Title:	Impact Assessment (IA)
Impact Assessment for Eastern IFCA whelk (*Buccinum undatum*) fisheries permitting byelaw	**IA No:**
	Date: 12/02/2015
Lead department or agency:	**Stage:** Development/Options
Eastern Inshore Fisheries and Conservation Authority (Eastern IFCA)	**Source of intervention:** Emergency Byelaw
Other departments or agencies:	**Type of measure:** Secondary legislation
	Contact for enquiries: Julian Gregory (Deputy Chief Executive Officer) Tel: 01553 775321

Summary: Intervention and Options

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANCB on 2009 prices)	**In scope of One-in, Two-Out?**	**Measure qualifies as**
N/A	N/A	N/A	No	N/A

What is the problem under consideration? Why is government intervention necessary?

Whelk stocks within Eastern IFCA's district are at a high risk of being over-exploited. Landings data (MMO data) has indicated that catch per unit effort has reduced during 2014 indicating that fishing effort is too great to be sustainable. It is well accepted in published scientific literature that whelk are particularly vulnerable to over-fishing due to their low mobility, slow maturation and the lack of a dispersive larval stage. In addition, the current minimum landing size (45mm) is thought to be well below the size at which whelk actually mature. Furthermore, there is currently no data available regarding the health of whelk stocks within the Eastern IFCA district. These combined factors indicate that the whelk stocks are at high risk from over-fishing. Regulatory (rather than voluntary) measures are required as the risk of over-fishing is high.

What are the policy objectives and the intended effects?

To attain landings data from fishers prosecuting the whelk fishery to build an accurate maximum sustainable yield model. To manage the effort of vessels prosecuting the whelk fishery until Eastern IFCA can more accurately determine maximum sustainable yield. To reduce the removal of pre-spawning whelk. To prevent a 'boom and bust' fishery with a view to establish a fishery operating at maximum sustainable yield.

What policy options have been considered? Please justify preferred option (further details in Evidence Base)

There are four potential management options considered within this impact assessment: do nothing, voluntary measures, introduction of an IFCA byelaw or introduction of an IFCA emergency byelaw. The preferred option is an IFCA emergency byelaw. There has been a sudden and dramatic increase in effort (both pots per vessel and number of vessels) which requires management, as catch per unit effort has suddenly reduced and was unforeseen. Given that effort and landings are at the highest recorded level since 2010 there is an urgent requirement to protect pre-spawning individuals which are likely being landed at present. There is also an urgent need to collect data to inform stock and effort management from the fishers.

When will the policy be reviewed to establish its impact and the extent to which the policy objectives have been achieved?	It will be reviewed 01/04/2016
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	Yes

Does implementation go beyond minimum EU requirements?			Yes		
Are any of these organisations in Scope? If Micros not exempted set out reason in evidence base.	**Micro** Yes	**<20** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** N/A	**Non-traded:** N/A	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Chief Officer: ..... Date:.....

Evidence base

1. Introduction

Eastern IFCA has a duty to take action to ensure the sustainable exploitation of fisheries within its district as per section 153 of the Marine and Coastal Access Act 2009. Furthermore, in carrying out its duties Eastern IFCA is obliged to ensure Good Environmental Status of fish and shellfish stocks as per the Marine Strategy Framework Directive (2008/56/EC) namely; sustainable fisheries with high long-term yields, stocks functioning at full reproductive capacity, and to maintain or increase the proportion of older and larger individuals.

Eastern IFCA currently has no mechanisms to manage a sustainable whelk fishery. Best available evidence has indicated that whelk stocks within Eastern IFCA's district are at a high risk of over-exploitation and potential collapse as a result of a sudden increase in fishing effort. Failure to implement management measures at this time would potentially result in the collapse of the whelk fisheries within our district and constitute a failure to meet the obligations set by the European Commission.

2. Rationale for intervention

a) Relationship between landings and effort

MMO landings data has indicated that landings of whelk into ports within Eastern IFCA's district have risen by 667% (by weight) since 2010 (Fig1.). In 2014, landings did not increase in comparison to 2013 yet effort - in terms of the number of different vessels landing per month – increased by 41%. The rate of increase of active vessels was decreasing and it was estimated that effort would level off in 2014. However, 2014 saw the largest increase in the number of active vessels thus far. This constituted a decrease in catch per unit effort (Fig.2.) indicative of having exceeded maximum sustainable yield. Furthermore, these estimates of catch per unit only take into account the number of vessels as this is the only data available to Eastern IFCA i.e. not the number of pots per vessel. Given that IFCOs have reported an increase in the number of pots per vessel during 2014 it is suggested that these decreases are underestimates of the actual increase which may be much starker.

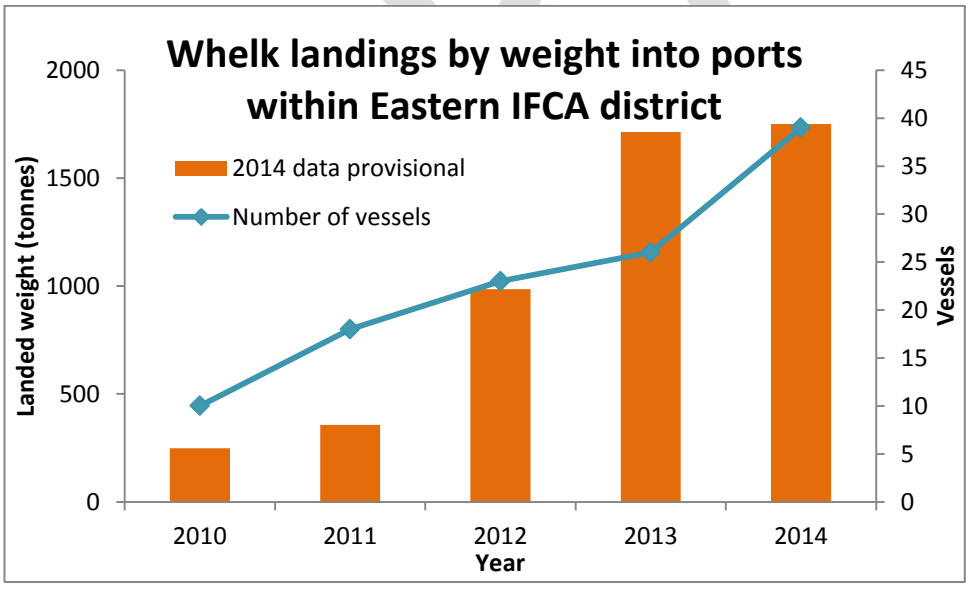

Fig 1. Landed weight of whelk according to MMO landings data (orange bars) and number of vessels prosecuting the whelk fishery annually (blue line).

In determining maximum sustainable yield of a fishery, a model using catch per unit effort is often used. The simplistic estimate of catch per unit effort used in Eastern IFCA's calculations indicates that the fishery is being exploited at levels beyond maximum sustainable yield. The potential impacts are a reduction in spawning stock biomass, which will reduce the capability of the population to replace individuals lost through fishing mortality and ultimately a loss in total biomass.

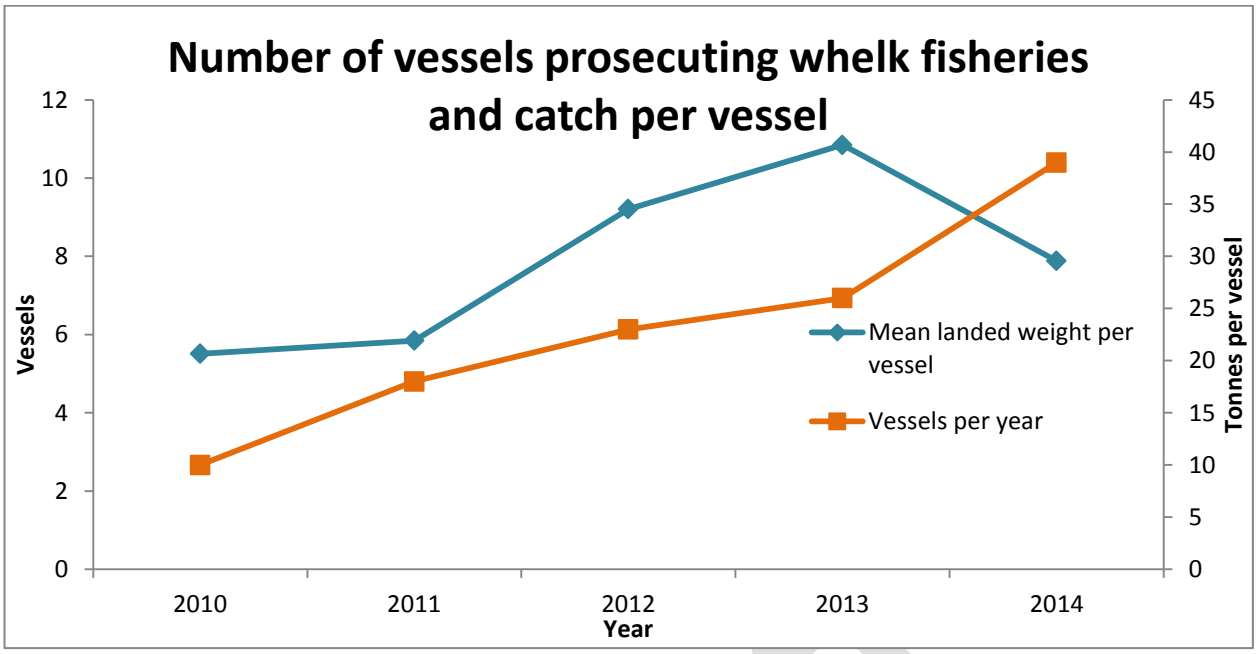

Fig 2. Mean weight landed per vessel (catch per unit effort – blue line) and number of vessels annually prosecuting the whelk fishery.

b) Whelk biology

Whelks have life histories which make them particularly vulnerable to overfishing. In addition, there is likely to be variation in key biological characteristics between fisheries within Eastern IFCA's district.

Size/age at sexual maturity – The size or age at which whelk reach sexual maturity (i.e. spawning age) is thought to vary greatly even over relatively small spatial scales (Fahy et al 1995, Fahy et al 2000). A recent Cefas report has found growth rates and size at age to vary greatly throughout the UK (Lawler 2014). There is general consensus that, the current minimum landing size (45mm) is below that of most whelk fisheries in the UK (Lawler 2014) and Europe (Fahy et al 2000).

Removing pre-spawning individuals can have a dramatic detrimental effect on stock sustainability particularly when the minimum size is far below the size of maturity. A limited evidence base suggests that the size of maturity for the Southern North Sea is around 78mm (Lawler 2014). The age of maturity ranges from 3 to 8 years. The same study found that whelk in stocks prosecuted by vessels landing catch at Wells-Next-The-Sea (main whelk port in Eastern IFCA district) matured at 62.5mm; 12.5mm larger than the current minimum landings size.

Low mobility – Tagging studies have revealed that adult whelks are relatively sedentary. In addition, larval development is known to occur within the eggs and as such, larval stages do not disperse (as in many other species such as mussels and cockles). As a result of this limited mobility, individuals removed through fishing mortality have to be replaced by recruitment from within the local stock. This will likely compound the effect of removal of pre-spawning individuals.

c) Data deficiency

Eastern IFCA currently has no data regarding the location, extent or size of the whelk stocks (or 'stocklets') within its district. There are no ICES or Cefas reports on whelk stocks. The only indication Eastern IFCA has relating to the status of whelk stocks is calculated using the estimate of catch per unit effort described above. There is a limited amount of literature relating to whelk as a fisheries resource examining, for example, stock dynamics and growth rates.

Being a data deficient species, the risk to these stocks are increased, without additional data relating to effect, location of fishing activity and fishing intensity Eastern IFCA is unable to ensure that the fishery is operating at maximum sustainable yield.

d) Social and economic worth

Whelk landings increased nationally in 2014 and are now, for the first time, in the top ten landed species by weight (MMO provisional report) with an estimated worth of £13.5 million. Within Eastern IFCA's district, landed whelk had a first sale value of £1.32 million which made it the most valuable fishery in the district. According to MMO landings data, 39 vessels engage the fishery.

The fishery is prosecuted primarily by fishers who also target other species. Whelk has previously been prosecuted as a marginal species, targeted when other species are less available. Recent landings data would suggest that whelk fisheries have become more important in their own right. Maintaining a long-term sustainable fishery will have significant socio-economic benefits – failure to manage the fishery could result in the significant loss of earning, particularly effecting local and inshore fishing sectors.

The above issues highlight the high risk posed by the over-exploitation of the whelk fishery.

3. Policy objectives and intended effects

Given the identified risks to the whelk fishery, management measures are required the objectives of which are as follows:

1. Acquisition of accurate effort and landings data to build models to work towards maximum sustainable yield;
2. Introduce effort management;
3. Cap effort until such a time as assessments can determine appropriate levels of effort; and
4. Prevent or reduce removal of pre-spawning whelk.

With the exception of objective one, Eastern IFCA currently has no ability to implement management measures pursuant of these objectives in a regulatory manner.

Data will be collected within the next 12 months relating to the location, number and yield of fishing gear (pots). This data will be used to inform effort management towards maximum sustainable yield. In addition to the data collected via the management measures, a research project will take place during the 2015/16 financial year to determine the presence of individual stocks across the district, the size of maturity across the district to better inform management measures relating to minimum landings size and gear specifications.

4. The options

Option 0: Do nothing – Considered inappropriate given the high risk of the fishery from over-exploitation and the socio-economic importance of the fishery.

Option 1: Emergency whelk permitting byelaw – Considered the most appropriate option.

An emergency byelaw will prohibit fishing for whelks within Eastern IFCA's district without a permit issued by the Authority.

Permitting scheme – Permits will be issued to whelk fishers. This measure will allow Eastern IFCA to manage effort initially with a view to review the appropriate number of permits and pots after 12 months in the light of data gained over the same period.

The permitting scheme will also allow for permit conditions as follows:

I. Permit holder must provide the number, location and soak time of fishing gear (whelk pots) and the biomass of whelk caught by pots.

II. Prohibition of all fishing gear except whelk pots as specified for the prosecution of the whelk fishery.
   a) Whelk pots must have escape holes of a specified dimension and location
   b) Sorting gear must be in the form of a riddle with a minimum specified spacing between sorting bars

III. A hull (vessel) is prohibited from setting more than the specified number of pots

IV. Whelks below a specified size may not be landed

Option 2: (Conventional) whelk permitting byelaw – considered inappropriate given the urgent requirement to introduce effort capping measures and measures to prevent the removal of pre-spawning individuals for the high risk fishery.

Option 3: Voluntary measures – Given the high risk of the fishery and the need to have immediate action, the potential for non-compliance to a voluntary measure is too high a risk.

V. Evidence base

5.1 Permit conditions

5.1.1 Pot limitations

In order to identify the appropriate number of pots that individual permit holders should be limited to, IFCOs undertook to investigate the number of pots currently being used to prosecute the whelk fishery. Of the 78 vessels identified as having prosecuted the fishery during the period 2010-2014, information on 50 vessels has been collated.

It was identified that the mean number of pots per vessel was 515 and that 32% of vessels prosecute both within and outside of the 6nm limit. Vessels which utilise more pots tend to be larger vessels (fig 3.).

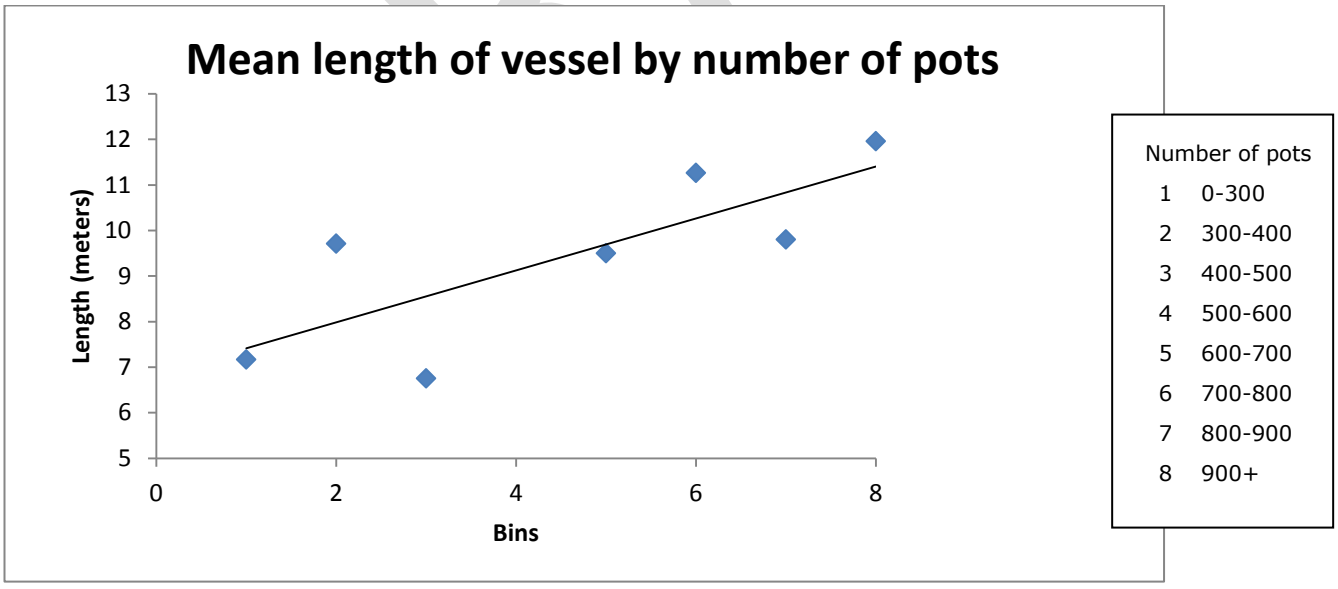

Fig 3. Relationship between the mean length of vessels and the number of pots a vessel uses to prosecute whelk fishery. Bins 1 to 8 represent a range of pots as depicted in the legend.

Analysis of the information gathered enabled an assessment of the indicative impact of introducing pot limitations of varying levels. The proportion of the fleet that would be affected by pot limitations is illustrated in Table 1 and Fig 4.

pot limitation	Number of vessels unaffected	% unaffected	% effected
300	21	42	58
400	26	52	48
500	28	56	44
600	28	56	44
700	29	58	42
800	41	82	18
900	42	84	16
1000	49	98	2

Table 1. The number of vessels unaffected for a given pot limitation, the proportion of the fleet unaffected and the proportion affected by a pot limitation – IFCO consultation data, based on estimated pots within 6nm.

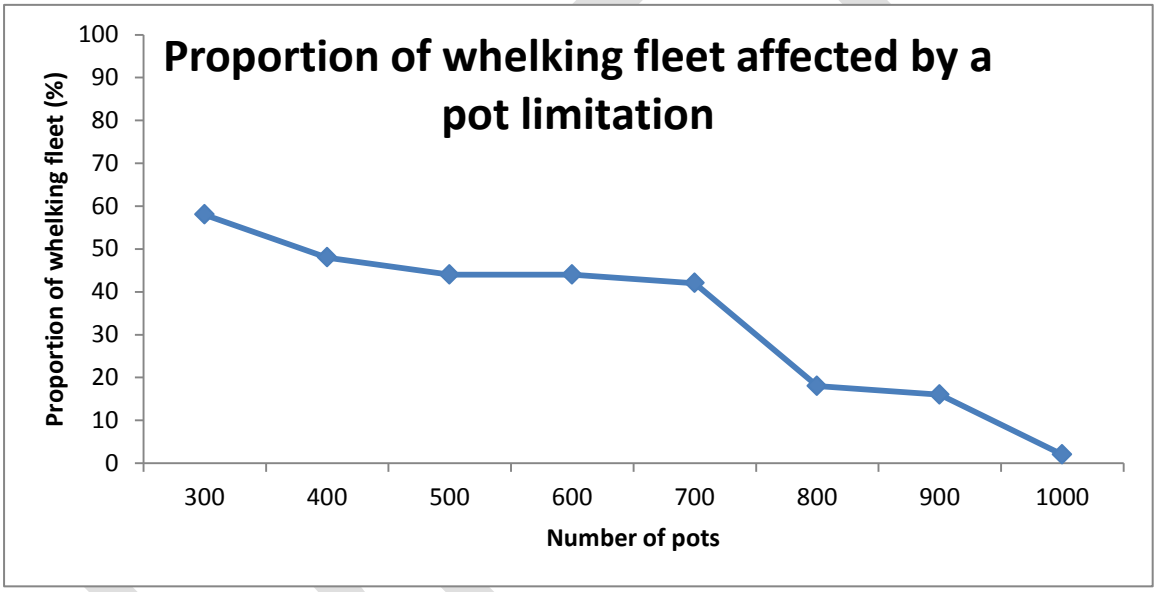

Fig 4. Proportion of the whelk fleet which will be affected by a pot limitation

Given that the mean number of pots currently used by a vessel is 515, an initial pot limitation of 500 would appear to be appropriate. In considering this figure it is relevant to note that there is no significant change in the proportion of vessels affected until the limit is increased to 800 pots – see Fig 4. This is more than double the limit set by Kent and Essex IFCA (300 pots) and significantly more than the mean number of pots used by the fleet at present. Whilst only 18% of vessels would be affected by a limitation of 800 pots it would not have the protective effect that is being sought.

The number of vessels that would be affected by a pot limitation of 500 is illustrated in Fig 4, which indicates that the proportion of the fleet which would be affected by this limitation is around 44%. Of the vessels likely to be affected it is estimated that 41% currently also set pots outside of the 6nm boundary. 12 vessels that currently use more than 500 pots do not presently set pots outside of the 6nm boundary. Fig 3. Indicates that the mean vessel length of vessels utilising 500-600 pots is 9 metres.

Analysis of whelk landings over the last four years (Tables 2, 3 and 4) indicates that a pot limit of 500 would not have affected overall landings if fishers prosecuted the fishery 8 times per month – this is known to be an accurate figure for many vessels. In addition, vessels prosecuting the whelk fishery 4 times per month would also not be affected (Table 2). 4 trips per month is thought to be an accurate estimation of levels of activity. Note that Table 2 indicates that by fishing 4 times per month, fishers prosecuting the whelk fishery inside the 6 nm would have been able to catch all of the whelk landed in 2014 with 375 pots each, even with the poorest catch-per-pot.

Table 2: Pots per vessel to achieve annual landings - **4 trips per month** (likely)

	Kg captured per pot						
Year	**1.75**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
2010	243	213	170	142	122	106	95
2011	187	164	131	109	94	82	73
2012	327	287	229	191	164	143	127
2013	455	398	319	265	228	199	177
2014	375	328	263	219	188	164	146

Table 3: Pots per vessel to achieve annual landings - **8 trips per month** (peak season)

	Kg captured per pot						
Year	**1.75**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
2010	148	129	103	86	74	65	57
2011	118	103	83	69	59	52	46
2012	255	223	179	149	128	112	99
2013	392	343	275	229	196	172	153
2014	267	234	187	156	134	117	104

Table 4: Pots per vessel to achieve annual landings - **2 trips per month** (unlikely)

	Kg captured per pot						
Year	**1.75**	**2**	**2.5**	**3**	**3.5**	**4**	**4.5**
2010	486	426	340	284	243	213	189
2011	374	328	262	218	187	164	146
2012	655	573	458	382	327	287	255
2013	910	796	637	531	455	398	354
2014	751	657	525	438	375	328	292

Tables 2, 3 and 4 indicating the theoretical number of pots required to land the annual landed whelk for a given year taking into account the number of vessels active for each year for the period 2010-2014 (10, 18, 23, 26 and 39 respectively) and the number of 'trips' undertaken per month. Data was adjusted to take into account the proportion of pots set inside and outside of 6nm where that data is known. Cells highlighted in red indicate where a pot limitation of 800 would impact on landings, cells in amber show the same for a 500 pot limitation. Based on estimates of pots inside 6nm from consultation with fishers.

Consultation with the industry has indicated that whelk capture at levels of 1.75 to 2 kg per pot is poor catch per unit effort but this does appear to represent reality. A consultation conducted by Kent and Essex IFCA indicated that landing 2.2kg per pot was average. Assuming that this was the case, Table 4 indicates that landings would have been reduced if there was a 500 pot limitation where vessels were prosecuting the whelk fishery only twice per month (Table 4). There would have been between 25 and 296 pots (per vessel) fewer than would have been required to land the amount as was landed in 2012 to 2014. This represents a potential loss of between £1125 and £10,656 per vessel per annum. The shortfall could be mitigated by relocating pots to outside of the 6nm boundary – 41% of vessels who fish with more than 500 pots already prosecute the whelk fishery beyond the 6nm boundary and would likely mitigate in this way. Assuming this is the case, this would reduce the average cost per vessel to between £461 and £4368 per annum. It is likely that the majority of vessels fishing with more than 500 pots have the capability of fishing for whelk outside

the 6nm boundary. Furthermore, it is unlikely that vessels will only fish for whelk on two occasions per month.

Business models for the whelk fisheries vary from vessel to vessel. Some larger vessels solely target whelk for a continuous 8 week period per year whilst others may only set pots once or twice in a month to offset poor catches in another fishery. With this in mind, setting a pot limit that will suit all business models is unlikely to be achievable. Illustrative business models have been developed and are shown in Tables 5, 6 and 7.

Table 5 - Earnings per person per week – Business model 1 (independent vessel)

	Kg whelk per pot							**Parameters**	
Pots	1.75	**2**	**2.5**	3	3.5	4	4.5	*Vessel expenses*	250
300	20.63	195.00	543.75	892.50	1241.25	1590.00	1938.75	*Bait (£ per pot)*	0.5
500	**534.38**	**825.00**	**1406.25**	**1987.50**	**2568.75**	**3150.00**	**3731.25**	*crew*	1
700	1048.13	1455.00	2268.75	3082.50	3896.25	4710.00	5523.75	*company share*	0
800	1305.00	1770.00	2700.00	3630.00	4560.00	5490.00	6420.00	*£ per kilo*	0.775
1000	1818.75	2400.00	3562.50	4725.00	5887.50	7050.00	8212.50	*Trips per week*	3

Table 6 - Earnings per person per week – Business model 2 (independent vessel)

	Kg whelk per pot							**Parameters**	
Pots	1.75	**2**	**2.5**	3	3.5	4	4.5	*Vessel expenses*	250
300	4.58	43.33	120.83	198.33	275.83	353.33	430.83	*Bait (£ per pot)*	0.5
500	**118.75**	**183.33**	**312.50**	**441.67**	**570.83**	**700.00**	**829.17**	*crew*	3
700	232.92	323.33	504.17	685.00	865.83	1046.67	1227.50	*company share*	0
800	290.00	393.33	600.00	806.67	1013.33	1220.00	1426.67	*£ per kilo*	0.775
1000	404.17	533.33	791.67	1050.00	1308.33	1566.67	1825.00	*Trips per week*	2

Table 7 - Earnings per person per week – Business model 3 (firm owned vessel)

	Kg whelk per pot							**Parameters**	
Pots	1.75	**2**	**2.5**	3	3.5	4	4.5	*Vessel expenses*	150
300	35.63	55.00	93.75	132.50	171.25	210.00	248.75	*Bait (£ per pot)*	0.5
500	**92.71**	**125.00**	**189.58**	**254.17**	**318.75**	**383.33**	**447.92**	*crew*	3
700	149.79	195.00	285.42	375.83	466.25	556.67	647.08	*company share*	0.5
800	178.33	230.00	333.33	436.67	540.00	643.33	746.67	*£ per kilo*	0.775
1000	235.42	300.00	429.17	558.33	687.50	816.67	945.83	*Trips per week*	2

Tables 5, 6 and 7. Weekly earnings of whelk fishing based on different business models. Parameters are based on information gained from consultation with various members of the fishing industry.

Vessels within Eastern IFCA's district with 200-300 pots have reported a viable income from whelk fishing – this is confirmed by analysis of MMO landings data which indicates a vessel with 300 pots landed £82,000 (first sale value) of whelk in 2014.

In contrast, larger vessels who may not be dedicated whelk fishers (i.e. fewer trips per week) and which require larger crews to operate will likely favour more pots. Tables 6 and 7 depict an estimate of weekly earnings based on information gained from liaison with fishermen. Whelk fishing may only constitute a proportion of their weekly income however, due to the extra costs incurred (extra fuel) and the larger crews, the earnings per person are reduced.

It is acknowledged that Eastern IFCA currently has no ecological or environmental justification to limit the number of pots to a specific number but the evidence set out does provide clear rationale to support the objective of managing effort and to stop the trend of increased effort in the light of catch per unit effort declining over the last year. The data collected through a permit condition would be used to determine the appropriate level of effort on the fishery.

5.1.2 Increase in minimum landing size

It is generally well accepted in the literature that the EU minimum landing size for whelk (45mm) is not sufficient to protect pre-spawning whelk. Fahy et al 1995, Fahy et al 2000 and Fahy et al 2005 found that the size at which a whelk is sexually mature varies across the UK and is generally greater than 45mm.

Cefas conducted a study investigating the size of maturity of whelk at ports across the UK and found that the size of maturity varied across the major whelking ports. The size of maturity was investigated at Wells as part of this study; this was found to be 62.5mm. There is no data available to estimate size of maturity at other ports within the district however, anecdotally it is thought that whelks of 62.5mm will likely be mature across the north Norfolk Coast and within The Wash. Fisheries on the East coast of Norfolk and Suffolk are thought to have smaller whelks for a given age.

The minimum landings size for Whelk in the Irish Sea was increased to 50mm in light of research which indicated that the minimum landings size was too small – this was however only a small increase relative to the recommended 65mm. The rationale was that an increase greater than 50mm would result in the collapse of the fishery as such a high proportion of the catch was less than 65mm. The fishery subsequently crashed in 2004 (fahy et al 2005).

There is a need to have a protective effect on pre-spawning whelks within the district however, with limited evidence regarding minimum landing size for the majority of the district (except the North Norfolk Coast) a cautious approach will be adopted which balances the economic impacts of reducing the MLS and the requirement to have a protective effect.

Table 5. Potential impact of an increase in minimum landing size. Estimates based on bio sampling conducted at a whelk processing factory. Nine samples of 100 whelks were measured for vessels fishing throughout the district. Proportion below (adjusted) takes into account the relative economic worth of larger whelks (i.e. greater mass) using length as a proxy (assuming an isometric relationship between length and volume). Economic losses are estimated on 2014 landings data.

Whelk length	Proportion below (by number)	Proportion below (adjusted)	Annual £ loss	Annual £ loss per vessel
45	2.8	1.75	23,097.73	592.25
50	7.8	5.49	72,686.90	1863.77
55	22.2	17.10	226,210.16	5,800.26
60	39.4	32.23	4264,50.99	10,934.64
62.5	50.1	42.30	559,680.04	14,350.77

Increasing the minimum landing size will have an economic impact on fishers. It can be seen from table 5 that almost three percent of landings are currently under the 45mm minimum landing size – strict compliance with this would result in a loss of £592 per vessel based on 2014 landings.

A minimum landing size of 55mm represents the best balance between economic impact and protective effect. Setting the minimum landing size at 62.5 would have the protective effect required but would result of losses in the region of 42%. A minimum landing size of 50mm would have very limited protective effect – 12.5mm under what is thought to be the size of maturity for at least part of the district – but would have a limited economic impact.

A minimum landing size of 55mm seems the most appropriate given the limited information available. This has the potential to reduce earning from whelk catches by 17% but is likely to have a protective effect in Suffolk and the east coast of Norfolk. The potential risk of the whelk fishery

collapsing (which would cost the fishers in the region of 100% of their catch) is considered too high not to impose a minimum landing size which will have a protective effect.

Whilst the potential cost of implementing the increase in minimum landing size is high, many (at least 41% of the fleet) vessels will be able to fish outside the 6nm boundary where the minimum landing size is 45mm. Furthermore, this is based on 2014 landings data – the value of landed catch of whelk in 2010 was an order of magnitude lower than in 2014, which has inflated the impact of imposing restrictions. In reality, the value of landings in 2014 is likely a result of the whelk stocks being over-exploited, particularly in the sense of pre-spawning individuals being removed from the fishery.

A study to determine the size of maturity will take place over the 12 month duration of the emergency byelaw. It is possible that the recommended minimum landing size will vary across the district and require a more complex regulating mechanism – beyond the scope of the current measures. It is also likely that the minimum landing size will have to increase form 55mm to have a greater protective effect.

It should also be noted that the above estimates of losses to fishers is an estimate based on very limited data. Whelks from only 6 different vessels were measured. Of these, one vessel would not have been impacted by an increase in minimum landing size and a further two vessels would have been effected less than the estimate given in table 5.

5.1.3 Minimum riddle size

Sorting gear (e.g. riddles or grids) are used to separate undersized whelk catch form commercial whelk catch. Informal consultation with the fishing industry has indicated that bar spacing of sorting gear varies from 20-25mm; a spacing of 20mm has been shown to be effective at selecting whelks of greater than the 45mm minimum landing size (Lawler et al 2012). Lawler et al 2012 found that the effectiveness of a riddle size depended on the location of the fishery with differences found in the width/length relationship between the four sample sites. The bar spacing at which whelk of a size of 55mm was retained varied between 23 and 24mm.

Whelks vary in width for a given length. For a given minimum landing size (length) the width of these whelk will vary and, as such, fit through riddles of different sizes. The intention of choosing a minimum bar spacing for riddles is to balance the amount of undersized whelk which will be discarded with as smaller loss of commercial sized whelk as possible.

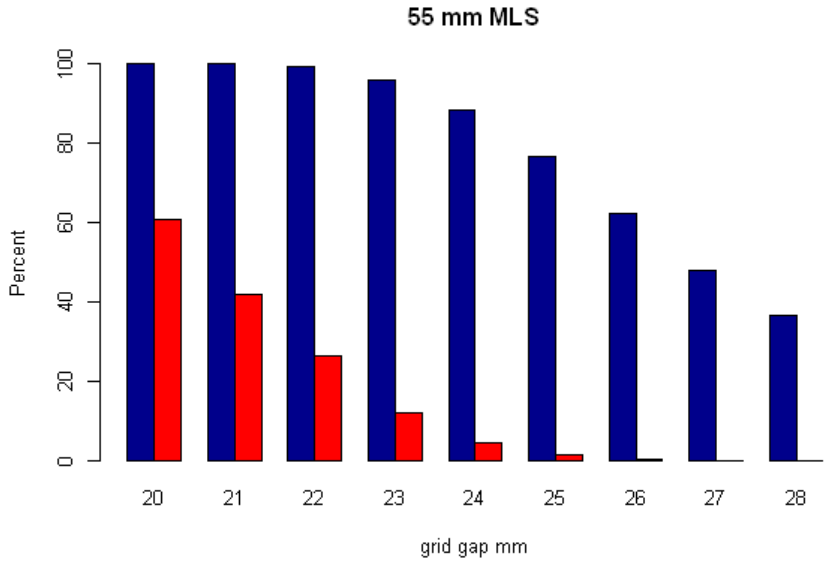

Figure 5 – extracted from Lawler et al 2012. Catch retention by riddle grid gap of both commercial (blue) and undersized (red) whelks for different assumed minimum landing sizes.

The most effective size of riddle for discarding whelks of the length 55mm would be 27 or 28mm – no whelks of 55mm will be retained (figure 5). However, this will also result in a loss of commercial whelk in the region of 50-60%.

A riddle size of 24mm would reduce the proportion of under 55mm whelk retained to under 10% and would result in the loss of commercial sized whelk in the region of 10%.

A riddle of 25mm would result of a reduction in the retention of undersized whelk to only a few percent but would reduce the retention of commercial sized whelk to around 80%.

A small study was conducted with whelk caught from within Eastern IFCA's district to ascertain if the Cefas study was comparable. As riddles select for whelks based on their width (rather than length), differences in the width-length relationship may result in differences in whelk retention. The study indicated that, for a riddle with bar spacing of 24mm, the proportion of commercial catch lost was comparable to that of the Cefas study (8.48% by weight).

A minimum riddle size of 24mm represents the best balance between a limited economic impact on the fishers whilst still having a protective effect. A study will be conducted over the next 12 months which will provide more evidence towards the most effective riddle size.

5.1.4 Escape holes

Some fishermen are thought to use escape holes in some whelk fisheries (e.g. Kent and Essex) however, informal consultation with the whelk fishers in Eastern IFCA's district indicated that none do so. Escape holes are used in other fisheries as a means of increasing gear selectivity (e.g. in crab pots) often to the benefit of the fishers as this reduces the time required to process catch (i.e. sort and discard undersize individuals).

By including a requirement for gear to have escape holes, fewer pre-spawning individuals will be captured by whelk pots. Lawler et al 2012 indicates that this is an effective method for reducing the capture on undersized individuals however; the experiment was focussed on determining the effectiveness of escape holes in relation to the current minimum landing size of 45mm.

Whelk pots are often 'homemade' costing relatively little however, one owner of several whelking vessels estimated a price of £30-35 per pot (specially made pots) and IFCOs have reported some pots costing in the region of £85. This is of importance when considering escape holes as, if an initial escape hole size is found to be too large, it may require the replacement of the pot.

Lawler et al 2012 found that the modal length of whelk caught in pots increased with increasing escape hole size. The total catch of each pot decreased with increasing escape hole size but the proportion of undersize (less than 45mm whelk) reduced at a greater rate – decline in the commercial catch of pots was most evident with escape holes of 28mm.

The size of the escape hole through which a whelk of a given size will fit is likely to be greater than the same for riddle spacing. This is due to riddle bars selecting for whelks in a different manner i.e. at its 'minimum width'. An escape hole will restrict a whelk at its widest diameter. As such, a whelk pot escape hole should in theory be greater than the associated minimum bar spacing.

That said, give the relatively limited data available on the effectiveness of escape holes for a minimum landing size of 55mm and the potential cost to fishers for having to replace pots should the size be reduced, it is considered proportionate that a minimum escape hole size would be 24mm (diameter).

A study will be conducted over the next 12 months to determine the effectiveness of this measure.

Potential cost of measures

a) Cost to fishers

I. Cost of permit

The cost of a permit will depend on which permit is granted and the number of pots used in association with that permit.

Category One Permit - The associated charge is £1 per pot for up to 500 pots (maximum charge of £500).

This charge is primarily based on the charge for the Kent and Essex IFCA permit (£300 for 300 pots). Eastern IFCA proposes a £1 per pot system to reflect that many fishers are currently using less than 500 pots. This will provide an incentive for fishers who do not wish to increase the level of effort.

Charges will contribute to the cost to Eastern IFCA of processing applications, data input from returns forms and enforcement costs.

Category Two Permit (by-catch) – The associated charge is £100.

Category Three Permit (recreational) – The associated charge is £5 per pot for up to 5 pots (maximum of £25).

The charge per pot is greater than for a Category One Permit primarily to take into account that the total cost of the permit will be an order of magnitude lower (up to £25) but that costs to the IFCA will not. Kent and Essex IFCA charge £30 for a recreational permit (for up to 10 pots).

The appropriateness of all charges will be reviewed over the next 12 months.

II. Cost of measures

The proposed measures will potentially reduce the income of whelk fishers. From the limited studies carried out within Eastern IFCA's district it has been estimated that a combination of the riddle size and increase in minimum landing size could reduce earnings by around 25.6% annually.

There will also be a cost associated with purchasing gear marking equipment (such as floats, staves and reflective tape) and an indirect cost of having to put escape holes into whelk pots (time lost which would have been used to fish).

The potential cost of not implementing these measures is the total income of whelk fishers following the collapse of the whelk fishery.

b) **Cost to Eastern IFCA**

I. **Admin –** There will be a cost to processing whelk applications including reviewing details (e.g. valid fishing licence etc.) and entering permit holder and nominated representative details into a database. There will also be a requirement to input returns forms data.

II. **Enforcement –** Increased enforcement at sea (vessel running costs), increased presence at ports (particularly for first three months whilst IFCOs assist fishers with making compliance related changes).

III. **General costs –** Printing costs (letters, returns forms) the cost of the whelk pot tags (9p per tag plus postage and packaging).

Conclusion

Evidence indicates that the whelk fisheries within Eastern IFCA's district are at high risk from over-exploitation. Option 1 (emergency byelaw) is appropriate given the level of risk.