looked at first as a top shooter with the same number of floats used in the field testing in Suriname. The first flaw found on this dive was the flap was found well over the grid frame extension. This resulted in a wide gap prime for fish escape.

Dive 7 Flynet and TII- bottom shooter

The grid was removed and reinstalled as a bottom shooter without any flotation. This dive found the flap seal was good but the LR was all distorted. The weight of the grid would drop the grid extension down into the flap which was good but the grid panel would have a concave shape instead of a planer slope.

This could hold heavy bycatch, such as five-foot wide southern sting rays, up against the grid and clog the trawl instead of helping them slide out of the opening. The LR is made to hold the grid at a consistent 45° angle when the LR is round like the fishing circle of the trawl. When the LR is not circular or is wavy then the grid cannot have a consistent angle, roughly starting with a 30° angle that increases towards the middle until it ends up in the 50's near the opening. This is the ultimate push for better understanding everything there is to know about the installation site and how it supports the LR. It was apparent looking at the LR on this dive it needed some attention.

Dive 8 Flynet and TII with kites, bridge and adjustment floats at 84 mesh Installation site (IS)
Using the same gear and configuration, on this dive a bridge was used to close the opening of the TII LR, kites were installed along the gores behind the LR ahead of the grid and floats were added to help seal the flap.

The kites helped correct some of the LR bends but it appeared the water flow directed by the kites blew the flap open. The bridge helped level the flap and floats help seal it intermittently but there was still an excessive opening that would easily loose catch. The kites consisted of four panels. The set at the top of he gores, towards the end of the LR that anchored the bars, were full of water and held the LR tight in a good but it was still partially collapsed by the weight of the grid. The bottom set of kite panels were awkward and offered no substantial amount of support to the LR.

Dive 9 Flynet and TII with kites, bridge and adjustment floats at 120 IS
Taking the gear from Dive 8 everything was move up further ahead in the trawl into a larger IS. The move resulted in the best LR shape ever seen for a TII grid. The move was extreme and the same result may be found moving ahead half the number of meshes but it was good to see how to make the LR look good. The angle of the grid looked good but some how in achieving this perfect grid juxtaposition the flap seal was lost. The grid frame extension was pull up away from the flap or maybe the water flow from the kites pushed the flap panel away? Flotation added to the bridge helped push the flap back up into the grid. 10lbs of floatation provided a light flap seal. 25lbs might offer better results.

Dive 10 Flynet and Type I croaker grid (TI)
This dive was needed to close the work done on the TI built for the Flynet fishery. It focused on observation and documentation of the configuration of the device used for the field work. It was interesting to see how well the flap sealed but how poorly the LR appeared. There are a number of things that could be done to make the LR fit better but this was not the time to make any changes.

Trawl dive figures

Dive 1.

Figure 1 75 mesh seam, top

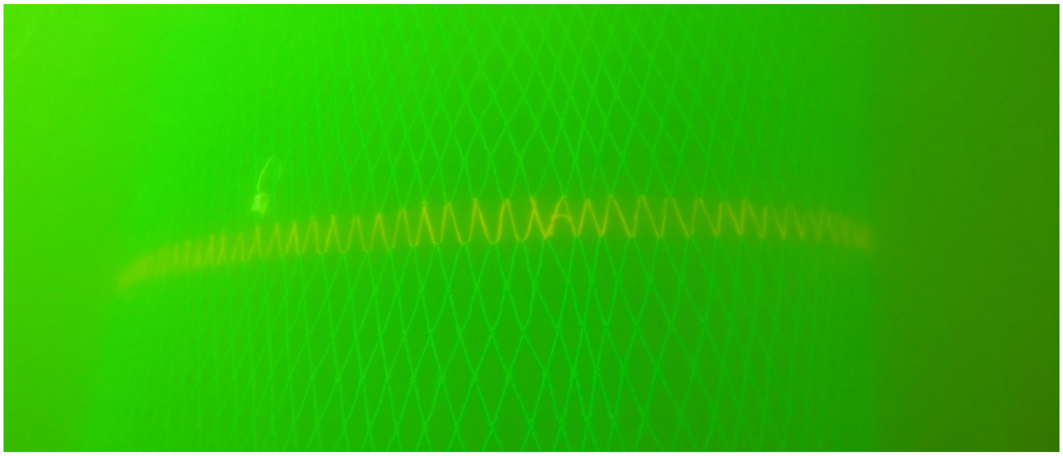


Figure 2 35 mesh seam, top

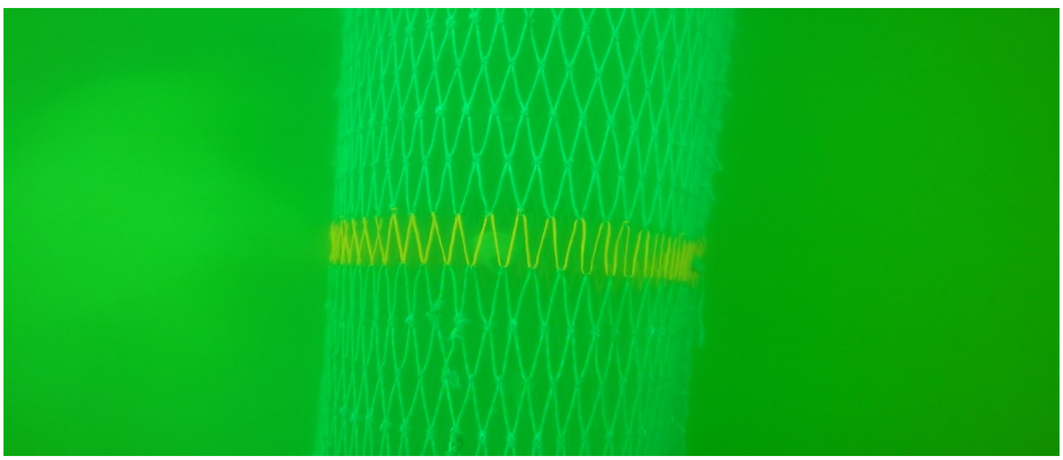
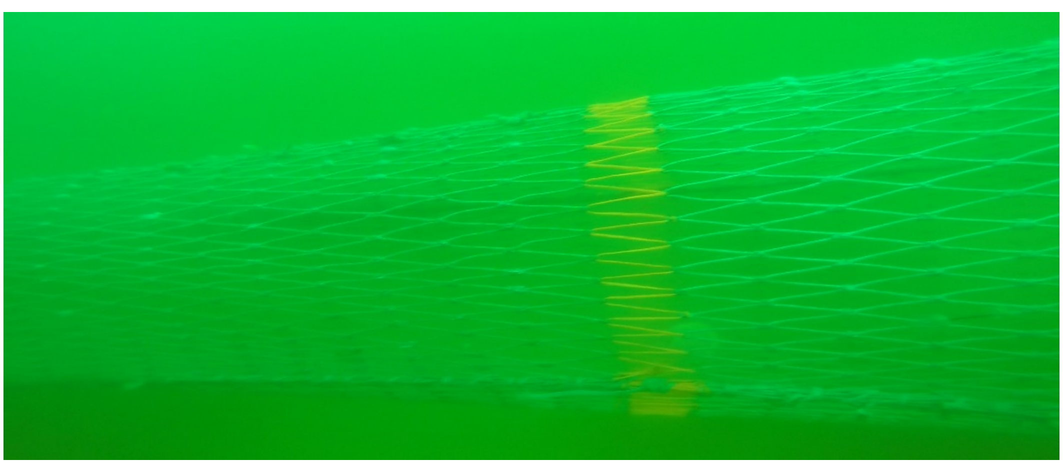


Figure 3 35 mesh seam, side



Dive 2

Figure 4 Side of TIII 2017

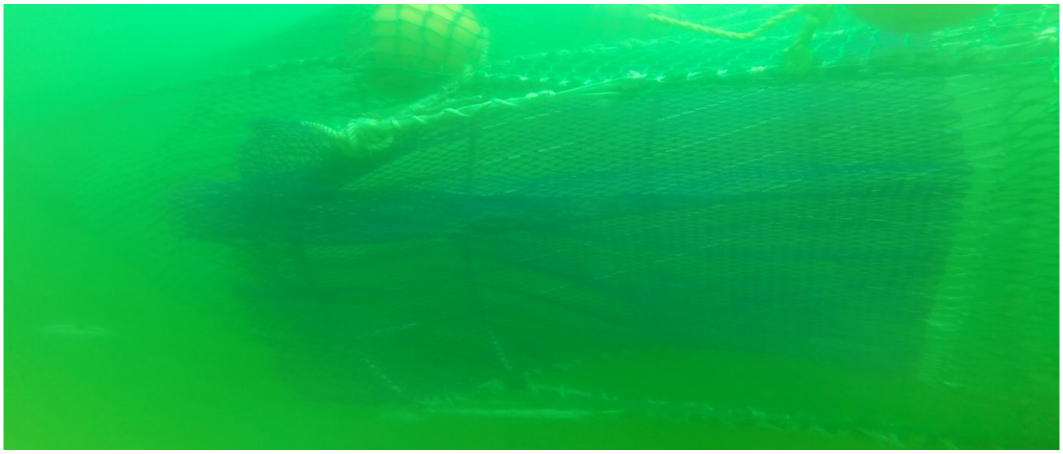


Figure 5 Flap seal of TIII

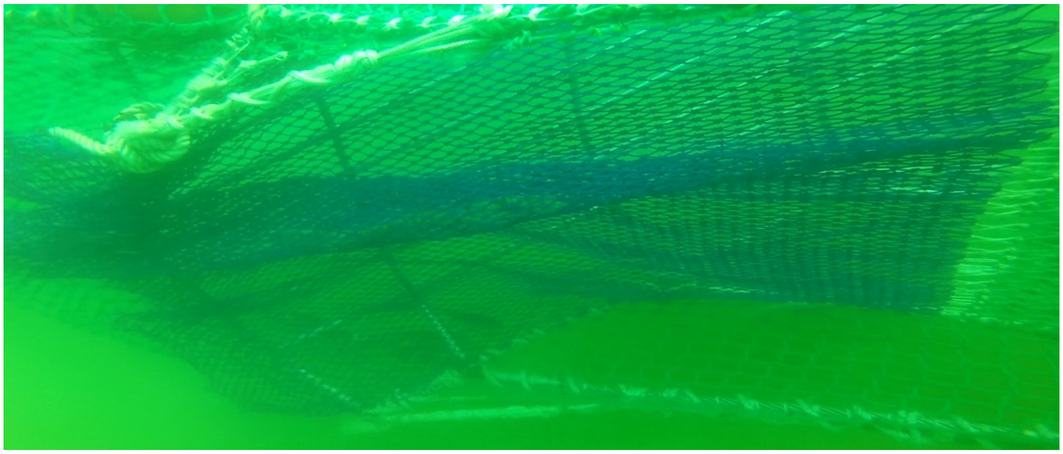


Figure 6 Overhead shot , float orientation

Dive 3

Figure 7 TIII2017 flap seal with TP1

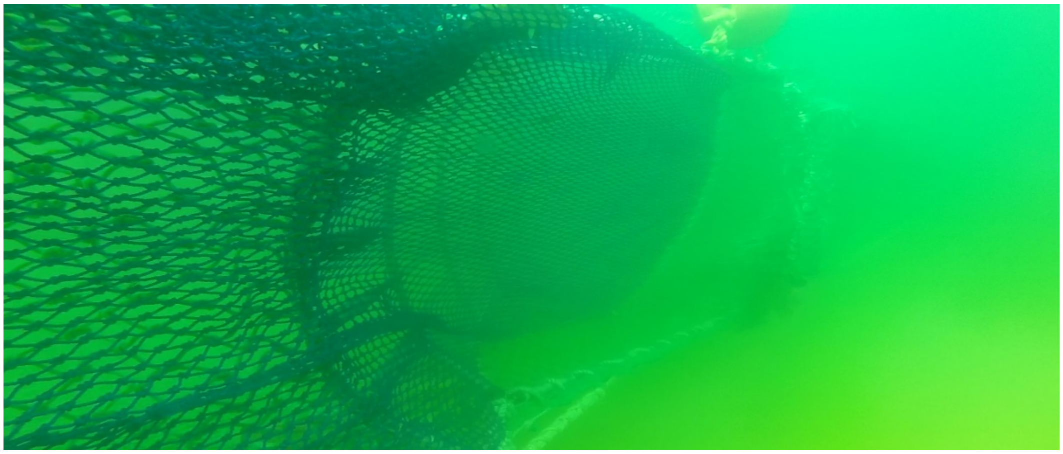


Figure 8 TP1 open side channels

Figure 9 TIII 2017 overhead view with TP1

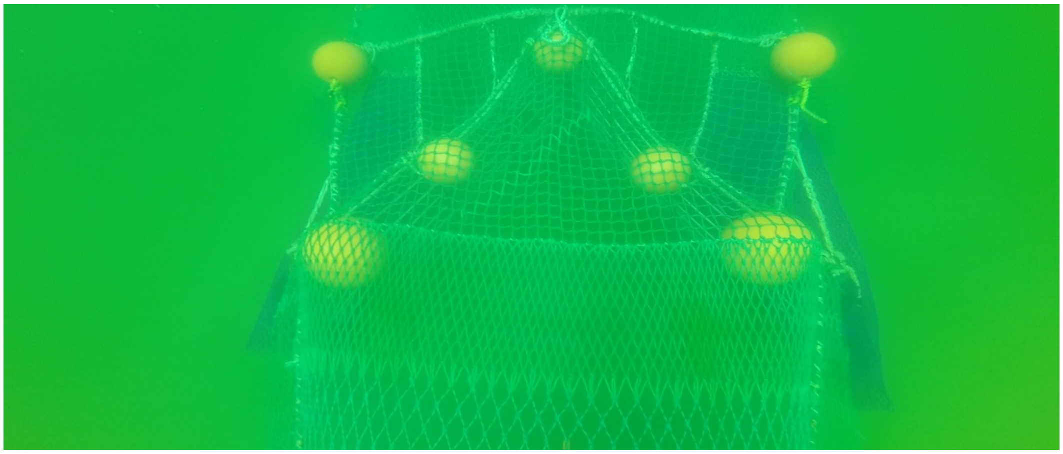


Figure 10 Water flow assisted flap seal

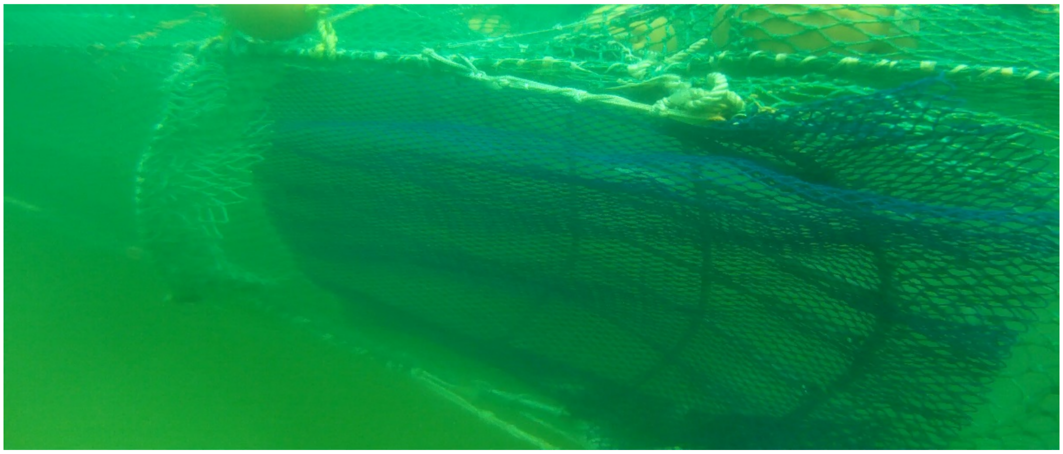


Figure 11 TP1 influence on center post and LR

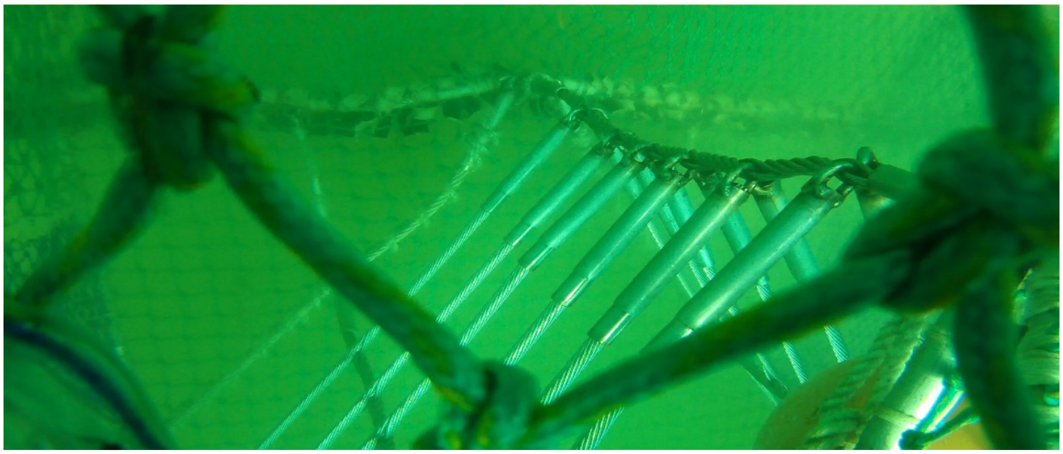


Figure 12 Grid opening and flap seal shot from the inside

Dive 4

Figure 13 TIII 2018 overhead, level LR and float distribution

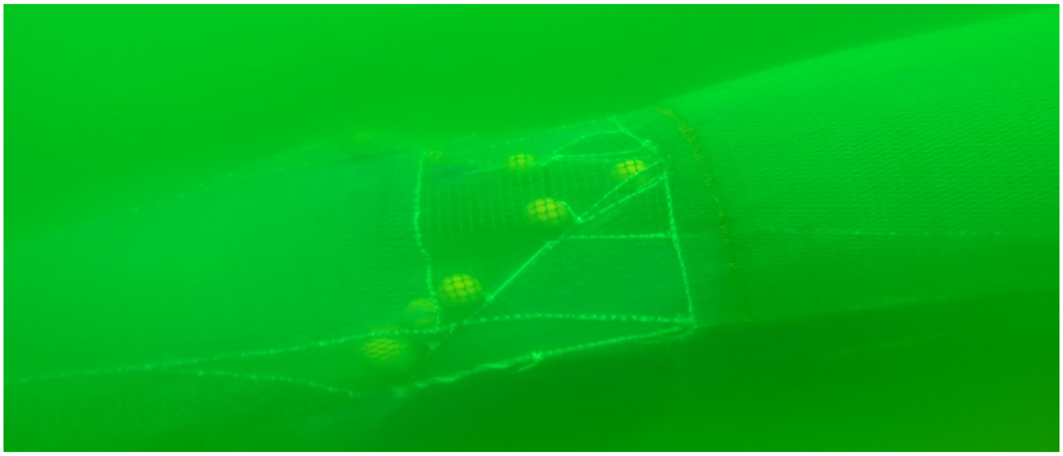


Figure 14 Superior flap seal side view

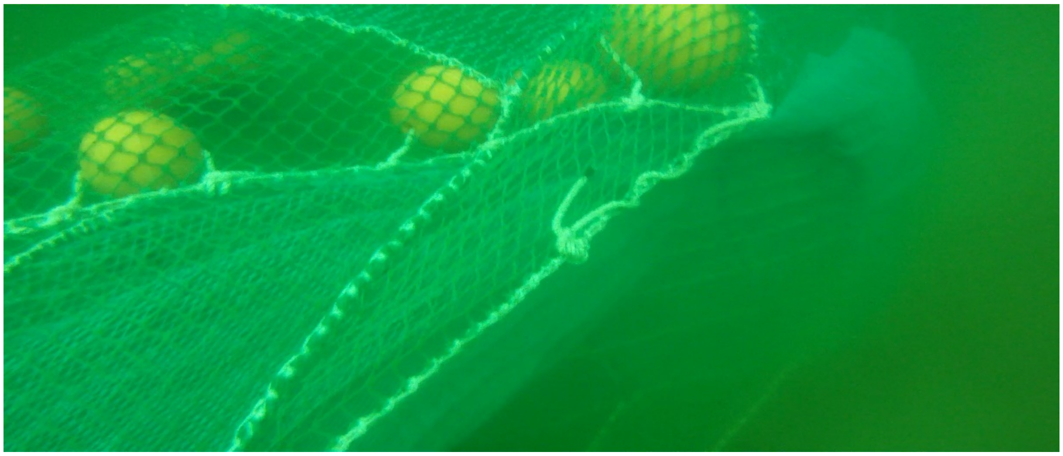
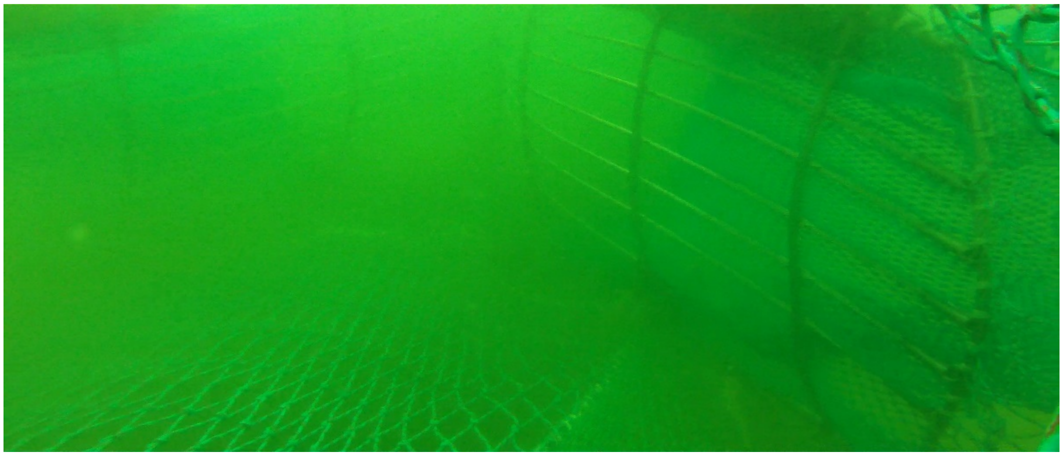


Figure 15 Flap seal shot from inside.



Dive 5

Figure 16 TIII 2018 overhead view, float distribution

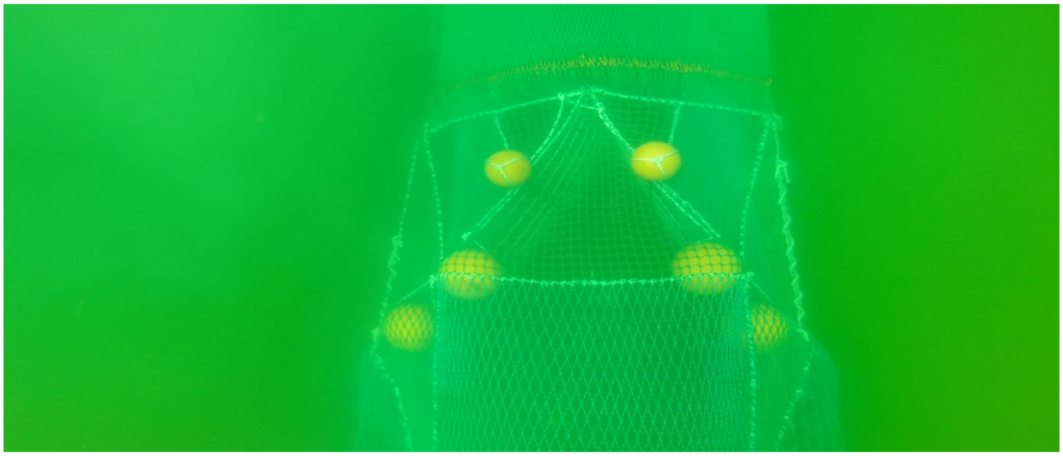


Figure 17 Side view with perspective of LR shape and profile

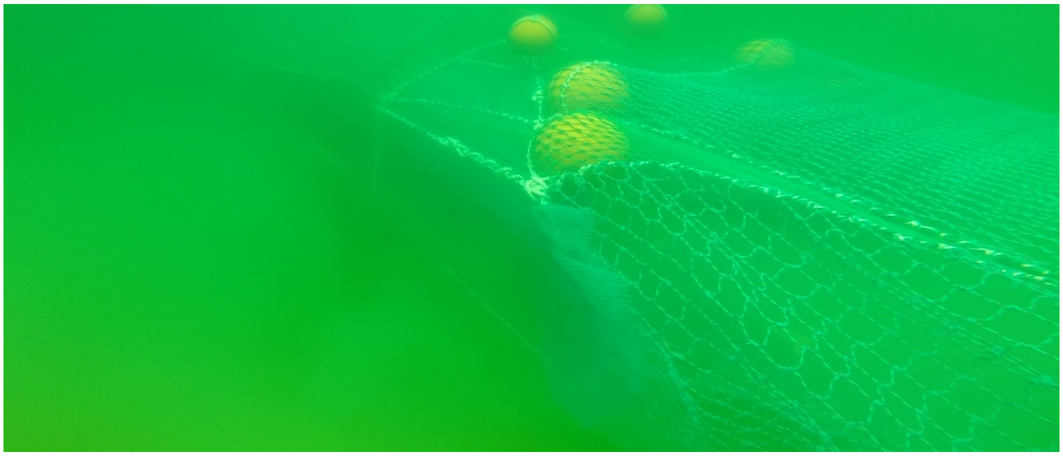


Figure 18 Opening and flap seal

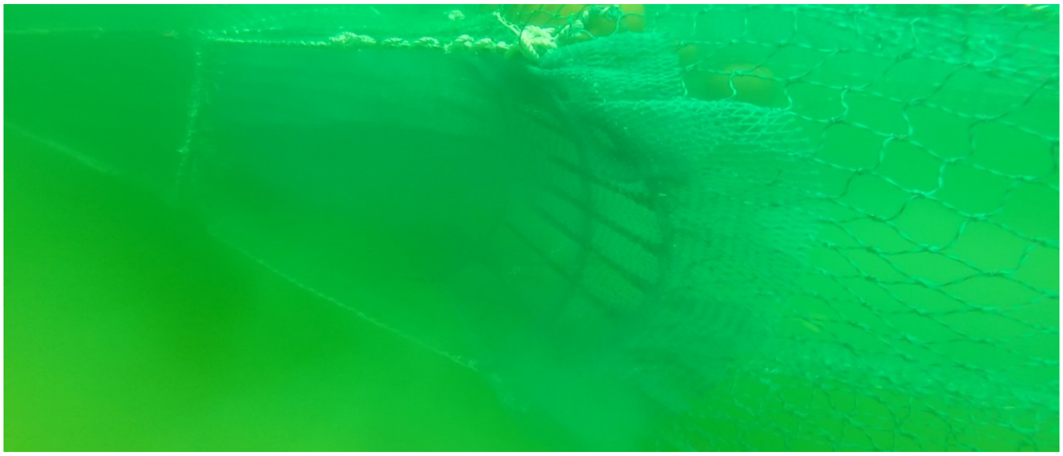


Figure 19 Inside view of grid and flap seal

Figure 20 TP frame- Gore ropes anchor

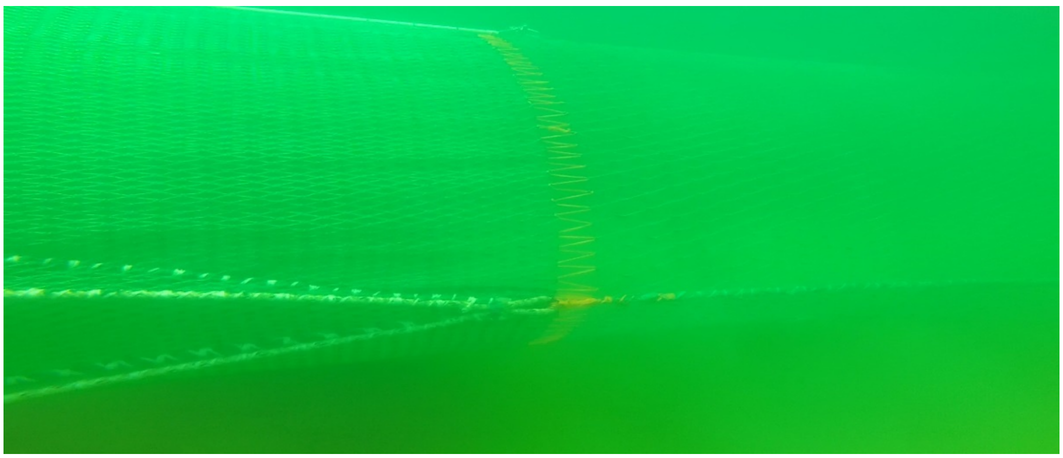
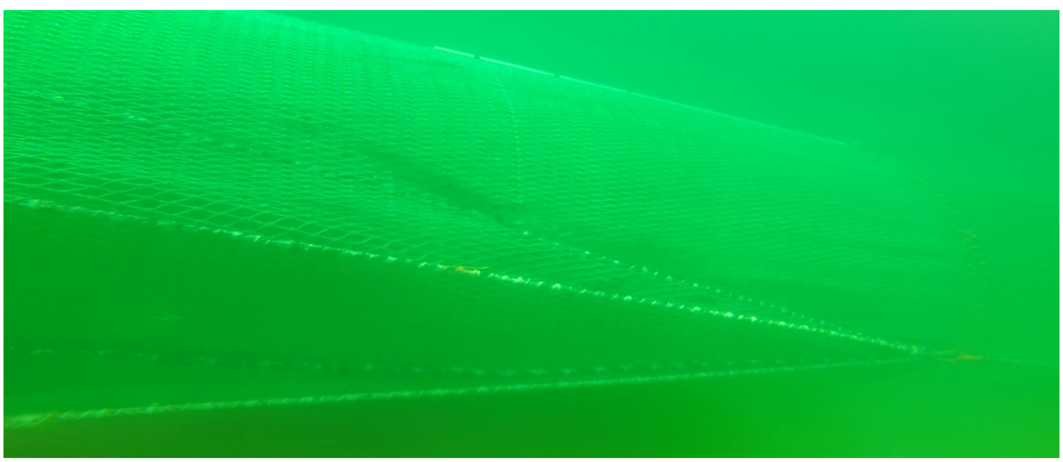


Figure 21 TP gores, funnel seams and side channels



Dive 6

Figure 22 Grid face of TI, LR shape and float distribution

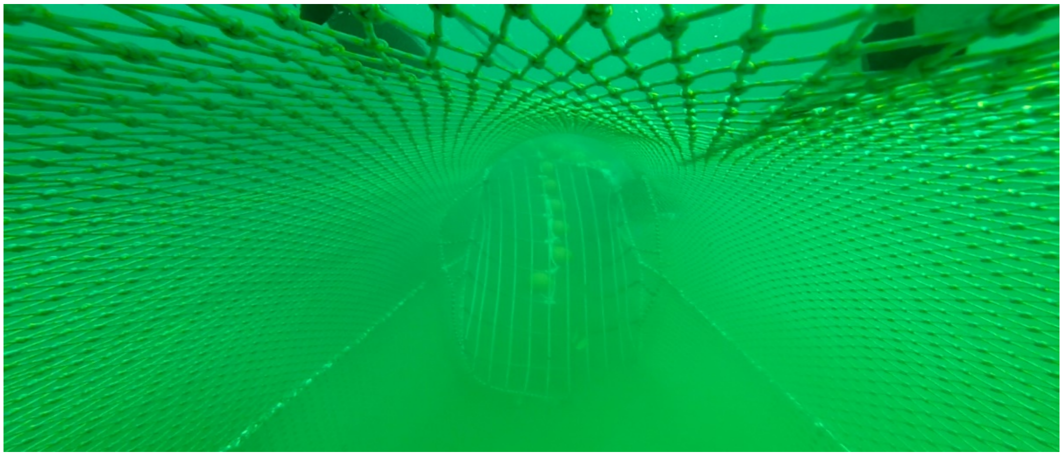
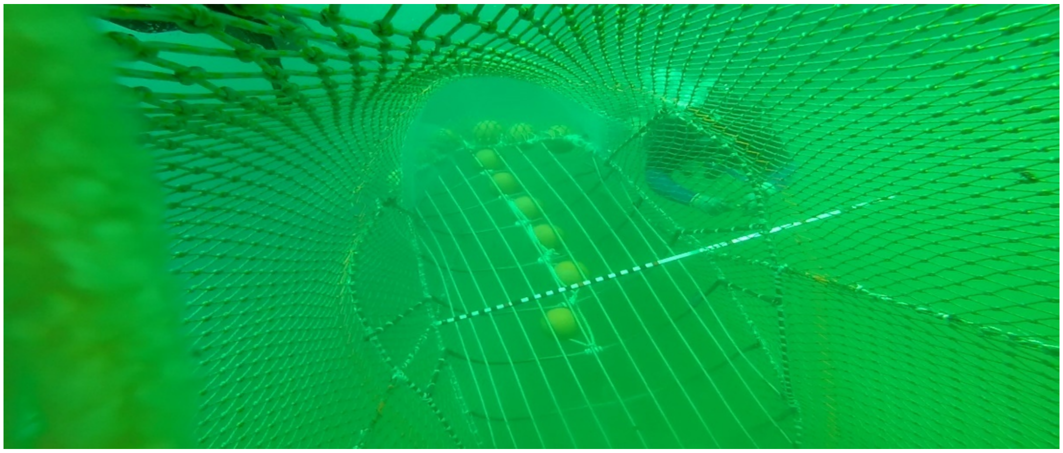


Figure 23 Water flow causing poor flap seal

Figure 24 Measuring the width of the grid between the gores



Dive 7

Figure 25 TII with no floats as bottom shooter

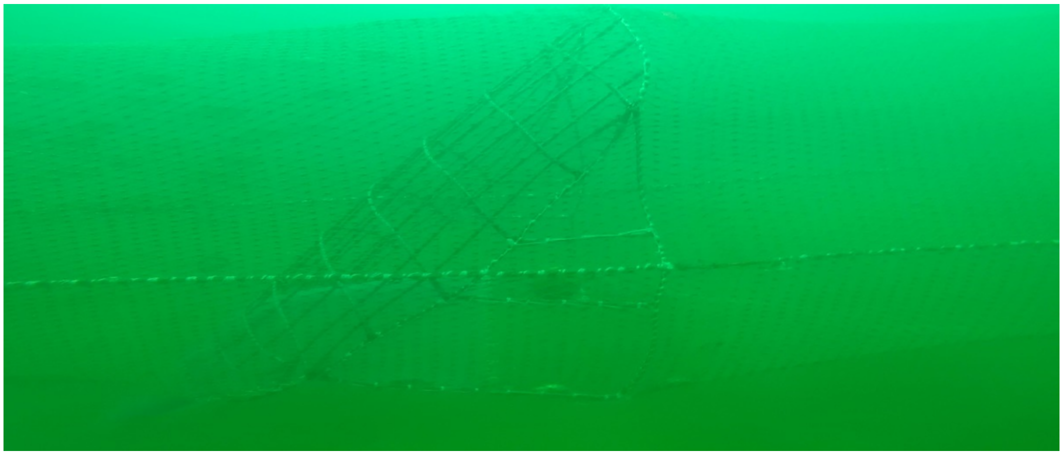
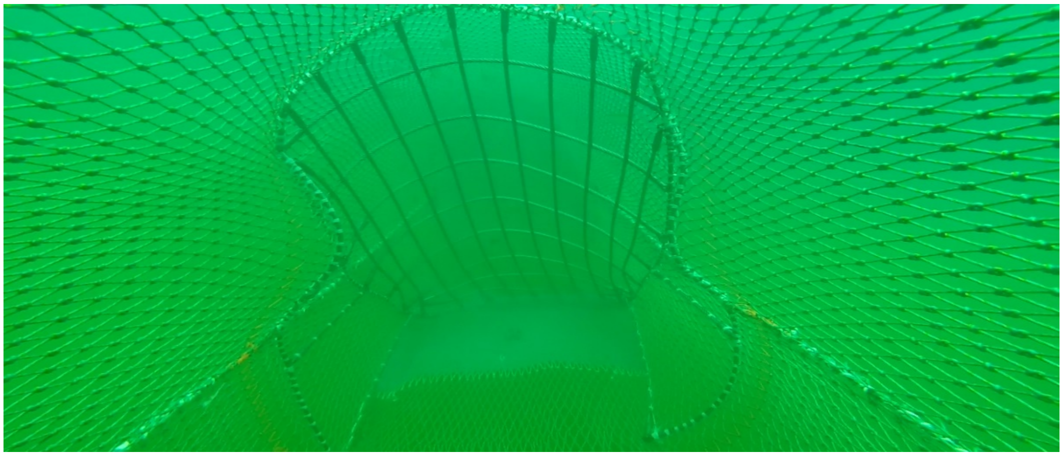


Figure 26 Flap seal

Figure 27 LR shape



Dive 8

Figure 28 TII installed in 168 meshes with kites

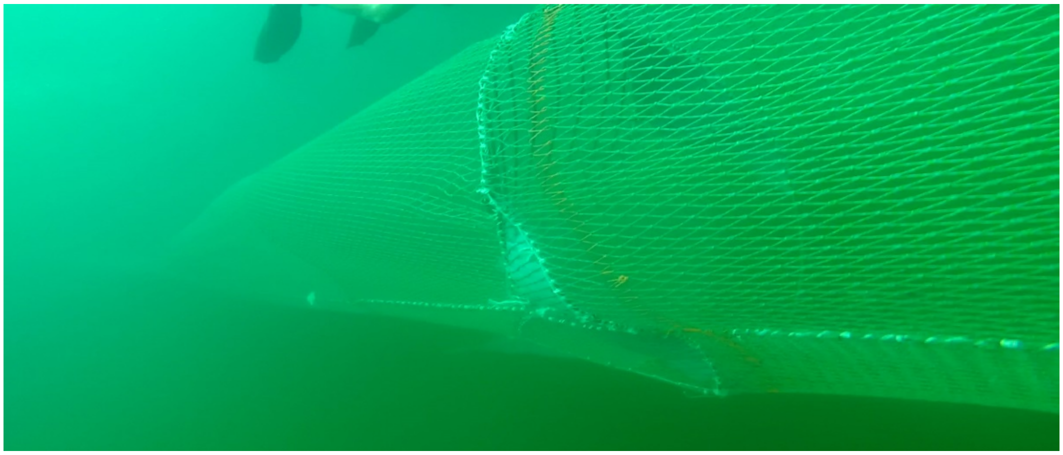


Figure 29 TII with kites anchored to LR and a float ahead of the flap

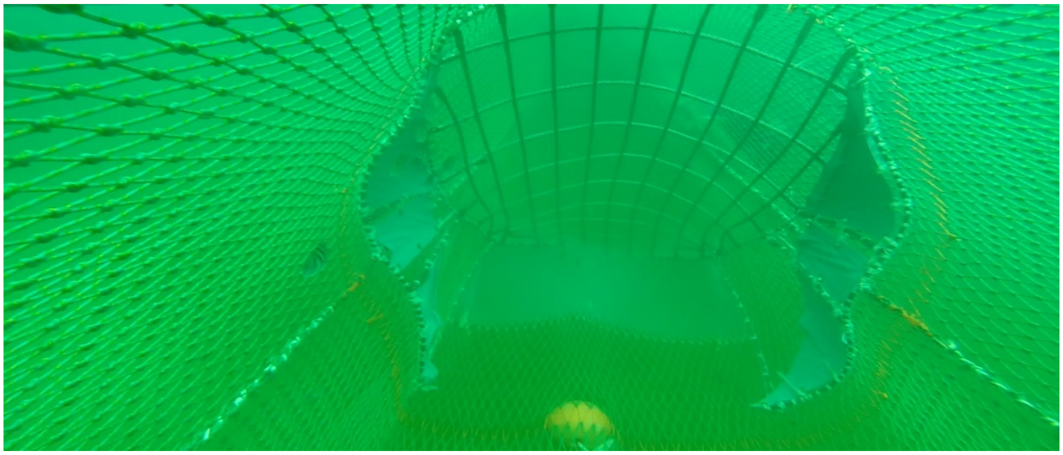
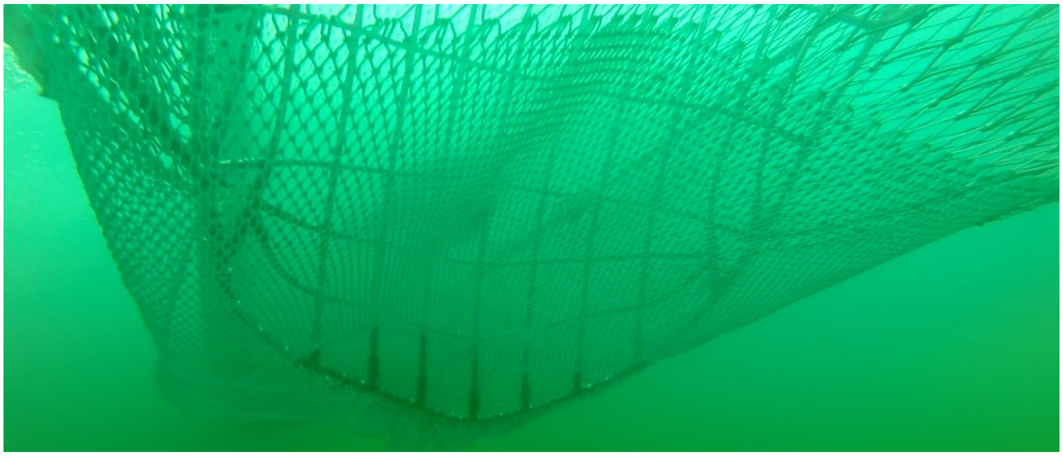


Figure 30 Flap seal



Dive 9

Figure 31 TII Installed in 240 meshes with kites

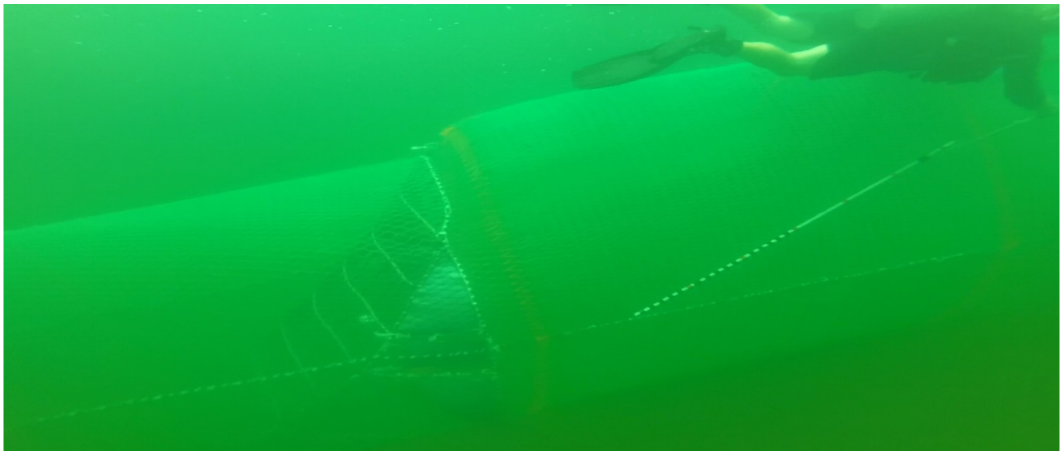


Figure 32 Two float to help flap seal

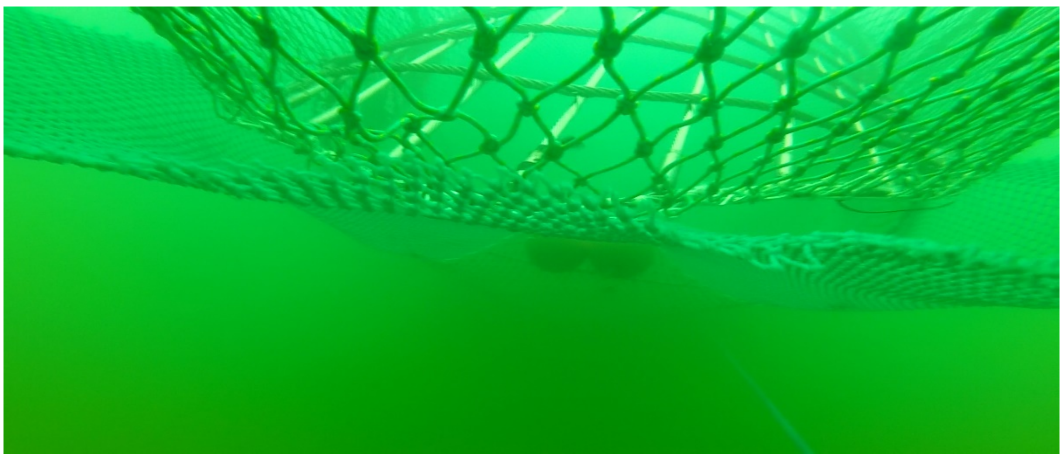


Figure 33 Water pressure from kites hinders flap seal

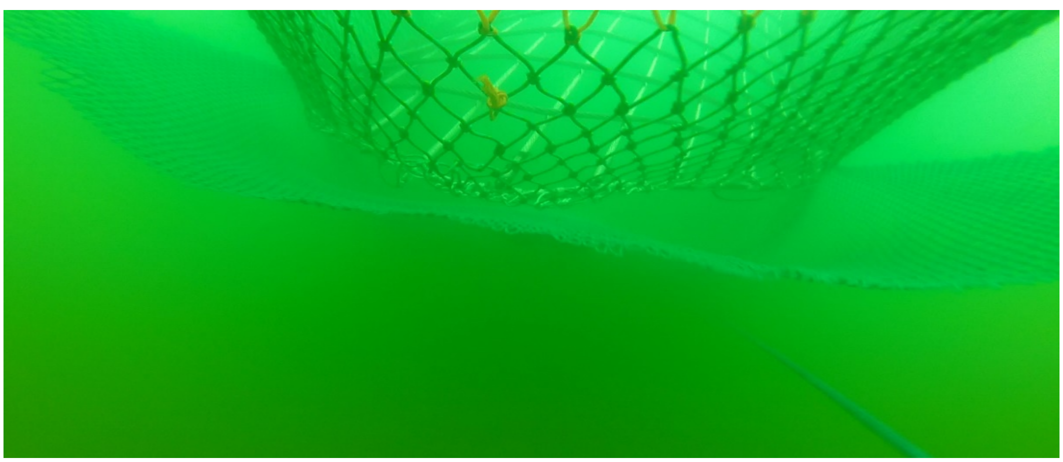


Figure 34 Flap is pushed below the plane of the trawl

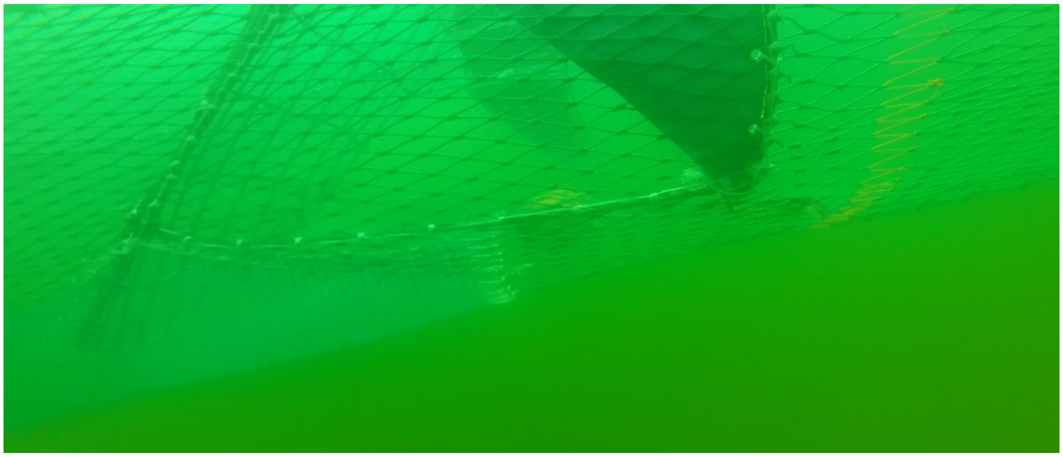


Figure 35 Kites and IS result in a perfect LR shape

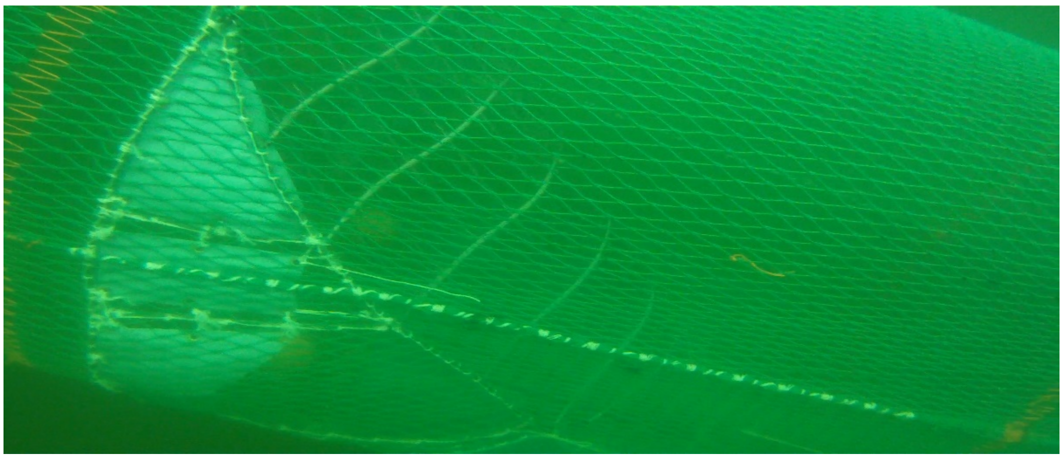


Figure 36 A perfect LR shape results in a perfect angle- 45°

Dive 10

Figure 37 TI rigged for fishing

Figure 38 TI flap seal

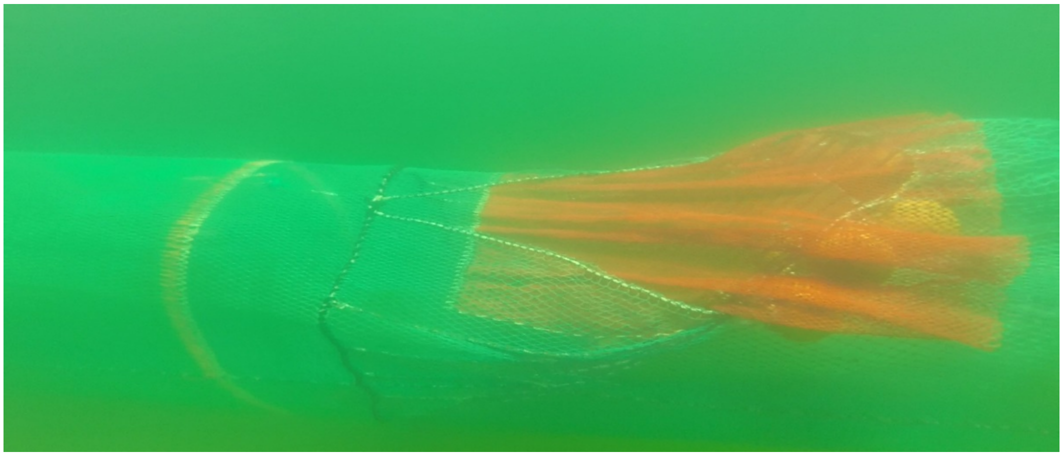


Figure 39 TI LR shape