Technical Assessment of Multiple Bodied Trawl Development Project

Consultancy Report No. CR141

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Sea Fish Industry Authority

Technology Division

Technical Assessment

of

Multiple Bodied Trawl Development Project

Confidential Consultancy Report for Highlands and Islands Enterprise Network.

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1 Background

The Highlands and Islands Enterprise Network approached the Sea Fish Industry Authority to provide a technical assessment for a grant application they had received. A small net manufacturer based in Thurso applied to develop a new type of multiple bodied trawl which was considered (theoretically) to be more efficient at catching certain species by increasing the total net area without the corresponding increase in resistance. They proposed to design, construct and test a model in a flume tank before going on to constructing a full scale trawl for trials on a commercial vessel.

The objectives of the assessment were to give an independent and impartial appraisal

The following assessment provides comments against the five numbered points contained in the original brief dated 4 March 1998 under the heading "Methodology...."

2 Assessment.

2.1 Feasibility of the project.

A gear technologist visited the Company in Thurso and spoke at length to the net manufacturer. A plan of the proposed trawl was obtained and taken away for examination at the Flume tank in Hull by various Technology staff.

The consensus of opinion was that the trawl was technically sound and the concept similar to other trawls currently being tested. The theory is that by joining two bosoms together and dividing the trawl by a vertical panel into two codends, you would pull open the meshes of the trawl more effectively and double the bosom area of the gear. This increase of the bosom area is of particular importance when targeting species such as *Nephrops* and shrimp. If the meshes in the rest of the gear are held open more effectively, then there should be no significant increase in resistance which usually accompanies large (30-50%) increases in net area. It was felt that it would perform under commercial conditions but full scale trials would be needed to facilitate this opinion.

2.2 Examination of reports with references to this type of design.

The net manufacturer quoted a number of reports from which he had gleaned various details about the potential performance of a multi-bodied trawl. The reports were obtained and examined for specific details.

A report from Marine Laboratory described trials on the testing of a divided trawl for comparative fishing experiments used to collect selectivity data (Robertson, Shanks and Kynoch 1990). It was introduced as an alternative to the previously used trouser trawl (eg those of Russell and Edser, 1926; Davis 1934; Herrington, 1936; and Cooper and Hickey, 1987), which was considered to suffer from asymmetry resulting in the possibility that the two codends could fish unequally. As a result of this a true comparison of the population sampled could not be made. Unlike the trouser trawl this design has the two sides of the net completely separated along the length of the net. Both sides are attached to the same headline and footrope at the front of the net. The main advantage of such a design is that it would sample the same population of fish in each codend whilst being more resistant to mechanical distortion and asymmetry than the trouser trawl.

An unrelated product of the trial was an observation that significant quantities of flatfish and skate were taken. It also went on to observe that rapid changes to gear parameters during fishing were not apparent (Robertson, Shanks and Kynoch 1990). This is of particular importance during turning manoeuvres when fish behaviour can be affected. When performing turning manoeuvres, trawl headlines can often drop and wing ends can distort in a poorly designed trawl.

A report by the National Board of Fisheries in Sweden (Johansson and Karlson 1990) yielded the most relevant data to this concept of increased efficiency in catching capabilities by increasing net area without the corresponding increase in resistance.

Commercial trials in a targeted *Nephrops* fishery using a twin rig for comparative data showed an increase in catch for this species of some 27%. Resistance tests between this trawl and a standard trawl used in the fishery showed an increase of only 1 kilonewton (100kg force) throughout a speed range of 2 to 4 knots; this is a relatively small increase compared to a normal trawl.

2.3 Extent of the use of this trawl type.

The Skipper of the 30m Belgian trawler *Aeigir* (Oostende 0316) was contacted, he indicated that he had used a trawl based on this concept for the previous 12 months in a predominantly white fish fishery. He had observed significant increases in high value flatfish species and monkfish. He had not observed any increase in fuel consumption or needed to increase his engine revolutions to cope with towing the trawl. The skipper's overall impression was a very positive one.

Thomas Knolsen manages a fleet of vessels in Sweden and had been given as a contact. When contacted he explained that his vessels had used a similar trawl since 1992 but did not use it currently. When prompted he said that although the trawl was successful it was too large and bulky for his crews to handle. When pressed further he pointed out that all of his vessels were crewed by one or two men and that larger vessels would not experience such problems. In the United Kingdom all vessels (with very few exceptions) carry 3 or more crews when engaged in trawling; this is especially salient for *Nephrops* trawlers which need a certain number of men to sort the catch.

2.4 Market verification.

It would not be prudent to attempt to verify if there is a market for this product. Generally, within the fishing industry, markets are usually created by a new type of gear rather than a gear being created for an existing market. Fishermen are notoriously fickle and tend to flow en masse into particular trends. Perhaps the best example of this is the twin rig gear which generated a huge market because the industry decided it was the saviour of all large vessels.

2.5 Testing procedures used to test a model trawl.

The Marine Institute of Memorial University of Newfoundland Flume Tank was contacted with regard to the expected test procedures used by this manufacturer and his associates Nordsea Ltd. It stated that they had considerable fishing gear technology experience called for comprehensive measurements of gear geometry and loading together with video records.

Their reply was examined by the Senior Flume Tank Engineer at the SFIA who indicated that the test procedures followed were of a rigorous and extensive nature. Typically, the tests include a full range of measurements at four or more speeds: spread (at wings and doors), opening height (wingend and headline centre), and tensions of towing wire and bridles. If a similar project was tested at the Authority Flume Tank in Hull we would in fact follow very similar procedures. It was intimated that the manufacturers also carry out full scale trials at sea to backup or verify data collected in the Flume Tank.

3 Recommendations

Based on the material gathered and after having discussed similar concept trawls with various people, we would advise that the project has merit and addresses the requirements set out by yourselves in the Objectives listed:

- Innovation
- Technical risk
- Technical problems to overcome
- Technical feasibility
- Recommendation on proposal proceeding

We would however register the following reservations as noted in our original correspondence:

- A market analysis is not practical for the reasons stated in 2.4 above and could not be attempted until commercial full scale trials were carried out.

- The Company could not realistically protect its design. It is relatively simple to measure up a trawl on the quayside and alter the design sufficiently to produce a "new" type of trawl. Successful designs are inevitably and quickly copied throughout the Industry (there are similar design concepts already under development). The best that can be realistically hoped for is 6 to 12 months as market leader.

- If successful it would result in an increase in effort (eg. Twin-rig). We are unsure as to the merit of utilising public funding for such an innovation without a corresponding improvement in selectivity. There is a possibility that the increased mesh opening could facilitate the release of small immature fish; at the present time there is no scientific evidence to substantiate this

References:

Johansson and Karlson 1990. Resistance and catch characteristics of the divided trawl in the *Nephrops* fishery. Swedish National Board of Fisheries report 2(3), 23-30

Robertson, Shanks and Kynoch 1990. The design and testing of a divided trawl for comparative fishing experiments. Scottish Fisheries Research Report No. 49 12pp

Russell, E.S. and Edser, T. 1926. The relation between cod-end mesh and size of fish caught: preliminary experiments with the trouser trawl. Journal du Consiel, 1(1), 39-54