Project UK, Fisheries Improvement – SW Monk

Alternative management & gear measures, P1 Reducing catch of Small Monkfish

 Action 2: *Review of alternative measures to minimise the mortality of any catch of anglerfish species that may be discarded for any reason once the annual quota has been used up, resulting in a formal assessment for consideration by MAs and the NWWAC. Where reasonable implement measures to record data of live discards suitable for fisheries management purposes.*

**Background**

The majority of Monkfish ~ 65% is caught in the SW is by beam trawl vessels, with a further 20% & 12% caught by demersal trawlers and Netters (Tangle nets) respectively. Monkfish are caught as part of a mixed fishery demersal fishery and make up approximately 20% of catches, in terms of weight, in the SW beam trawl fishery and 10-15% in the mixed demersal trawl fishery .

In terms of reducing the mortality of Monkfish this is difficult due to the mixed nature of the fishery and further complicated by the physical shape of a monkfish making selectivity during fishing operations problematic. Selectivity trials for Monk in demersal trawl fishers are limited due to the difficult nature of the selectivity and Monk but are included as part of the catch in generic mesh size trials. Previous trials in Norway have shown that Monkfish are susceptible to infection after capture which will affect the survivability of discarded specimens over time.

Gear measures

**Larger diamond mesh**

The use of larger mesh sizes has been used extensively in many fisheries to improve selectivity of a variety of species. Diamond mesh is most applicable to the selectivity of flat fish species as the gaps created in the netting allow for easier escape. As diamond mesh is the most common type of netting used in Moving to the larger sizes of diamond mesh has also proven to be effective for round fish species such as cod and haddock and has been seen to also improve the selectivity of Monkfish.

Trials have been carried out in the North Sea on the West coast of Scotland aiming to reduce the discards of Cod using 300mm mesh, compared with the standard 160mm, in the forward sections of a demersal otter trawl. ***Campbell R., Harcus T., Weirman D, Fryer R.J, Kynoch R.J, O'Neill F.G. (2010) The reduction of cod discards by inserting 300mm diamond mesh netting in the forward sections of a trawl gear. Fisheries Research Scotland.*** As part of the trial the catches of Monkfish were evaluated with both mesh sizes. The results showed a 37% reduction at 37cm, with no significant reductions for lengths above 55cm.

A second selectivity trial was carried out comparing the selectivity of the 300mm mesh in the forward sections of the trawl with 600mm mesh. ***Kynoch R.J., O'Neill F.G. and Fryer R.J. (2011) Test of 300 and 600 mm netting in the forward sections of a Scottish whitefish trawl. Fisheries Research Scotland.*** The results for Monkfish showed that the 300mm trawl caught 50% fewer monkfish at 30cm with no significant difference >76 cm. The 600mm trawl caught 90% fewer monkfish at 30cm with no significant difference >83 cm.

**Larger Mesh Codend**

When looking to improve the selectivity of trawls through the use of larger mesh sizes, in many cases this can be seen to be most effective when making changes to the cod end. In a trial carried out NE of Scotland & West of Shetland the effects of increasing the codend mesh size from 100mm to 110mm & 120mm.  ***Bullough L., Napier I., Riley D. and Passfield K. (2001) The effects of 110 mm and 120 mm cod-ends on the catches of a twin-rig trawler. Fisheries Development Note No. 10. North Atlantic Fisheries College, Scalloway, Shetland 4pp.*** With respect to the catches of Monk with the larger mesh sizes no change was seen in the catches during the course of the trial.

**Selection Grids**

Grids have been tried in a number of fisheries notable in the UK fishery for Nephops. The grids general made of a semi flexible plastic are positioned in the extension of the trawl. The objective being to allow the nephrops to swim freely through the gaps in the grid and diverting the larger fish into a separate codend or allowing them to escape through a panel in the top of the trawl.

In a trial carried out in the Northern North sea to look at separating nephrops from fish species. The aft end of the trawl was modified into a four-panel extension and codend to fit the rectangular shape of the separator frame. The separator frame was placed in the extension at an angle of about 50◦ relative to the lower panel. It was installed two meshes behind the joining round between the last tapered belly section and the extension piece, which meant that it was effectively 12m in front of the codline. Non-selective collection bags made were attached to each compartment to retain fish passing through the separate sections of the frame. The trawl was rigged with Scanmar sensors to monitor gear geometry. The separator frame consisted of three vertically stacked compartments. The upper compartment covered the upper 50% of the frame and the middle and lower compartments covered 25% each. **Krag L.A., Madsen N. and Karlsen J.D. (2009) A study of fish behaviour in the extension of a demersal trawl using a multi-compartment separator frame and SIT camera system. Fisheries Research 98: 62-66.** The results of the trial showed clear separation between Nephrops and gadoids: about 75%. The separation of Monk was 38.0 % in the upper section, 35.9% in the mid-section and 26.1% in the lower section not highlighting a clear pattern of vertical separation.

Further trial with grids have been carried in Nephrops fisheries

**Loaec H., Morandeau F., Meillat M. and Davies P. (2006) Engineering development of flexible selectivity grids for Nephrops. Fisheries Research 79: 210-218.**

**Drewery J., Mair J., Edridge A. and O'Neill F.G. (2011) 35 and 40 mm Swedish grids in a Scottish Nephrops trawl fishery. Scottish Marine and Freshwater Science Vol 02 No 04 18pp.**

The results of both these trials showed that monkfish, along with other fish species, could be successfully selected from nephrops. No work was done to look at possible size selection of monkfish during these trials.

**Square Mesh Panels (SMP)**

Trials were carried out by the Scottish Fishermen’s Federation in 2009 **SFF (2009) 120, 160 and 200mm square mesh panels in the extension of whitefish trawls. SFF Chartered TR1 SMP trails - Preliminary report, 9pp.** taking place on a demersal twin rig trawler, fishing around Shetland and the North Sea. A square mesh panel was fitted to one of the two trawls to test the effectiveness of a range of square mesh panels in whitefish trawls.

Standard and control gear constructed from 120mm diamond mesh, 5mm double twine and had 100 open meshes. Test gears were fitted with a variety of Square mesh panels of 120mm, 160mm & 200mm.

The results showed that 200mm SMP is more selective than a 160mm SMP, which is more selective than the 120mm diamond mesh control gear. The only species where the 120mm SMP was more selective was perhaps Hake. Cod only escaped from the 200mm SMP and this gear also released relatively large quantities of Haddock, Ling, and lesser quantities of Plaice, Megrim and Monkfish. The 160mm SMP also released large quantities of Haddock, Whiting, and Ling and about 35% Hake.

With relation to Monkfish relative catch rates of the three SMPs did not differ with each other. Catch rate of 200mm SMP differed from the control. 200mm SMP retained fewer small Monkfish up to 50cm with retention of around 50% for 30cm monks rising to 77% for 50cm monks.

 **Project 50%**

In 2009/10 an innovative partnership between scientists and SW Beam trawler skippers, nicknamed ‘Project 50%’ was set up with an aim to reduce the amount of juvenile fish discarded overboard by 50%. Fisheries scientists worked closely with Beam trawl skippers to drastically reduce the number of juvenile fish discarded overboard. The beam trawl fishery in the SW had one of the largest discard rates of all UK fisheries. The key to Project 50% was to understand the reasons for discarding and work together to address these issues. The main solution to minimise discarding was to develop more selective trawl nets. Working alongside local net-makers, skippers of the vessels developed modified nets with different configurations and mesh sizes. Although the project was not focused on specific species such as Monkfish, Monkfish makes up around 25% of the total catches of the vessels taking part in the trial. Beam trawling is also the main method of capture of Monkfish in the SW demersal fisheries.

The use of larger mesh panels throughout the trawl, as tried in the 50% project, could be a means of improving the selectivity of juvenile Monkfish.

Although no dedicated Monkfish selectivity trials have been carried out, the trials listed above have only assessed the selectivity of Monkfish as an addition to the objective of the trials. Other options that have been tested, in demersal trawl fisheries, to improve selectivity some of which could be could be applicable to improving juvenile monkfish selectivity. Trials includes testing of:

* **Square mesh or T90 codends** – allows the meshes to remain open. Particularly effective for juvenile round fish and may also be effective for Monkfish.
* **Benthic release panel** – fitted to the belly of the trawl to remove benthic material and keep the catch as clean as possible adaptation possible for smaller sizes of monkfish.
* **4 panel codend** – tested in several fisheries (both diamond & Square mesh) to improve the flow of water in the codend of the trawl by allowing the meshes to remain open. Have shown to improve selectivity and quality of catch could also improve survivability.
* **Lights** – As yet untested to any great extent in mixed fisheries.
* **Knotless netting** - reduced damage to undersized specimens to aid survivability.
* **Tow duration** – limiting tow duration has shown to improve the survivability of fish species including Monk.

**Static gear**

In addition to the demersal trawl fishery monkfish are targeted in the SW by gillnetters using larger mesh tangle and trammel nets. Static nets have a much reduced bycatch and discards rate when compared with demersal trawls. In the SW static net fishery the mesh size used is a minimum of 210mm (10 ½ inch) minimum. This large mesh size ensures that bycatch and the discards of monkfish are minimised.

In a trial carried out in the US in the Gulf of Maine. **Analysis of the size selectivity and bycatch in the Gillnet Fishery for Monkfish 2010, Gulf of Maine Research Institute Daniel J. Salerno1, Steve Eayrs1, Michael Pol2, Stephen Lee3 & Adam Baukus.** This study targeted monkfish using an otter trawl and tangle nets with 10˝, 12˝ and 14˝ mesh size. Although the study was carried out in the Gulf of Maine, the fish and gear type used are very similar to those seen in the SW England Monk fishery. The vessel used for the trial was the F/V Kirsten Lee a commercial monkfish vessel that could deploy both trawl and gillnet fishing gear during the same fishing trip. This study occurred during the summer fishery for monkfish. The results of the trial showed that 12˝ mesh gillnets had the highest catch of monkfish by weight and the 14˝ gillnets had the lowest catch of monkfish by weight and number. The levels of bycatch of Monkfish were low for the 3 different mesh 10˝, 12˝ and 14˝ with totals of 0.9%, 1.4% and 0.2% by weight respectively. The results of the trial indicate that size selectivity of Monkfish could be improved through increases in mesh size.

**Management**

In addition to improvement in the selectivity of the fishing gears used to target monkfish by SW vessels there are also management measures that could assist in reducing fishing effort within the different monkfish fisheries and reduce the levels of bycatch. These may include:

**Effort restrictions:**

* **kW/days**
* **Closed areas** - attempts to protect juvenile monkfish by utilising closed areas would potentially involve large areas since small monkfish appear to be widespread, and would affect catches of other economically important species taken by mixed fisheries.
* **Seasonal closures**
* **Real time closures**
* **Avoidance areas**

**Technical measures:**

* **gear size limitation** - beam trawls currently limited to 4.5m or 12m max depending on fishing area and vessel HP
* **Size & Power limitations** – Dictated by area wishing to be fished, both MMO and localised IFCA restrictions.
* **Maximum/minimum size limits** – No MLS on Monkfish but an EU Council Regulation (No. 2406/96) laying down common marketing standards for certain fishery products fixes a minimum weight of 500 g for anglerfish.
* **Catch composition** – depending on the mix of species in the catch will dictate what mesh size is allowable.