SLUTTRAPPORT

Til Nordisk Arbeidsgruppe for Fiskeri (AG-Fisk) for prosjektet 48-2011
MULTPELT – Multipurpose pelagic ecosystem pelagic trawl

Background

Traditionally, the annual pelagic ecosystem surveys in the North Atlantic coordinated by the WGNAPES (Working Group in the North Atlantic Pelagic Ecosystem Surveys, ICES) have focused on the blue whiting and Norwegian spring-spawning herring. The results from these surveys have been used in assessment of those species since 1995 (WGWIDE). The method used is based on acoustic recordings along cruise tracks with necessary trawling to identify the species recorded and to determine their size and age distribution.

However, in recent years mackerel has been observed in increasing quantities in the Nordic Seas. This has led to the introduction of a new summer survey in the area, initiated by Norway some years back, and in 2009 a joint Nordic survey with participation of Norway, Faroes and Iceland was attempted. In the first survey the timing among vessels was not satisfactory. In 2010 all three countries surveyed the Nordic Seas north of 62^{o}N in July and August simultaneously with four vessels. The focus in the earlier surveys was mainly mackerel, but in recent years, and particularly in 2010 all large pelagic species were surveyed (mackerel, herring and blue whiting). This has this become an ecosystem survey covering the whole pelagic complex later in summer than the ongoing May survey covering mainly herring and blue whiting.

But, there is a large difference in the survey design targeting mackerel compared to the other pelagic species. Since mackerel is lacking a swim bladder (producing 95 % of the backscatter), it is very difficult to detect by traditional acoustic methods. Therefore, a new approach has been used with a pelagic trawl that is towed at the surface at regular intervals on fixed locations to estimate the trawl density of mackerel in the upper layer. This method is analogue to the well-known swept-area method used in the bottom trawl surveys throughout the Northeast Atlantic.

However, to obtain reliable results when several vessels from different countries run a pelagic swept-area trawl survey, it is of utmost importance that the survey trawl and gear are standardized and operated in the same manner on all participating vessels. This standardization includes the whole trawl operation, using the same gear, trawl doors, bridle lengths, towing speed, etc. In 2010 ICES (WGWIDE) recommended that a standardization of gear and trawl methods was made prior to the 2011 survey. In order to use the results for the mackerel swept-area trawl surveys in future assessments.

On this background WGNAPES representatives from Iceland, Faroes and Norway met ad hoc during the Pelagic-Complex meeting in Torshavn, Faroes 9th September 2010, and agreed on

a workplan to plan and develop a new ecosystem trawl for WGNAPES to be launches for the 2011 surveys. One of the activities in the plan was to arrange a meeting in Bergen in November-December 2010 with gear technologists and skippers on vessels that had participated in WGNAPES surveys in 2009 and 2010. The purpose was to get input from experienced fishers on how they recommended to design and operate a pelagic trawl to optimize data collection during surveys. The results will be synthesized into a design paper for standardized trawl for the sampling of fish in the North Atlantic. John Willy Valdemarsen was appointed project leader.

Project activities

The appointed project leader applied for partial cost funding from AG-Fisk for holding a workshop in Bergen in January 2011. The funding from AG-Fisk should mainly cover travel costs for participants. Salary expenses for participants were paid for by the participating companies and institutes.

The workshop was arranged at Institute of Marine Research in Bergen 11th January 2011. List of participants and their affiliation is shown in table 1. In addition to scientists responsible for the pelagic surveys and gear technologist from each of the three countries, trawl designers from Iceland, Norway and Faroes as well as skippers from Faroes and Norway participated in the workshop.

The workshop discussed and agreed upon a generic trawl and rigging specification to be further elaborated by correspondence. Some members of the project team working on the trawl specification met again in Reykajvik 12th May 2011 to agree upon a final trawl and rigging specification. Staff from Vonin modified the trawl concept several times based on proposals from the project participants. The performance of at least 4 version of the trawl design was simulated using the DynamiT program. Drag and geometry with various towing speeds were calculated based on these simulations.

The research institutes in Iceland and Faroe Island acquired trawls during 2011 from the companies Hampidjan and Vonin, respectively, according to the agreed specifications. These trawls were used during surveys in July-August 2011 by the Faroes chartered fishing vessel "Finni Fridur" and by the Icelandic research vessel "Arni Fridrikson" .

Results

The workshop participants agreed on a trawl specification and operational parameters as in table 2.

The three trawl producers present at the workshop, were invited to propose trawl designs according to this specification.

The project leader received design proposals from Egersund Trawl AS, Hampidjan and Vonin.

As the three original design proposals were slightly different, the project leader in consultation with the other gear experts in the team agreed on a common trawl design as shown in figure 1.
Simulation results with this trawl design are illustrated on figure 2 and 3.
Practical results from fullscale testing of the two prototype trawls in July-August is described in a cruise report from the mackerel survey in 2011 and with some additional comments in attachment 1 to this report by a scientist responsible for the survey.

Project relevance
Reliable stock assessment of the mackerel resource as well as other pelagic resources is of key importance for optimal management of these valuable fish resources, in particular for some of the Nordic countries. As stated in the introduction a new methodology for mackerel assessment is under development involving the use of standardized trawling close to the surface where mackerel mainly is distributed during the summer month when feeding in the Norwegian Sea and its surroundings. A major challenge when developing new methodology is that all parties involved uses the same equipment and operational methods.

In this project the survey owners identified their needs, whereas practical and theoretical competence in pelagic trawl design and fishing operations developed the solutions. What was very special with the exercise was that commercial competitors in trawl design all assisted constructively in the development of a suitable pelagic survey trawl, the MULTPELT.

By adopting the same survey methodology by all participating countries more accurate stock estimates might be developed, which might result in more optimal harvesting of the pelagic resources and thus possibly increased income from the pelagic fisheries.

Table 1. Workshop Participants;

Norway	Jens Christian Holst, Havforskningsinstituttet (HI)
	Asbjørn Aasen, HI
	Arill Engås, HI
	Åge Høines,HI
	Leif Nøttestad, HI
	John Willy Valdemarsen; HI
	Livar Valdemarsen, Egersund Trål AS,
	Arne Storebø, MS ”Brennholm”
	Darren, Hammersland White, Scantrol AS
Iceland	Haraldur Einarson, IMR
	Olafur Ingolfson, IMR
	Guðmundur Gunnarsson, Hambidjan.
Faroe Island	Bogi Jacobsen, M/S Finnur Fríði
	Jógvan Hendrik Johannesen, Vónin
	Kristian Zachariassen, Vónin
	Leon Smith, Havstovan

Table 2. General requirements for MULTPELT design, rigging and operation

Krav til operasjon, rigging og trålkonstruksjon

Operasjon

Minimum tauefart : 5 kn

Minimum trekk kraft (bollard pull): 22,5 tonn

Rigging

Trålwire:

400 m foran tråldørene skal være av Dynex type (Dyneema fibre). Det må klargjøres om dette kan nyttes i kombinasjon med vanlig tvinnet stålwire før dette inngår i en endelig spesifikasjon. Det ble under møtet hevdet at Dyneema tau ble avslitt under tauing når denne var koblet sammen med vanlig wire. Hambidjan hadde ikke tilsvarende erfaringer fra denne kombinasjonsbruk på Island.

Tråldører:

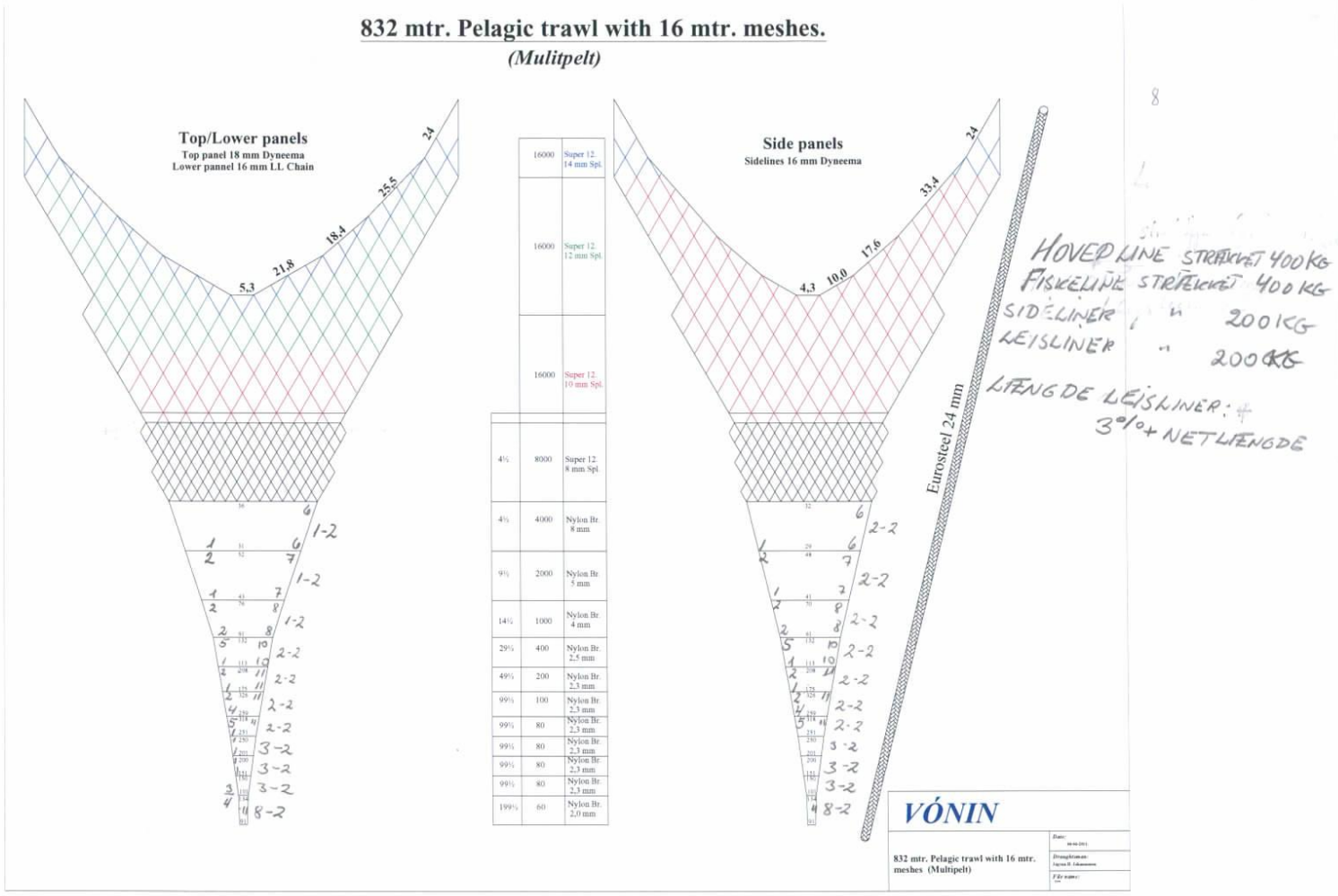
Skal være store nok til å oppnå horisontalspredning på minimum 40 m (målt med trålsonar i åpningen, ikke mellom vingene) når trålen taues i overflaten med 400 m wire ute.

Sveiper:

- Skal være laget av Dyneema tau.
- Skal være 70 m lange inklusive haneføtter bak tråldørene

Trålkonstruksjon

- Omkrets: ca 850 m (250 m over og under og 175 m i sider)
- Maskevidde i framparten: 16 m
- Nettmateriale i hele trålbelgen: Nylon
- Trådtype: > 4 m masker = Flettet og spleiset, -4 m og mindre maskevidde = tvinnet og maskinbundet
- Trådtykkelse: 16 m masker oppe = 12 mm dia, 16 m under og sider = 10mm dia
- Fiskeline: 16 mm ML kjetting (ca 4,5 kg/meter)
- Rammeverk: Flettet Danline tau, 28 mm dia
- Ekstra kraftige tau mot kjetting fiskelina
- Vertikalhøyde under tauing med 5 kn : 35 m
- Trålbelg: 16m – 8 m – 4 m - 2 m – 1 m – 400mm – 200mm – 80mm
- Pose: 40 mm maskevidde, 30 m lang



- 90m flyteline lagt dobbelt, dvs 45m, på hovedlinen fra midten og 22,5m frem på hver side. Flytelinen har en opdrift på 2,03kg pr/m og har en diameter på 100 mm.
- Sveiper: 60m dynema 22mm. I tillæg kommer rigging fra trawldør, 10m.

Figure 1 MULTPELT design

Multipelt 832m – nede i søen

Multipelt 33/27% maskeåbning
Slæbefart 4 knob – vægte 1500 kg
Avst døre: 110m Trawlåbning 48,5m x 71,7m
Belastning: 15,1 tons

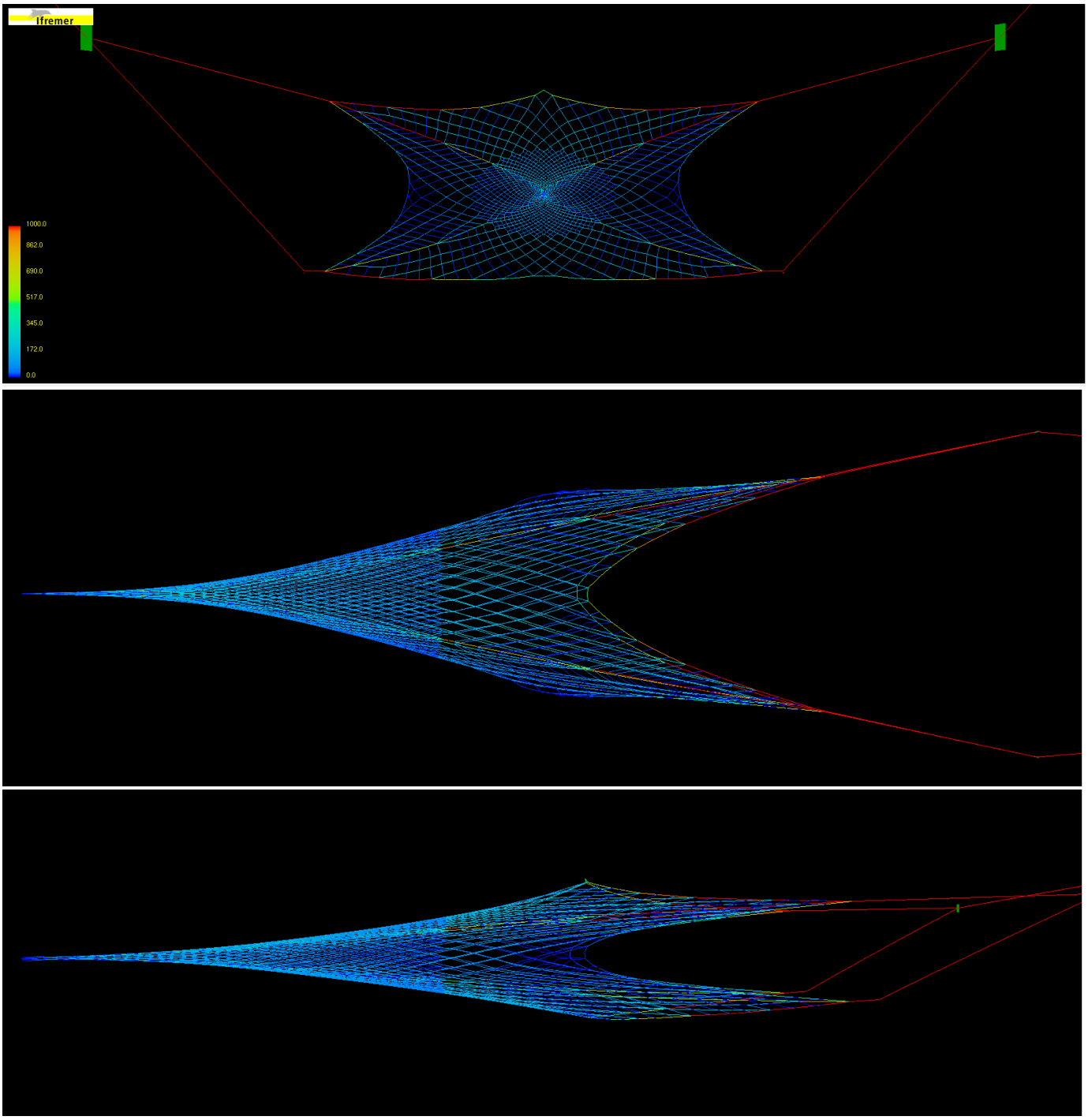
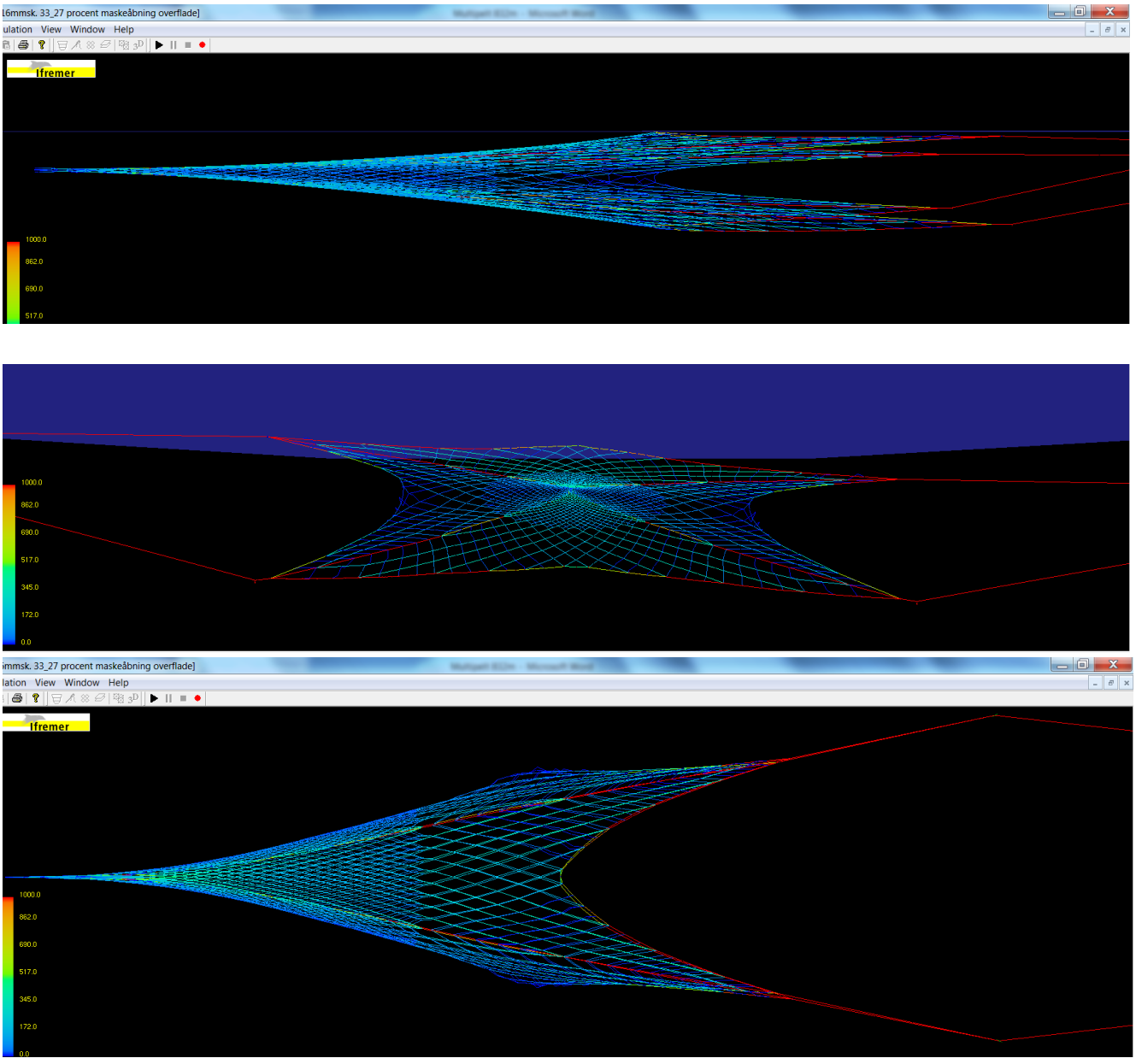


Figure 2. Simulation results with the final MULTPELT design when towed in mid-water

Multipelt 832m - Overfladen

Multipelt 33/27% maskeåbning
Slæbefart 5 knob - vægte 1000 kg
90m flyteline lagt dobbelt på midten (45m) Opdrift ialt 180kg
350kg opdrift på henholdsvis midte og hver spids
Avst døre: 115m Trawlåbning 25,9,5m x 76,6m
Belastning: 23,7 tons



Figur 3. Simulation results with the final MULTPELT design when towed in the surface layer

Attachment 1

Faroese experience using the new Multpelt 832 pelagic sampling trawl

Jan Arge Jacobsen, Havstovan 23/11 2011

Background

The Faroes and the Icelandic vessels used the newly designed and constructed Multpelt 832 pelagic trawl aimed for standardization of fishing gear used in the survey while the Norwegian vessel used a different type of pelagic trawl as the main tool for biological sampling. The most important properties of the trawls during the survey and their operation were as shown in Table 1 (from the survey report 2011). Details of the trawl are shown in Fig. 1 and 2. A sketch of the rigging of the headline, floatropes, fenders and trawl sonar is shown in Fig. 3 and the rigging of the doors in Fig. 4.

Table 1. Properties and operations of the sampling trawls in the July/August survey 2011 used by the different vessels.

	M/V Finnur Friði Faroes	R/V Arni Friðriksson Iceland	M/V Libas Norway
Trawl type	Multpelt 832	Multpelt 832	Egersund/Blue whiting
Trawl doors	7.5 m^2, 2038 kg Thyborøn V doors	7.0 m^2, 1400 kg	10 m^2
Wire type	Dynema	Dynex	
Wire length (m)	450 on average	200-220	200-220
Bridles length (m)	Upper 60, lower 68.4	Upper 60, lower 66	
Rigging of headline and wings	Three fenders (buoyancy, 720 kg each) + 90 m 100 mm floatrope (buoyancy 198 kg) + 187 m 70 mm floatrope (buoyancy 197 kg)	Kite/glider	None
Weights (kg)	375 on each lower wings	No Weights	No Weights
Circumference (m)	832	832	890
Mesh size in cod-end (mm)	40	40	30-40
Operation:			
Typical towing speed (kn)	4.7 on average	5.0-5.6	4.0-5.0
Fishing approach	Towed in a curve	Towed in a gentle curve	Towed in a curve

Typical depth of the headline (m)	0	0	10
Mean horizontal opening (m)	60	45	70
Mean vertical opening (m)	27.7	28.5	35

Trawl sampling

My suggestions based on the 2011 trials with Finnur Fríði and the new Multpelt 832 trawl with two types of doors tried (old Faroese 5.5 m^2 1000 kg doors and 7.5 m^2, 1700+338 kg Thyborøn doors):

1) All vessels should have identical equipment up to the wire, i.e. same trawl and rigging, weights and floats/floatrope, bridles and rigging, doors and rigging
2) I would suggest new 6 m^2 1200 kg Injector F 15 trawl doors (plus extra weights), or of similar size as we used in 2011, i.e. 7.5 m^2, 2038 kg Thyborøn (incl. 338 kg weights) (the Injector doors have higher spread force/m^2 than older doors)
3) Rigging of headline with floatropes along the whole headline and double in the centre section (Fig. 3) works fine
4) Use of a large buoy/fender on each wingtip (buoyancy 720 kg each, Fig. 3)
5) If trawl sonar is used then add one more fender to the centre of the headrope (Fig. 3).

Specifications of Injector F 15 doors can be found on Vonin.com (http://www.vonin.com/default.aspx?pageid=7724&sectionid=145).

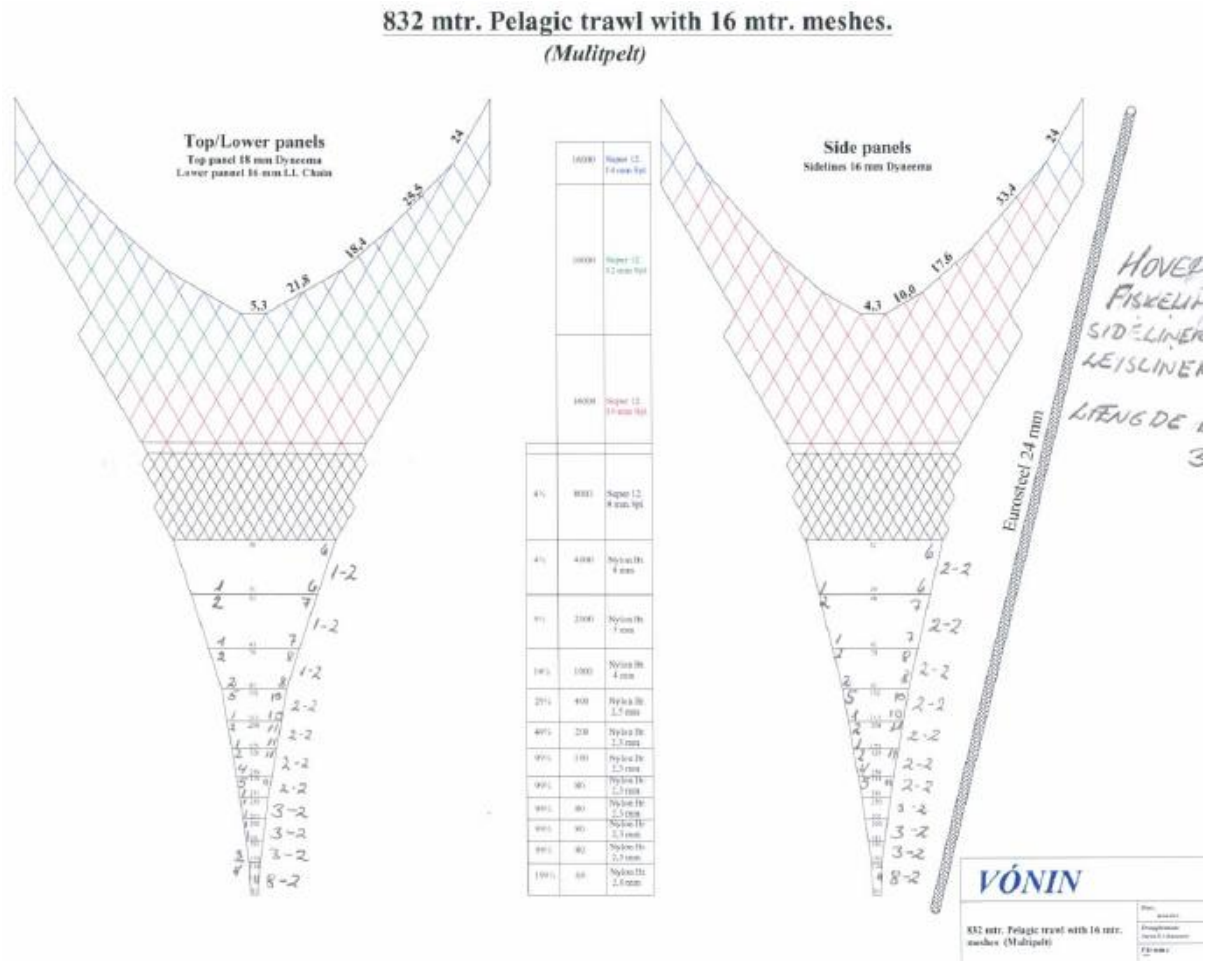


Figure 1. Multpelt 832 standard pelagic sampling trawl (drawing Vónin). Head- and fishing lines 400 kg each, side- and lacelines 200 kg each.

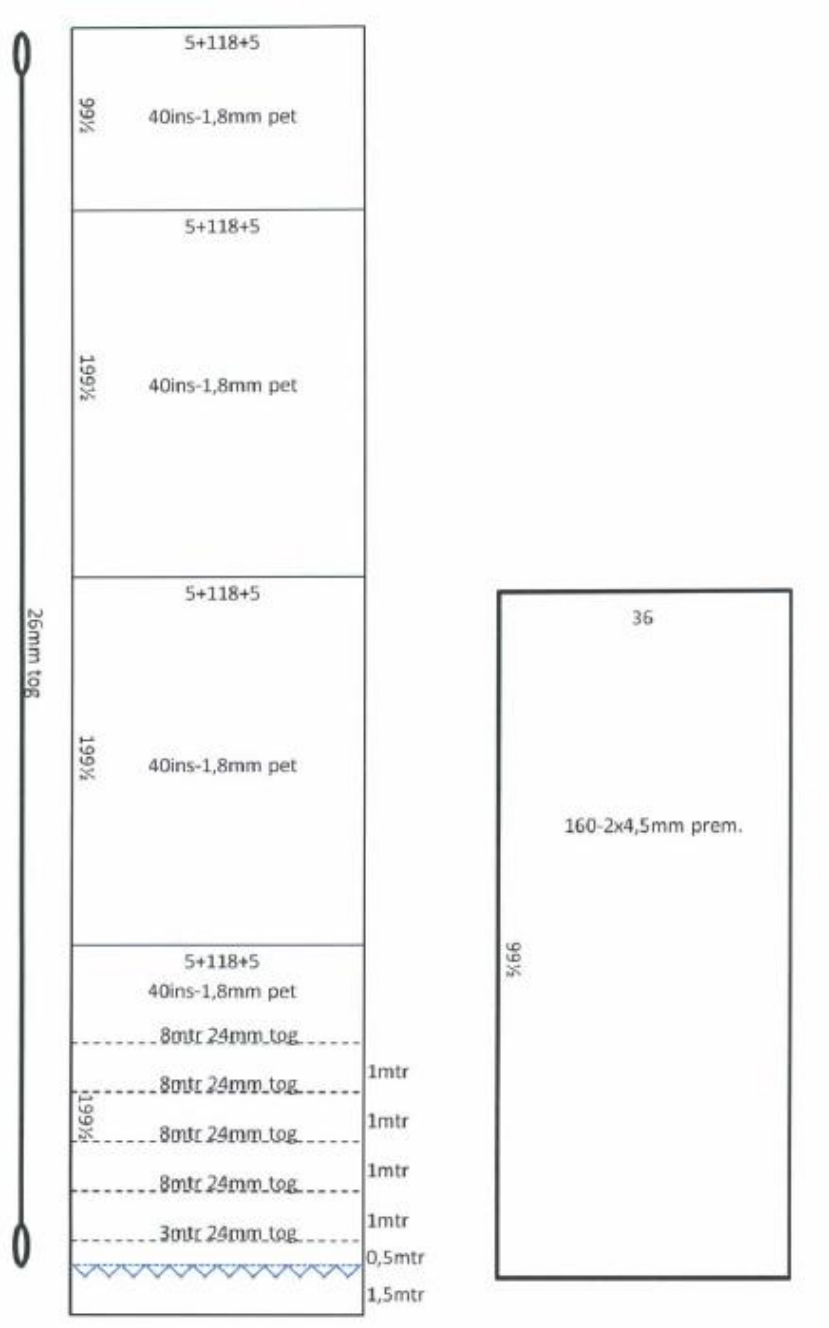


Figure 2. Cod-end 26 m with 40 mm meshsize and cover.

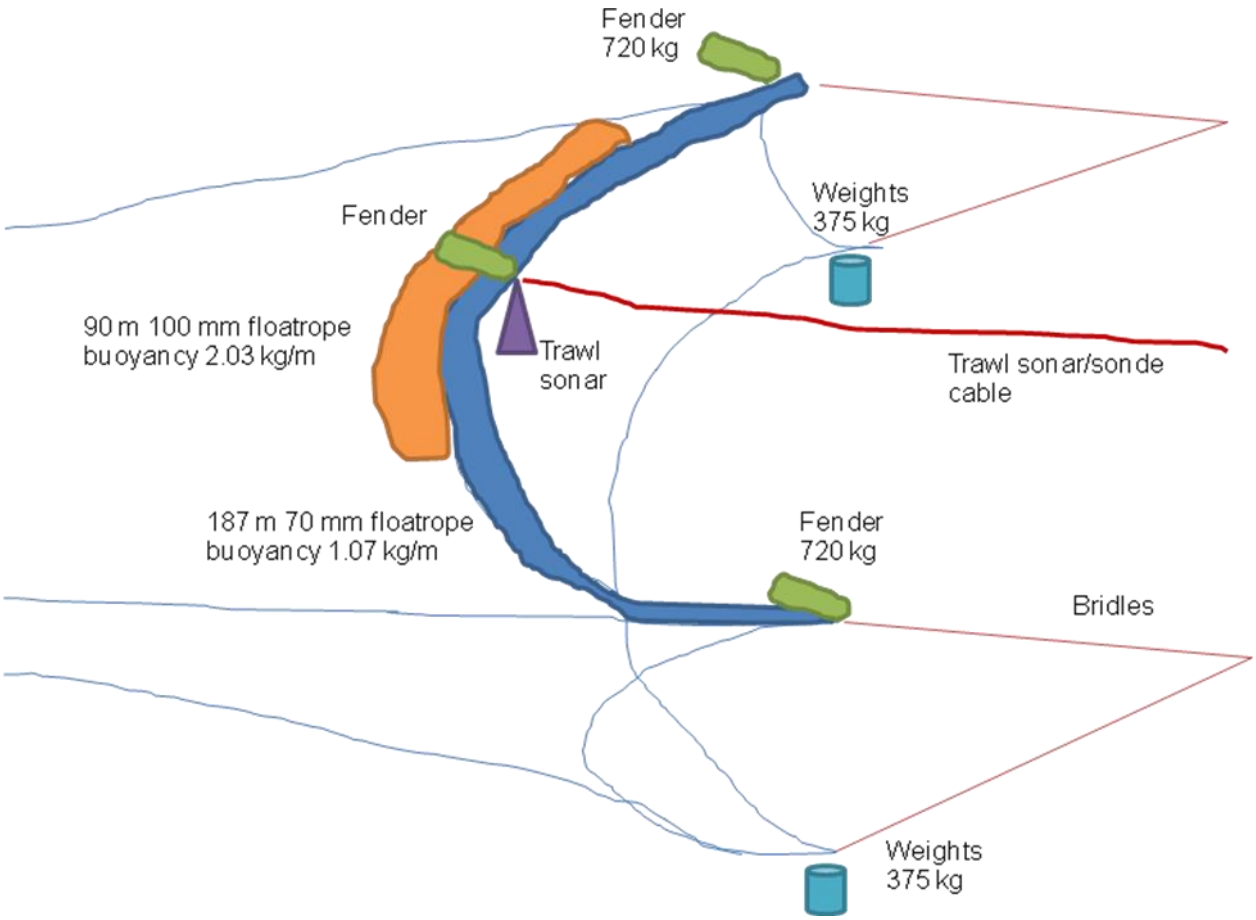


Figure 3. Sketch of the rigging of the headline, floatropes, fenders and trawl sonar on the new Multpelt 832 sampling trawl as used on M/V Finnur Fríði during the 2011 mackerel survey.

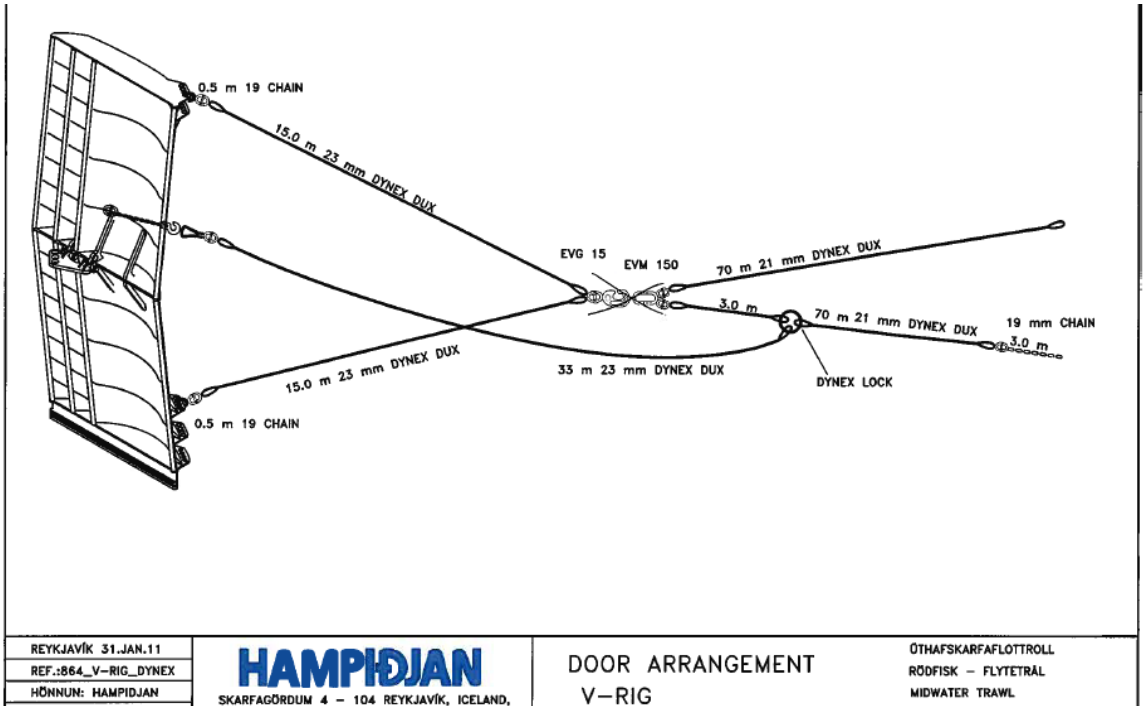


Figure 4. Door rigging (V rig) used 2011.