

AN OVERVIEW OF THE CURRENT ATTITUDE OF FISHERS FROM THE NORTHUMBERLAND DISTRICT TO THE VOLUNTARY USE OF ESCAPE GAPS IN LOBSTER POTS.

Introduction

The Northumberland district's shellfishery currently holds 91 registered shellfish permits. A commercial permit holder may fish for specified species of shellfish with up to 800 pots at a given time. The most commonly targeted species in the district are *Homarus gammarus* (European lobster), *Cancer pagurus* (edible brown crab) and *Necora puber* (velvet crab). The use of escape gaps in lobster pots has recently been under review by Northumberland Inshore Fisheries and Conservation Authority, and the aim of this study was to gain an understanding of the attitudes of fishers from the district to the use of escape gaps.

An escape gap is a small opening on the side of a lobster pot that allows undersized individuals to escape whilst still retaining sized catch to be hauled [Pantin, et al, 2015]. There are a number of benefits associated with escape gaps relating to the conservation of shellfish stocks; these include decreasing the temptation to land and sell undersized catch, decreasing the sorting time of catch, reducing the rate of injury to the catch from both handling and interactions within the pot, and reducing the rate of predation on vulnerable individuals that are displaced away from their natural habitat. As well as this there is the potential for a reduction in ghost fishing, decreased harm to eggs of berried hens, and more space within the pots for sized catch [Arana, et al, 2011]. However, there are also drawbacks to using escape gaps and these stem from the impacts they have on the velvet crab fishery, the potential loss of sized individuals and the potential loss of data needed to form lobster stock assessments that comes from capturing juveniles.

Investigations into the use of escape gaps in shellfish pots goes as far back as the 1950's when studies on the correlation between lath spacing (these are the spaces in between the pieces of wood at the bottom of the lobster pots) and undersized catch were conducted [Templeman, 1958]. Since then the modernisation of pots has meant that instead of lath spacing, escape gaps are now used to reduce the number of undersized individuals that are caught [Pantin, et al, 2015]. Successful use of escape gaps have been witnessed along the West coast of America, as well as Hawaii, New Zealand and Australia [Everson, 1986]. Mandatory escape gaps have been introduced as a byelaw by Devon & Severn, Eastern, Kent & Essex, Cornwall, Isle of Man and Jersey Inshore Fisheries and Conservation Authorities. North Western IFCA has an impending byelaw, North Eastern IFCA has recently enforced the byelaw and Southern IFCA has distributed 1000 escape gaps to fishers for their voluntary use.

During Northumberland's investigation, 23 fishermen from the district were interviewed in order to gain an understanding of their opinions on escape gaps.

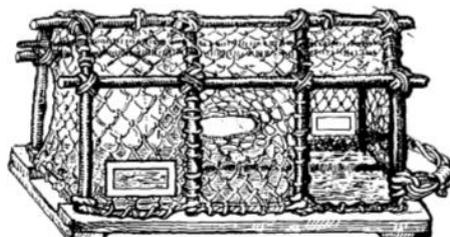


Figure 1. Lobster pot from North Eastern district with escape gaps installed [Brown, 1982].

Methods

This investigation took place from the 15th to the 17th of March 2016 and involved collecting data from ports at North Shields, Blyth, Amble, Seahouses and Holy Island. This was done to ensure the surveys represented the general opinion of fishers across the district. 23 surveys in total were collected, which represents approximately 20% of the commercial shellfish fleet in Northumberland (there are currently 91 registered commercial shellfish permits in the NIFCA district). Those fishermen that were interviewed were chosen at random so that there was no deliberate skew in the data.

Results

The following questions were included in the questionnaire.

1. Are you currently using escape gaps in your lobster pots?

Of the 23 fishermen that were interviewed, five said they had installed escape gaps in at least some of their lobster pots. In comparison, 18 had not installed the gaps in any of their pots. The proportion of fishermen using escape gaps and not using escape gaps is shown in figure 1.1. Of the five fishers who had installed the escape gaps, one had only installed them in two pots in order to try them out, three used them in a significant portion of their pots and one had installed them in his entire fleet. There was a general opinion amongst these fishermen that had installed the gaps that the escape gaps produced a higher quality of catch by letting the undersized organisms out and leaving room for larger shellfish.

Of those fishermen who did not use the escape gaps, 10 disagreed with the concept of the gaps saying that it was possible for sized lobsters to escape. There was also a large amount of concern over the impact the gaps would have on the velvet crab fishery. Four of the interviewed fishermen were indifferent about the idea of installing the escape gaps and did not have any major concerns with using them. The remaining four fishermen agreed with the concept of the escape gaps however they said they did not have enough time to install the gaps in their gear. There was however a general opinion amongst all of the fishermen that escape gaps are a good measure used to prevent illegal capture of undersized shellfish.

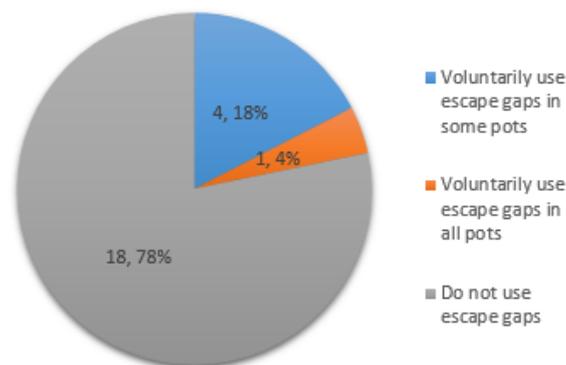


Figure 2. The number of fishers from the Northumberland district using escape gaps voluntarily in all of their pots, some of their pots and those who do not use them at all from the 15th to the 17th March 2016. The percentage is also shown on the chart in order to gauge what proportion of total fishers from the district are using escape gaps voluntarily.

2. If you are currently using escape gaps in your lobster pots, what initially made you decide to use them?

A primary reason for fishermen using escape gaps is the implementation of an escape gap byelaw by North Eastern IFCA. Fishermen interviewed at North Shields port stated that they had installed gaps in half of their fleet as they preferred to fish in both the Northumberland and North Eastern district. These fishermen are continuing to gradually install the gaps in the rest of their pots as they preferred the quality of catch the pots with escape gaps brought. Two of the fishermen that used the escape gaps stated that “fishermen down South claimed the gaps produced a better standard of catch as well as decreased sorting time”. These fishermen agreed with this premise and are continuing to install the gaps in the rest of their fleet. One of the fishermen said that he worked prawn pots and that he had installed the gaps in these pots in order to let out the high abundance of undersized lobster that these pots let in. He stated that he was pleased with the outcome as it resulted in a higher quality of catch.

3. If you are opposed to the use of escape gaps in your pots, what are your main concerns?

Of those fishermen that currently use escape gaps there only appeared to be one hindrance that had significance and that was that it takes a long time to install the gaps in the pots, especially when the gear is always at sea. A general opinion amongst those fishermen that did not use the escape gaps was that those pots deployed offshore would benefit from having the gaps as lobsters were found in higher abundance and the pots are left for longer periods of time. The presence of the escape gaps would mean that undersized catch could escape, leaving more room for sized catch. However, it was also thought that inshore fishers would not see the benefit as the gaps could let sized lobsters out. It was said by several of the fishermen that if the gaps had smaller dimensions they would be more inclined to install them.

A primary concern brought up throughout this investigation was that escape gaps would result in reduced catches of velvet crabs. Although velvet crabs do not constitute a large proportion of catch they do provide a valuable source of income that can be used to pay for bait or fuel. The potential loss of lobster stock data brought by the capture of juveniles was also raised as a concern with regard to the use of escape gaps.

4. If you are currently using, or have used escape gaps in the past, do you think their presence has an impact on sorting time of lobsters?

Of the five fishers who had installed the escape gaps in their pots, four said they thought there was a reduction in sorting time of the catch. They stated that this was a valuable trait especially when only one person was sorting the lobsters. Only one fisherman said he didn't think there was any effect on the sorting time, and he put this down to him not working alone when sorting the catch.

5. Do you think the presence of escape gaps would be beneficial to the amount of sizable catch caught?

Of the 23 fishermen who were interviewed, 16 said that they thought that the escape gaps would be beneficial to the catch by increasing the catch rate and seven of the fishers thought that there would be no impact. It was in the opinion of those who thought it would not be beneficial that the escape gaps can allow sized lobsters out and so this would be a hindrance to the overall catch. It was a general opinion amongst those fishers who do not

use escape gaps that they would consider the use of escape gaps if they were smaller in size.

The fishermen who thought that it would be beneficial to the catch said that allowing the undersized catch out whilst the pots were still on the seabed would allow more room for sized lobsters in the pots and it would also mean that the small lobsters would not be able to consume all of the bait.

6. How do you think the use of escape gaps could affect profitability?

Of the five fishermen who currently use escape gaps, one individual stated that his profit had increased slightly as a result of a higher quality of catch being landed. Two said that their profit had not been altered as a result of the escape gaps. The remaining two said that they had seen an initial decrease, however in the long term there would be an increase in profit.

Of the 18 fishermen who do not use the escape gaps, two said they thought there would be an increase in profit, 14 said they thought there would be a decrease in profit and two thought there would be no impact. The main reasons why the fishermen thought there would be a fall in profit were the loss of velvet crabs from the pots and potential loss of sized lobsters.

One of the fishermen suggested that to those who are fishing further off shore (4-5 nautical miles), there would be an increase in profit because the smaller individuals being let out would make room for the larger organisms. However those fishermen who fish inshore and target velvet crabs could see a potential loss of valuable funds.

Some of the fishermen expressed concern over the potential loss of prawn (*Nephrops norvegicus*) catch that could come from installing escape gaps.

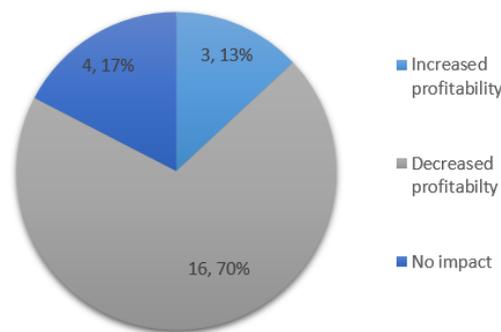


Figure 3. The opinions of Northumberland fishers on the impacts escape gaps would have on profitability from the 15th to the 17th of March 2016. Three fishermen thought the escape gaps would increase profitability, 16 thought the escape gaps would decrease profitability and four thought there would be no impact.

7. Do you think that the use of escape gaps would have an impact on the incidence of damage to the catch?

Of those fishermen who used escape gaps, four thought that there was a decrease in the incidence of damage done to the catch. The general opinion was that allowing the smaller organisms to escape prevented the larger lobsters preying upon them.

A portion of those fishermen who did not use the escape gaps thought that the escape gaps themselves may be a potential source of damage to the lobsters as when the large organisms try to escape they can cause damage to themselves. On the other hand four of the fishermen said they thought the escape gaps would be beneficial in reducing the incidence of damage to the catch. One of the fishermen said that he had seen undersized lobsters eating a large lobster in a pot before and so allowing the small organisms to escape would be beneficial to the sized lobsters caught.

8. Do you think the increased use of escape gaps in the district would have a positive impact on the conservation of target and non-target shellfish species?

A 2013 CEFAS stock assessment for Northumberland and Durham deemed the districts shellfish stock as poor and the exploitation rate as high. This has resulted in a monthly in house stock assessment of four local fishing vessels which provides information on lobster carapace length, gender and condition (for example crippled/berried). This assessment will also provide information on the districts bycatch rate, fleet location, bait type and soak time [NIFCA pers. Comms. 2016].

Of the fishermen who were interviewed 14 said they thought the escape gaps would have a positive impact on the conservation of the species in the local area, and nine thought that there would be no impact. There was a general trend throughout this question that as long as people were honest and didn't land undersized lobsters there should be no issues with population numbers and so the escape gaps would not be needed. However some of the fishermen said they should be put in place as an added precaution in order to ensure that undersized lobsters were definitely being released. Some of the fishermen brought up that V notching was a popular method of conserving shellfish stocks and therefore installing escape gaps is unnecessary.

9. Do you target other species such as prawns or velvet crabs?

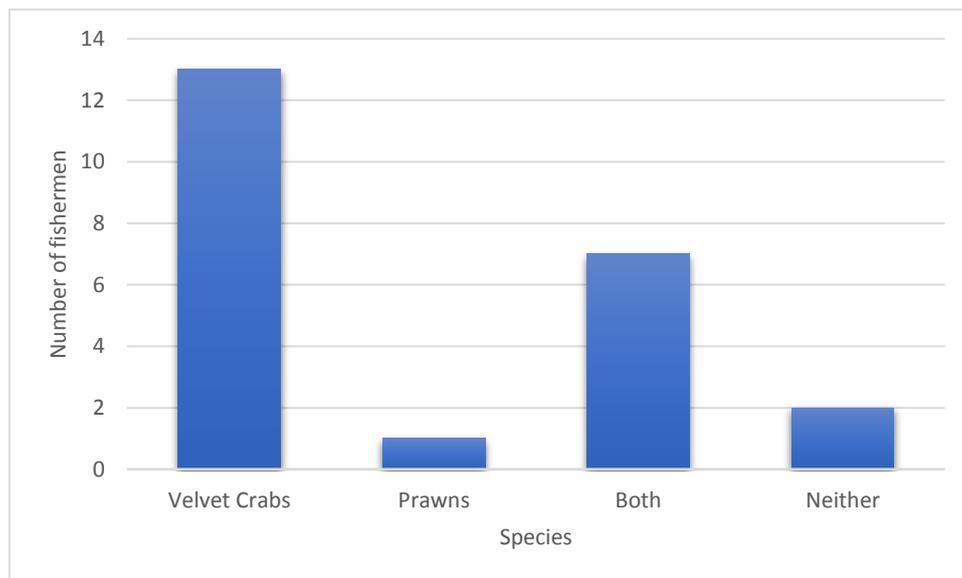


Figure 4. The number of fishermen from the district who pot for velvet crabs, prawns, both velvet crabs and prawns or neither species.

A significant proportion of fishermen target velvet crabs, whilst a smaller number target prawns. This needs to be taken into consideration with regard to the use of escape gaps as the number of velvet crabs and prawns that are caught could be reduced.

10. If you target velvet crabs, how important are these to your overall landings throughout the year?

It was the general opinion of those who caught velvet crabs that their stocks fluctuated from year to year and that they were not to be relied upon for a massive source of income. A fisherman interviewed at Amble port stated that although he did not rely on the velvets as a substantial source of income, they can be kept as bycatch and used for bait or fuel money. It would therefore still have a negative impact on profit if there was a loss of velvet crabs from the pots.

11. If you target prawns, do you set the pots within 3 nautical miles of the coast or further off shore?

Of the eight people who targeted prawns, five potted for them beyond 3nm and three within. There was concern over the use of escape gaps in those pots that had dual purpose for catching both prawns and lobsters as those pots would no longer catch any prawns.

One fisherman said that there should be a boundary between where the best prawn populations are and where the best lobster populations are so that you could distinguish between where escape gaps should and shouldn't be used.

12. What seasonal variability have you observed in the abundance of target and non-target species?

There was the general view that the summer months (July through to September) were the best time of year to find lobster. However the lobster fetched the highest price during winter time. The velvets tend to come and go all year round.

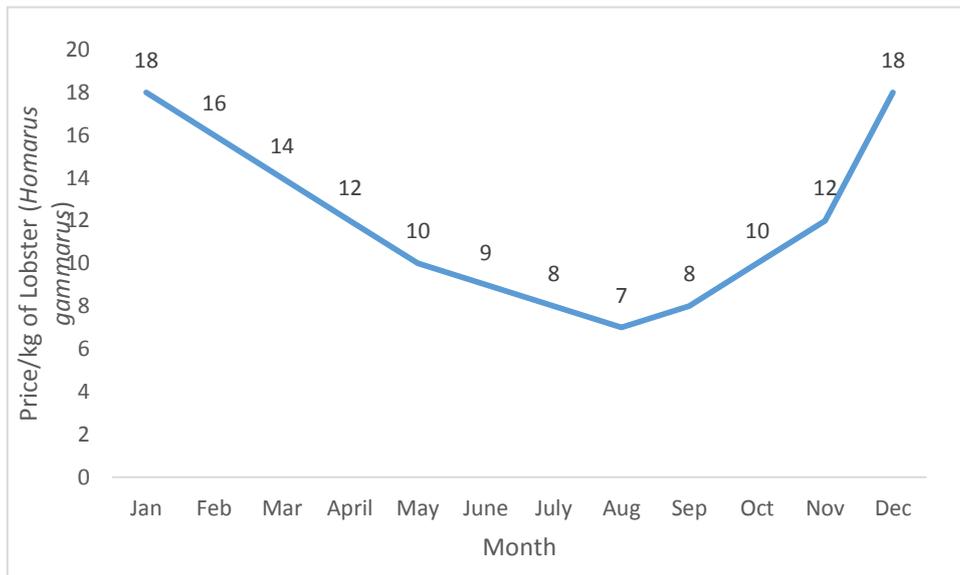


Figure 5. Changes in approximate price/kg of lobster (*Homarus gammarus*) throughout 2015 from a local wholesaler in the Northumberland district.

Discussion

During this investigation, 23 fishermen were interviewed from the Northumberland district for their opinions on escape gaps. There was some protest against the escape gaps from 10 of

the interviewee's with regards to the potential for sized catch to escape. This can be true in some cases of sized lobsters due to their individual body morphology, in the same way that some undersized lobsters may remain trapped in the pots. For example there are morphological differences between male and female lobsters. The females' abdomen width tends to be greater than carapace width and this can mitigate their use of escape gaps. The opposite occurs in males and the carapace width is greater than the abdomen width and this poses no obstruction to the individual escaping the pot [Lovewell & Addison, 1989]. The majority of those fishermen who did not use escape gaps agreed that if the gaps were smaller in size they would be more inclined to install them, however this would mean that very few undersized lobsters would escape and may defeat the gaps purpose. A CEFAS report on the effectiveness of escape gaps found that installing the gaps reduced the amount of undersized lobsters caught by 60%. There was also a slight reduction in the amount of sized lobsters caught, however this statistic was outweighed by the benefits of the gaps and so was deemed insignificant [CEFAS report, 2013].

A reduction in sorting time was reported to result from installing the escape gaps by four of the fishers. This is a valuable asset to fishers, especially for those who lone work on their vessels. Reducing the sorting time of catch would allow more gear to be hauled and would reduce fuel consumption [Shelmerdine & White, 2011], this could also result in an increase in potting effort as there would be more time to fish more pots. This increased potting effort may however result in a decline in lobster stocks, therefore having a negative impact.

There was unanimous favour for the escape gaps with regard to the mitigation of illegal fishing, which is an obvious benefit of the gaps, however the Northumberland district does not suffer from high rates of illegal fishing [NIFCA pers. Comms. 2016] and so the escape gaps would primarily serve as a conservation tool allowing juveniles to escape the pots, increasing their survivability. Studies on lobster evolution suggest that air exposure can reduce the growth rate of lobsters [Brown & Caputi, 1985] and that being disorientated by the exposure means lobsters do not always seek shelter where they are displaced. This in turn leaves them vulnerable to predation and so harms the populations [Brown & Caputi, 1983]. The fishermen interviewed during this investigation generally thought that releasing the undersized lobsters would suffice the conservation effort, however the escape gaps would aid this effort further by allowing the organisms to escape before they are exposed to the open air [Lovewell & Addison, 1989].

Several studies have indicated that the presence of escape gaps would mitigate aggressive behaviour occurring within the pots between large and small individuals. Havens (2009) suggested that installing the gaps would allow small brown crabs to escape from pots that had not been hauled for a significant period of time, reducing aggressive inter- and intra-specific interactions. Brown (1982) supports this by suggesting escape gaps would reduce damage to both undersized and sized catch. This therefore has both conservation and economic benefits for the fishery.

The 80 by 46mm escape gaps would not be able to retain velvet swimmer crabs and so one of the biggest concerns with using the escape gaps appeared to be the loss of velvet crab stock. The velvet swimmer crab is spread around the UK coasts and has a wide distribution throughout the North Sea [Shelmerdine & White, 2011]. Velvets do not seem to make up a significant portion of the income of fishers in the district, however after the European lobster and Norway lobster (*H. gammarus* and *N.norvegicus*), velvet swimmer crabs fetch the highest price per kg [Shelmerdine and White, 2011] and when caught in abundance they can cover fuel and bait costs. There was less concern for the loss of prawns as not as many of the fishermen targeted them. There was some concern for duel pots which catch both

lobsters and prawns as installing the escape gaps would reduce the number of prawns caught. Taking these losses into account is important, however they may be balanced out by the benefits of the escape gaps.

Conclusion

This study of the attitude of fishermen in the Northumberland district towards escape gaps has highlighted some very valuable benefits and costs of installing escape gaps in lobster pots. The main concerns taken from the survey appear to be the loss of sized lobsters as well as velvet crabs. Although there would certainly be a loss of velvet crabs and a possibility of losing sized lobsters, this would hopefully be outweighed by the benefits of the escape gaps. This includes the increase of lobster populations due to a decrease in mortality after air exposure [Pantin, et al, 2015], reduced rates of injuries to catch (and therefore improved quality and value of landable catch) and a decrease in sorting time [Shelmerdine & White, 2011]. Successful use of escape gaps has been recorded in countries around the world [Everson, 1986] and during this study fishermen reported that fishers from Southern IFCA district had remarked on the success of a voluntary escape gaps measure, which was echoed in the CEFAS report of escape gap trials. In summary, there are potential benefits of increasing escape gap use within the Northumberland IFCA district for shellfish stocks and the potting fleet, however these must be weighed up against limitations such as the loss of non-target species and landable catch when considering implementation of an escape gap measure.

Reference list

Addison, J.T. and Lovewell, S.R.J. (1989) 'Size composition and pot selectivity in the lobster (*Homarus gammarus* (L.)) and crab (*Cancer pagurus* L.) fisheries on the east coast of England', ICES Journal of Marine Science, 48(1), pp. 79–90.

Arana, P.M., Orellana, J.C. and De Caso, Á. (2011) 'Escape vents and trap selectivity in the fishery for the Juan Fernández rock lobster (*Jasus frontalis*), Chile', Fisheries Research, 110(1), pp. 1–9.

Brown, C.G. (1982) 'The effect of escape gaps on trap selectivity in the United Kingdom crab (*Cancer pagurus* L.) and lobster (*Homarus gammarus* (L.)) fisheries', ICES Journal of Marine Science, 40(2), pp. 127–134.

Havens, K.J., Bilkovic, D.M., Stanhope, D. and Angstadt, K. (2009) 'Location, location, location: The importance of cull ring placement in blue crab traps', Transactions of the American Fisheries Society, 138(4), pp. 720–724.

NIFCA monthly shellfish returns forms 2016

Pantin, J.R., Murray, L.G., Cambie, G., Le Vay, L. and Kaiser, M.J. (2015) 'Escape gap study in Cardigan Bay: consequences of using lobster escape gaps', Fisheries and Conservation Science.

Shelmerdine, R.L. and White, E., (2011). Scottish Industry Science Partnership Report.

Templeman, W., (1958). Lath-spacing in lobster traps. Progress reports of the Atlantic coast stations of the Fisheries Research Board of Canada, 69, pp.22-28.