

# SEAFISH

**Evaluation of Technical Conservation Measures in  
UK *Nephrops* Fisheries – New Trawl Designs**

**Seafish Coverless Prawn Trawl  
Design & Construction Guidance Notes**



## INTRODUCTION

Gear Technologists at the Seafish Fisheries Development Centre have been involved in a programme of work to develop bycatch reduction devices for *Nephrops* trawls. The work was initially directed at developing ways of reducing discarding by releasing the unwanted bycatch after capture e.g. using square mesh panels. More recently, effort has been concentrated on a slightly different approach, placing the emphasis on avoiding the capture of unwanted bycatch in the first place.

A trawl design has been developed with features that reduce the potential for catching certain finfish species, whilst at the same time maintaining *Nephrops* catching performance. In other words, making the gear design more species specific. (Seafish Report Nos: SR532 and SR542 refer).

The objective of the work was to modify the design, construction and rigging of a conventional *Nephrops* trawl so as to exclude the unwanted roundfish bycatch prior to it entering the net. This had to be achieved in a commercially acceptable manner without any detrimental affect on the *Nephrops* catching capability of the gear.

The project relied on novel trawl design work coupled with modelling and testing at the Seafish Flume Tank in Hull.

The task of introducing such new net designs, especially ones originating from the R&D sector as opposed to from commercial gear manufacturers, is always a difficult one. For this reason, the work was conducted in collaboration with established trawl designers/manufacturers. The commercial credibility gained from this partnership is expected to increase the prospects of commercial uptake of any successful designs resulting from this work. The net manufacturers J&W Stuart Ltd, (Stuart Nets) from Eyemouth, Scotland have been actively involved in the work since its inception. All the full-scale versions of the new trawl designs used in commercial trials to date have been produced by Stuart Nets.

The resulting new trawl design is referred to as a 'coverless' trawl. As the name suggests, the cover which is in place to prevent fish herded into the mouth area of the net from rising upward and escaping over the headrope, was removed from a conventional prawn trawl design. This resulted in the net having a headrope equal to or slightly longer than the footrope. This is opposed to the conventional arrangement of the footrope being longer than the headrope. The inclusion of increased mesh sizes in the upper wings and upper netting panel immediately behind the headrope crown, coupled with reduced headline height, all serve to encourage the escape of fish species such as haddock and whiting in and around the mouth of the trawl.

Over a considerable period of time, the resulting coverless prawn trawl design has undergone extensive evaluations under commercial fishing conditions in a number of *Nephrops* fisheries around the UK. The results obtained have demonstrated the conservation benefits of the new design by achieving bycatch reductions for haddock and whiting in excess of 60% without affecting the catches of prawns.

Seafish are actively encouraging commercial uptake of the coverless prawn trawl concept as another tool to assist fishermen in addressing the problems associated with unwanted bycatches in certain *Nephrops* fisheries.

The following information is designed to assist fishermen and net manufacturers interested in adopting the new design.

It is not possible to cover all the details for conversion of all the commercial prawn trawl designs available to fishermen in a document such as this. The aim is however, to give some general advice based on the principles used to make the net and practical guidance based on experiences gained from commercial usage.

## DESIGN GUIDELINES

In order to alter a conventional prawn trawl to conform to the Seafish coverless design criteria, it is important to first define what is meant by the 'cover' or square panel as it is also commonly known.

The cover can be referred to as any netting panel spanning the width of the upper half of the net extending forward of the footrope. This can be checked by tracing the row of meshes attached to the footrope fishingline around the fishing circle, (mouth of the net). Any netting panel extending across the full width of the net, from selvedge to selvedge forward of this point is classed as cover.

The following describes the stages involved and the general procedures used in the re-design of a conventional prawn trawl to produce the Seafish trawl designs to date. Figures (1) & (2) show the relevant trawl sections referred to and viewed in conjunction with the text help to explain the process.

Two approaches have been used to achieve the elimination of cover. The aim is to use the minimum of alterations wherever possible.

For the conversion of an existing net in situations where the size of the net (fishing circle) is to be maintained, the simplest approach involves detaching the upper wings (1) and removing the square panel (4). The lower sections of the net (2, 3, 6) can remain unaltered. The only re-tailoring required is that of the upper wing (1). This has to be re-designed to produce a length, width and crown (C) to match those of the lower panels. The new upper wing is re-attached to the baitings (5) to complete the net.

The other approach involves more re-design of the original net plan and allows more scope for increasing the potential escape area within the mouth area of the net. Firstly, the upper (1) and lower wings (2 & 3) are detached and the square panel (4) is removed. The baitings (5) and belly (6) netting is extended to a point level with the position of the original cover using the same taper rates as in the existing belly/baitings panels. This effectively forms the new belly and baitings sections of the trawl. At this point, the overall length of the bellies/baitings has been increased by the length of the original square panel (4).

The upper (1) and lower wings (2 & 3) have to be re-tailored to achieve practical taper rates and the required dimensions i.e. width and length, before re-attachment to the new baitings and bellies sections respectively. For example, if the same overall length of net is to be retained, then the length of the original lower wings (2 & 3) will have to be shortened by an amount equal to the length of the square that has been removed. If the overall dimensions of the upper wing (1) remain unchanged, then the crown (C) length can remain the same. If however, the widths of the lower wing bunts (3) are kept the same, the result is an increased lower bosom length (B) due to the increase in the width of the new extended belly. Since the aim is to achieve a headrope and footrope of equal length, (or to have the headrope slightly longer), this re-tailoring enables the bosom length (B) to be matched with that of the crown (C).

Although the cover has effectively been removed, a narrow crown (C), coupled with a wide base to the upper wing (1) can create some additional overhang of netting in the 'shoulders' of the net. Increasing the length of the crown (C) and the headrope length relative to the footrope helps to reduce 'shoulder' cover. This can be beneficial in increasing the escape area in and around the mouth of the trawl.

The crown (C) and lower bosom (B) can be made the same in terms of equivalent mesh lengths, (number of meshes x mesh size) and still produce the required length difference between headrope and footrope by using different hanging rates, (e.g. crown 50% and bosom 35% of stretched mesh length).

Having removed cover from the net, an additional bycatch avoidance feature is incorporated in the form of a large mesh panel (9) immediately behind the headrope crown (C). This panel covers the width of the crown and stretches back over the full length of the baitings section (5). The mesh size of this panel must be large enough to allow free passage to any fish encountering it, therefore the larger the mesh, the better. However, practicalities should prevail. It is recommended that the mesh size should be at least twice the current minimum legal requirement but experience has shown that 200mm is more suitable.

To incorporate all of these factors it is inevitable that in some cases considerable re-designs and re-tailoring of the original net design will be required. In most cases however, the changes required can be made relatively simply and practically.

In summary, the key points and stages involved in producing a coverless trawl along the lines of the Seafish design are:

- A. Removal of cover, i.e. ensuring no full width netting panels are in place forward of the fishing circle.

*Stage 1:* Starting with conventional trawl design;

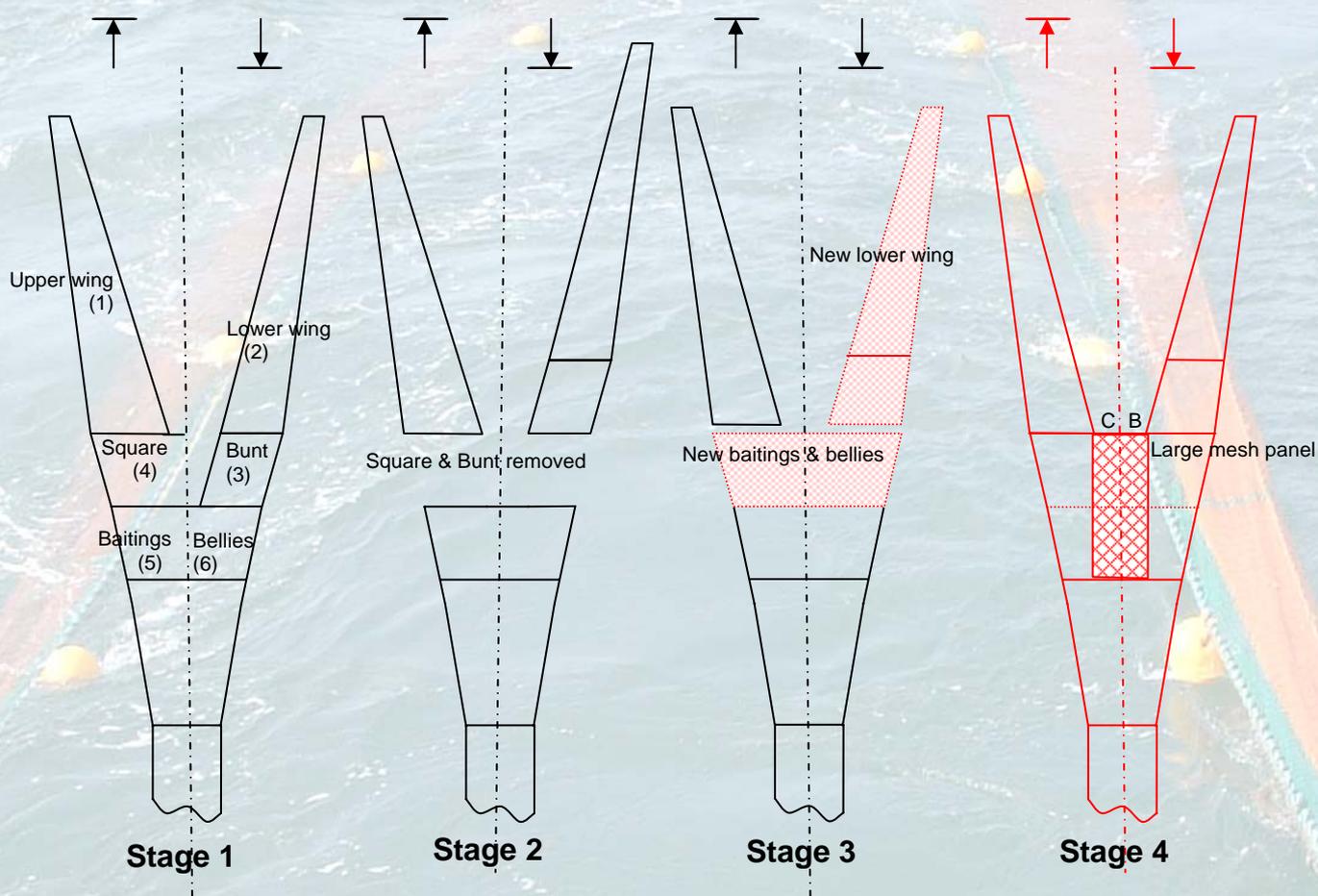
*Stage 2:* Detach wings and take-out square panel;

*Stage 3:* Form new baitings and belly sections by extending existing netting panels using same taper rates. Re-shape wings as necessary to attain required dimensions including an increased crown length and matched crown and bosom. Attach upper wings to new baitings and lower wings to new belly panels.

- B. It is recommended that the number of meshes in the crown should be a minimum of 25% of the number, (equivalent mesh size) across baitings panel.
- C. Headrope to be of equal length or slightly longer than footrope.
- D. Hanging ratio for crown meshes to be ~50%.

*Stage 4:* Incorporation of large mesh panel attached to and covering full width of crown and extending over full length of baitings section. (This panel could be fitted during the construction of the new baitings section at stage 3).

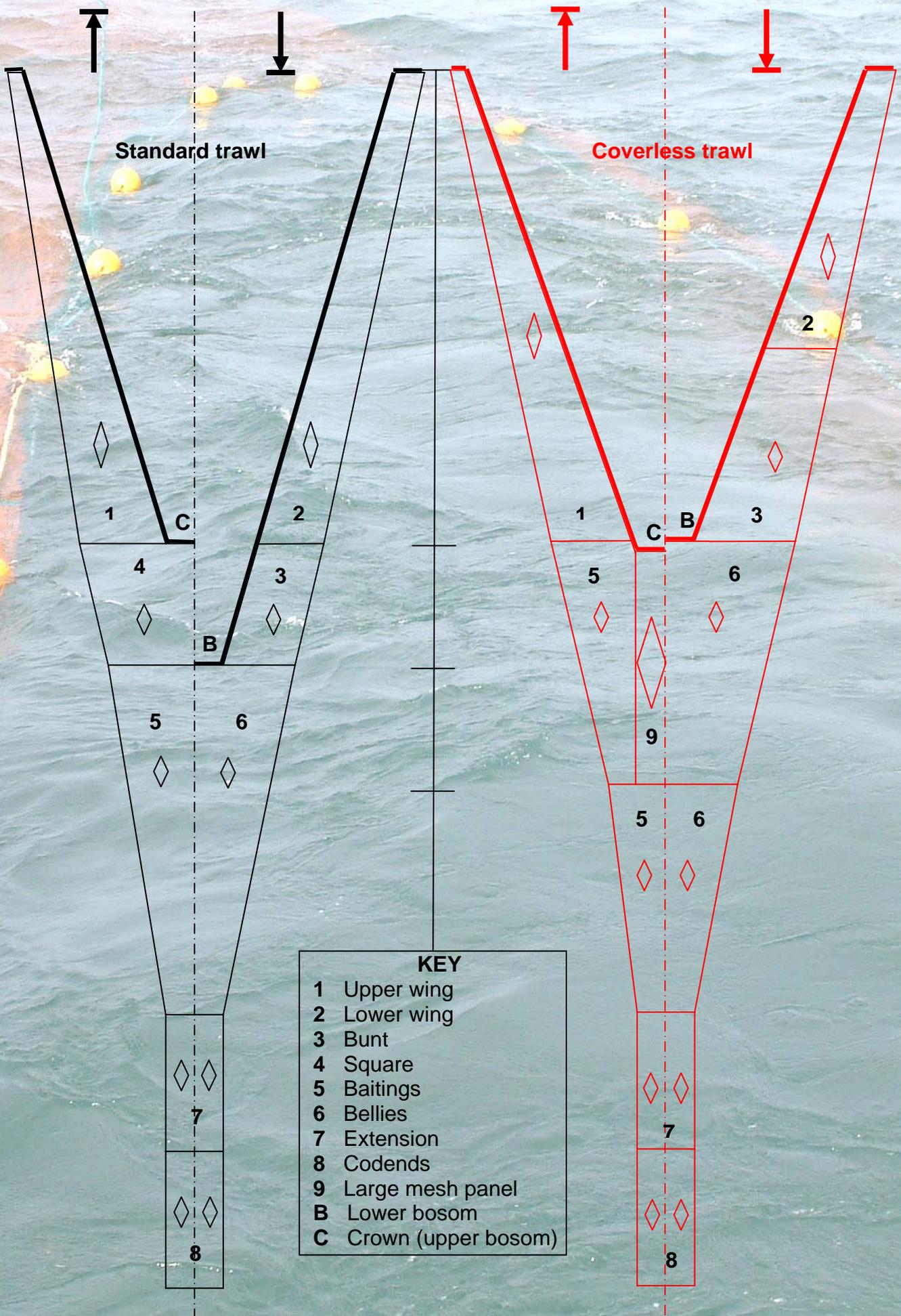
**Figure 1: Summarising the main stages involved**



It is expected that these guidelines should be sufficient for net makers and/or relatively experienced fishermen to undertake the necessary modifications to their existing net designs. Should further assistance be required, Seafish Gear Technologists and/or the net makers J&W Stuart (Stuart Nets) can be contacted directly for first hand advice or further information.

Figure 2

# Schematic diagram showing comparison of standard prawn trawl with **Seafish coverless trawl** design



**For more information please refer to:**

**Seafish report number SR532 - *Evaluation of Technical Conservation Measures in UK Nephrops Fisheries – New Trawl Designs***

**and**

**Seafish report number SR542 – *Improving the selectivity of towed fishing gears – New Prawn Trawl Designs to Avoid Capture of Unwanted Bycatch***

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