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Predicted impacts of proposed management measures in the Isle of Man queen scallop (*Aequipecten opercularis*) fishery:

2014 Fishing Season

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Summary

This report examines the likely impacts on the scallop fishing fleet of management measures proposed for the 2014 queen scallop fishing season. The imposition of a maximum vessel length of 15 m LOA in the fishery would potentially exclude 74 eligible vessels from fishing for queen scallops in the Isle of Man's territorial waters. However, only 69 of these vessels are predicted to fish for queen scallops, based on historical fishing activity. At present there are no multi-rig trawlers fishing for queen scallops within the 12 nm limit and as such no such vessels would be impacted as a result of a ban on this type of fishing. Due to the limited availability of data and research the impacts of a proposed limit on queen scallop net spread to a maximum of 12 fathoms (c. 24 m) is unclear.

A large latent fishing capacity exists at present and this leaves the fishery vulnerable to over-fishing or rapid depletion. The proposed management measures aim to help reduce the latent fishing capacity of the fleet and ensure that queen scallop densities are not depleted rapidly at the beginning of the fishing season, thereby extending the season for the economic benefit of both fishing vessels and the associated scallop processors.

1. Introduction

The Isle of Man's queen scallop (*Aequipecten opercularis*) fishery has been prosecuted in and around the Isle of Man's territorial sea since the 1950s, becoming of increasing importance during the late 1960s. The majority of Manx vessels now fish for queen scallops with otter trawls, while UK vessels usually use dredges fitted without toothed bars (Murray, 2013). In 2011 the Isle of Man queen scallop trawl fishery gained Marine Stewardship Council (MSC) accreditation. The fishery within the territorial sea (0 to 12 nm) is governed by several management measures (Table 1) that include areas where dredging is prohibited, a closed season, a weekend ban and a minimum landing size, as set out in the following byelaws:

- Sea-Fisheries Act 1971. Isle of Man Sea-Fisheries (queen scallop fishing) bye-laws 2010. Statutory document No. 668/10;
- Sea-Fisheries Act 1971. Isle of Man Sea-Fisheries (queen scallop fishing) bye-laws 2013. Statutory document No. 0160/2013;
- Sea-Fisheries Act 1971. Isle of Man Sea-Fisheries (queen scallop fishing) (amendment) bye-laws 2013. Statutory document No. 0193/2013;
- Sea-Fisheries Act 1971. Isle of Man Sea-Fisheries (queen scallop fishing) (emergency measures) bye-laws 2013. Statutory document No. 0268/2013.

Following advice from Bangor University, based on a comprehensive stock assessment survey of the fishery undertaken in 2013, the Queen Scallop Management Board (QMB) recommended a Total Allowable Catch of 4,000 t for the trawl fishery which opened on 17th June 2013. Despite the introduction of emergency byelaws that were introduced to try and slow the fishery (e.g. ban on fishing on a Friday and a restriction on the amount of queen scallops caught per day) the trawl fishery was closed early (October 10th 2013) when an uptake of 4,000 t was achieved. The QMB agreed that although the new regulatory measures introduced for the 2013 fishing season worked well, in order to avoid an early closure of the fishery again during the 2014 fishing season, a review and revision of the regulatory measures is required. As such additional measures are proposed for the 2014 fishing season (Table 1). This report examines the likely impacts on the scallop fishing fleet of management measures proposed for the 2014 queen scallop fishing season.

Table 1: Current (2013 fishing season) and additional proposed (2014 fishing season) management measures within the Isle of Man's *Aequipecten opercularis* fishery.

Current (2013)	Additional Proposed (2014)
Qualifying vessels (over 221Kw track record required)	< 15 m vessel length overall (LOA)
Curfew: 18:00 to 06:00 Monday to Friday	Multi-rig trawlers prohibited
Curfew: 00:01 Saturday to 00:00 Sunday	Maximum net footrope length of 12 fathoms
Minimum landing size 55mm	
Total allowable catch: set on an annual basis	
VMS required	
Minimum mesh size 85 mm	
Closed season: 1st April to 31st May	

2. Additional proposed management measures (2014 fishing season)

2.1 Vessel Length

"It is proposed that a vessel length of 15 metres LOA is used as the qualifying condition for entry as this standard is already recognised under other management regimes (e.g. Western Waters)."

Fleet capacity

The option to restrict entry to the fishery by vessel length (15 m LOA) could affect a total of 71 vessels with engines of less than 221 kW which currently hold an Isle of Man license and are eligible to fish for queen scallops within the 12nm mile limit. However, only 66 of these vessels are considered likely (following advice from Department of Environment, Forestry and Agriculture (DEFA) to fish for queen scallops within the 12 nm limit. In addition 3 vessels over 221 kW that are currently eligible to fish due to their track record in the fishery would also be excluded (Table 2).

Table 2: Number of vessels that are potentially eligible for access to the Isle of Man queen scallop fishery categorised by vessel length and engine size. Vessels considered unlikely to ever enter the fishery were identified by DEFA (e.g. potters and *Nephrops* boats removed) and a secondary list(*) compiled of those that might potentially fish

Vessel length	≤221kW		>221kW		Total	
≤ 15m overall	**118**	(61)*	**0**	(0)*	**118**	(61)*
> 15m overall	**71**	(66)*	**3**	(3)*	**74**	(69)*
Total	**189**	(127)*	**3**	(3)*	**192**	(130)*

Fishing Power

Vessel Capacity Units (VCUs) provide a measure of the fishing power of a vessel and are calculated as:

(Length overall (LOA) x Beam) + (Engine Power (kW) x 0.45)

Using VCUs it is possible to quantify the potential decrease in fishing power that restricting entry to the fishery for vessels in excess of 15 m LOA would have. Despite representing only 39 % of the eligible fleet, vessels in excess of 15 m LOA account for 53 % of the total VCUs (Figure 1). Additionally, larger vessels exhibit greater catch efficiency and higher catch per unit effort (CPUE); although this is more relevant for the trawl portion of the fishery (Figure 2). Therefore, the introduction of restricted entry to the fishery for vessels over 15 m LOA would provide a reduction in

potential fishing power disproportionate to the number of vessels affected. If only the 130 vessels that are likely to prosecute the fishery are considered, over 15 m LOA vessels make up 53 % of vessels and 63 % of fishing capacity (Figure 1).

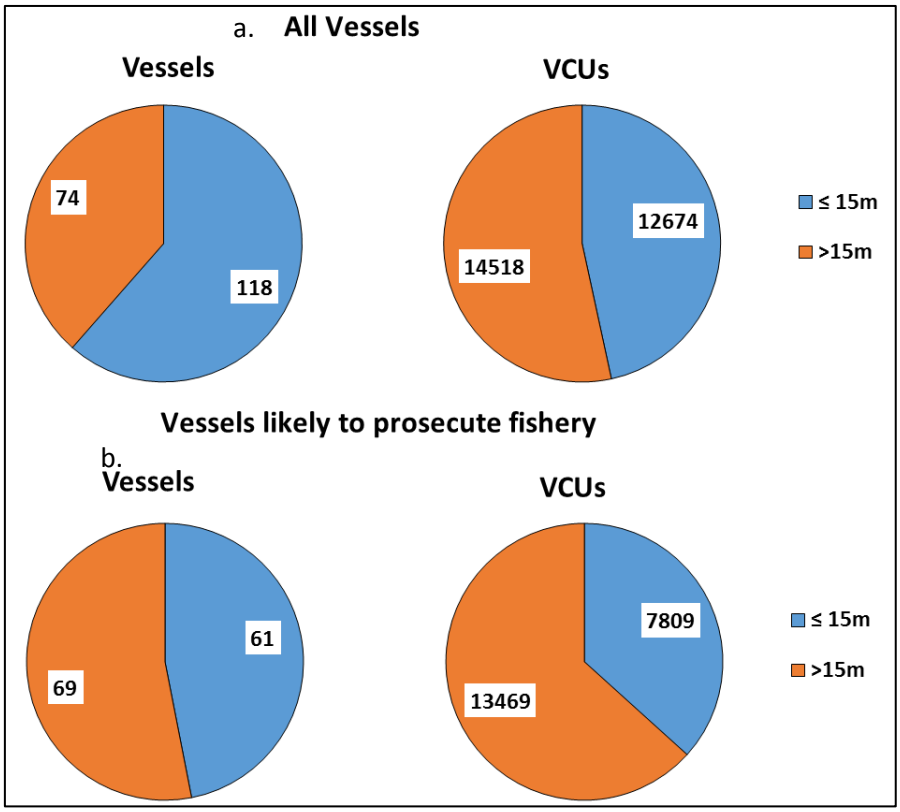

Figure 1: The number and fishing power of vessels, above and below 15 m LOA, which are (a) currently entitled to fish and (b) considered potentially likely to fish for queen scallops within the territorial sea. Fishing power has been represented by Vessel Capacity Units (VCUs).

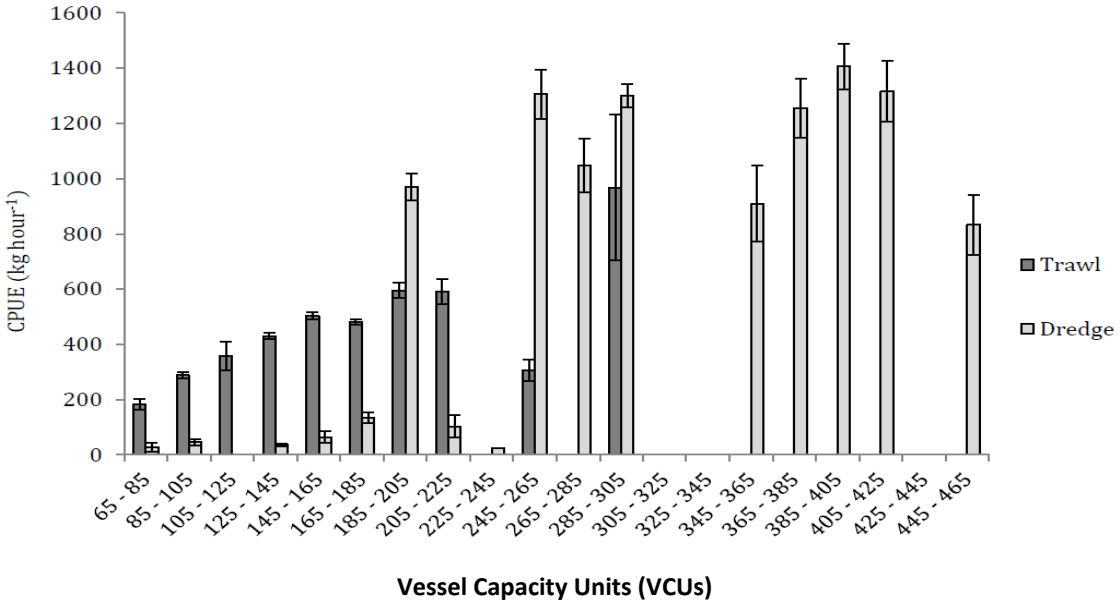

Figure 2: Average CPUE for vessels within VCU classes for both trawlers and dredgers averaged over 2011 and 2012. Error bars show ± 1SD (Figure taken from Dignan (2013)).

Landings within the territorial sea

Vessel Monitoring System (VMS) and logbook data from the years 2011 and 2012 were analysed with a view to quantifying landings from vessels targeting queen scallops within the territorial sea. Landings were attributed to the territorial sea if the majority of fishing activity, based on the time a vessel spent at a speed of between 1 and 3.5 knots inclusive, for a voyage that took place with the 12 nm limit. Landings from both inside and outside the territorial sea were then calculated separately, by gear type, for each year and are presented in Table 3.

Table 3: Landings (t) of queen scallops from ICES statistical rectangles 38E5, 37E5 and 36E5 in 2011 and 2012, separated into landings from inside and outside the territorial sea. (Trawl = Otter Trawl, Dredge = Scallop Dredge (either mechanical or hydraulic) and Nephrops = Nephrops Trawl).

	Trawl		Dredge		Nephrops		Total	
	2011	2012	2011	2012	2011	2012	2011	2012
Inside 12nm	3493	2914	4469	1290	61	24	**8022**	**4227**
Outside 12nm	36	110	4563	3245	40	3	**4639**	**3358**
ALL	**3529**	**3024**	**9032**	**4535**	**101**	**27**	**12660**	**7584**

Landings within the territorial sea were analysed in terms of the numbers of vessels above and below 15 m LOA. Initially the numbers of vessels involved in fishing activity within the territorial sea were quantified. In 2011 a total of 42 vessels fished for queen scallops within the 12 nm limit (13 below 15 m LOA and 29 above 15 m LOA), while for 2012 the equivalent value was 51 vessels (19 below 15 m LOA and 32 above 15 m LOA) (Table 4).

Table 4: The number of vessels fishing for queen scallops within the territorial sea in 2011 and 2012.

		No. of Vessels	
		2011	2012
Inside 12nm	**<15m**	13	19
	>15m	29	32
	Total	42	51

In 2011 the 29 vessels over 15m LOA were responsible for 84 % (6777 tonnes) of landings, while in 2012 the 32 vessels over 15m LOA landed 69 % (2914 tonnes) of the catch (Table 5).

Table 5: Landings (tonnes) by vessels fishing within the territorial sea in 2011 and 2012, separated by gear type (Trawl = Otter Trawl, Dredge = Scallop Dredge (either mechanical or hydraulic) and Nephrops =Nephrops Trawl) and vessel length over all (LOA) (>/< 15 m LOA).

Landings Tonnes	Trawl		Dredge		Nephrops		Total	
	2011	2012	2011	2012	2011	2012	2011	2012
≤ 15m LOA	1224	1286	22	17	0	10	1245	1313
> 15m LOA	2269	1628	4447	1272	61	14	6777	2914
Total	3493	2914	4469	1290	61	24	8022	4227

Table 6: The number of days spent fishing by vessels within the territorial sea in 2011 and 2012, separated by gear type (Trawl = Otter Trawl and Dredge = Scallop Dredge (either mechanical or hydraulic)) and vessel length over all (LOA) (>/< 15 m LOA). (Fishing time = time spent (from VMS) at between 1 and 3.5 knots inclusive).

Days Fished	Trawl		Dredge		Total	
	2011	2012	2011	2012	2011	2012
≤ 15m LOA	124	166	35	34	159	201
> 15m LOA	205	183	338	303	543	486
Total	329	350	373	337	702	687

Table 7: CPUE (calculated from VMS and logbook data) for voyages within the territorial sea in 2011 and 2012, separated by gear type (Trawl = Otter Trawl and Dredge = Scallop Dredge (either mechanical or hydraulic)) and vessel length over all (LOA) (>/< 15 m LOA).

CPUE kg/hr	Trawl		Dredge		Both	
	2011	2012	2011	2012	2011	2012
≤ 15m LOA	490	362	32	45	261	203
> 15m LOA	519	486	1548	1114	1033	800
Both	504	424	790	579	1294	1003

Considering time spent fishing, vessels over 15 m LOA spent the equivalent of 205 days trawling in 2011 and 183 in 2012 while the equivalent values for dredgers were 338 and 303 days respectively

(Table 6). Finally, there was a marked difference in CPUE between larger and smaller vessels, with trawl vessels over 15 m LOA catching an extra 29 kg/hr per what and 124 kg/hr per what when compared with vessels of less than 15 m LOA in 2011 and 2012 respectively (Table 7). Due to the small number of dredgers under 15 m LOA the equivalent values for dredgers were not considered comparable due to a lack of statistical power.

Latent capacity within the fleet

Table 2 shows that a total of 192 vessels are eligible to fish for queen scallops within the territorial sea. Considering that the actual number of vessels that took part in the fishery in 2011, 2012 and 2013 were 42, 53 and 51 respectively, this represents an enormous latent fishing capacity within the fleet. There is the possibility that vessels currently involved in other fisheries, for example *Nephrops*, could diversify into the queen scallop fishery if their current target stock became depleted or the value of either their current target stock or queen scallops stock changed significantly.

An increase of vessels entering the fishery could have many potential ecological, environmental and socio-economic impacts. An influx of vessels, leading to increased effort, would mean that given the delay in receiving catch returns there would be an increased likelihood of exceeding the TAC. Vessels which exclusively target scallops would lose income in the face of increased competition, adversely affecting the livelihood of these fishers. A dilution of the knowledge base as a result of inexperienced fishers, in terms of specific knowledge of the fishery, could lead to fishers fishing sub-optimally and increased ecological and environmental impacts resulting from an increased environmental impact associated with an increased fishing footprint. Secondary industries could also be impacted as variable catches could affect processors, who rely on year round supply of product, ultimately impinging upon their ability to sustain full time employees.

2.2 Multi rig trawls

"It is proposed that fishing with multi rig trawls should be prohibited"

The major advantages of twin rig trawls (i.e. one vessel towing two nets simultaneously) over more traditional single rigs (i.e. one vessel towing one net) are twofold with both being related to a reduction in drag for equivalent net opening (Figure 3A). Firstly, twin rig trawls allow vessels to tow nets which increase the overall size of their net opening without also increasing vertical opening and towing resistance, thereby increasing the effective swept area and catching power while incurring similar economic costs. Alternatively, the reduction in drag compared with an equivalent single rig may allow a vessel to maintain its catching power while decreasing fuel costs. Curtis and Myers (2006) found that vessel owners generally opted for the increased net opening with similar drag option, over the similar opening with reduced drag, and hence reduced fuel costs (Figure 3A). However, in light of further increases in fuel prices since 2006, the situation on the ground at present may have changed with vessel owners potentially being more willing to consider the latter option. As efforts are currently focussed on sustainability the latter option would be more desirable in this instance.

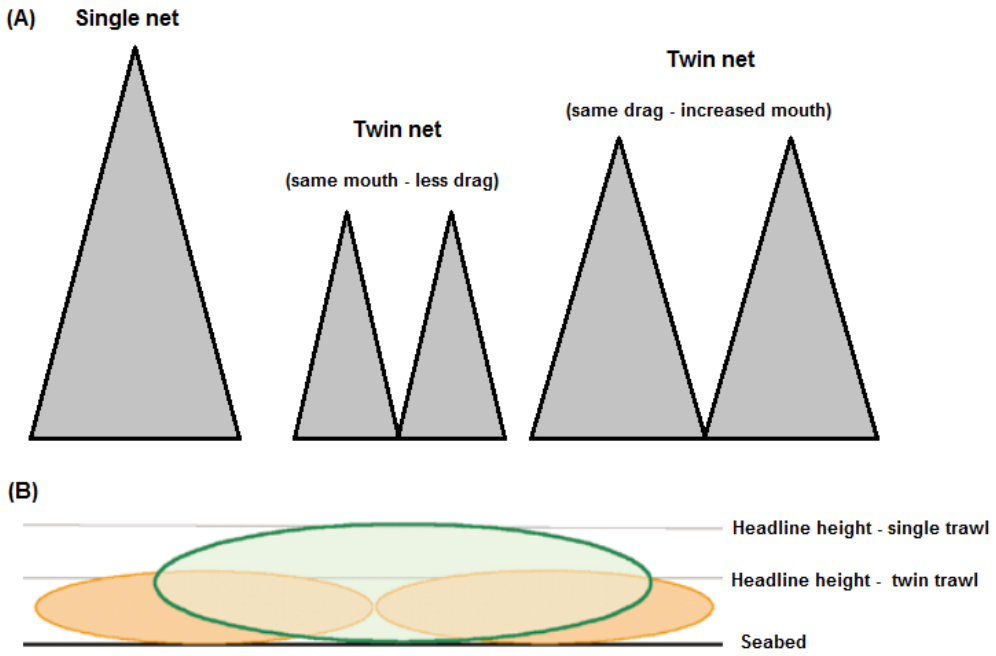

Figure 3: (A) Theory of twin rig gear – ratio of catching capacity to drag. (B) Shape of net opening of a single rig trawl and twin-rig trawls with equal net opening area. (Figures adapted from Curtis and Myers (2006)).

Beyond purely reducing drag, twin trawls impart further advantages which would appear, in theory, to be ideally suited to targeting demersal species such as queen scallops. Twin rig trawls present a wider lower net opening, with greater bottom contact, when compared with single trawls of equivalent catching power (Figure 3B). These characteristics result in increased catch efficiency of

the target species and, as a result of the reduced headline height, a reduction in bycatch of finfish. In terms of current vessels conversion from fishing single trawl rigs to twin trawls using a 2 warp twin rig system (Figure 3C) is relatively straightforward. Further benefits may be realised by converting to a more flexible 3 warp system (Figure 3B), however, this requires the installation of a 3 barrel winch system which in some instances may be prohibitively expensive.

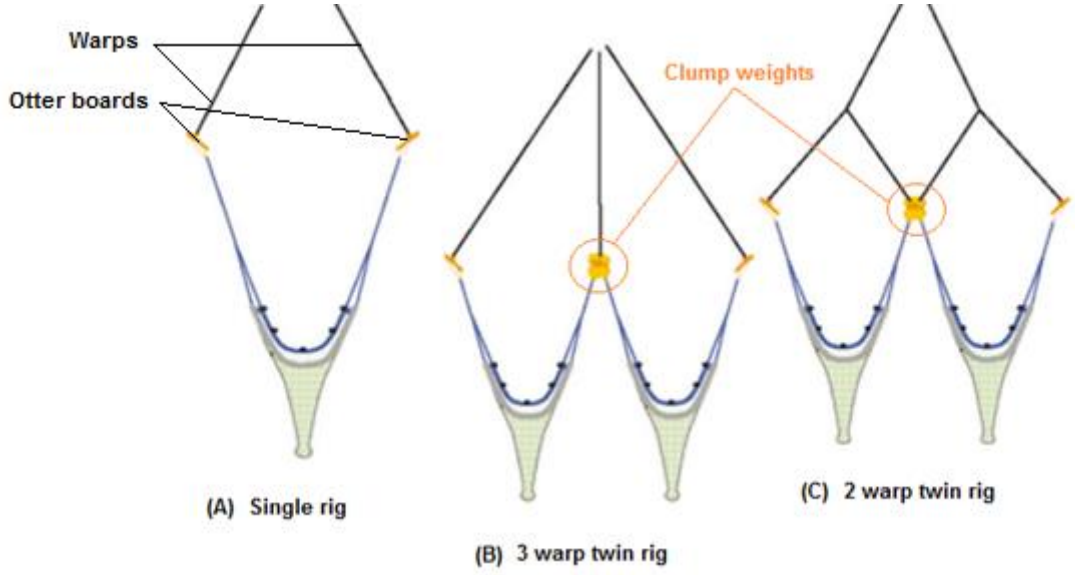

Figure 4: Schematic of single rig trawl and 2 potential set-ups of twin rig trawls. (Note third warp on B necessitating 3 barrel winch and central clump weights)(Figures adapted from Curtis and Myers (2006)).

In terms of the ecological impact of twin rigs versus single rigs little is known at present. The heavy "clump weights" present in the centre of twin rigs and the greater area in contact with the seabed could result in increased impacts per pass. However, the greater gear efficiency might mean a reduction in the overall number of passes necessary to catch a similar volume and thus balance the potentially increased impacts resulting from a single pass.

Allowing vessels to fish twin rigs of greater catching power than current single rigs should not, assuming the current system of TACs remains in place, adversely affect the long-term sustainability of the fishery and could impart environmental and economic benefits. However, the TAC could be attained more quickly and this could in turn shorten the fishing season, resulting in unfavourable conditions for processors, adverse impacts in terms of employment and potentially lower prices at the quayside. At present there are no twin rig vessels fishing for queen scallops within Isle of Man's territorial sea and so the introduction of this regulation would have no impact on vessels that actively fish within this area.

2.3 Queen scallop nets

"A change to the current definition to state the net should be no bigger than 12 fathom measured from wing end to wing end on the foot rope of the net."

By convention trawling for queen scallops within the Isle of Man's territorial sea is fairly standardised, however, minor differences in the configuration of the fishing gear and its operation do occur among different vessels (Duncan, 2009). With single trawl techniques, commonly used to target demersal species, trawl net width (wing end spread) is an important parameter affecting catchability. Measurements of trawl net width are not routinely reported by vessels within the electronic logbook system so it is difficult to assess what proportion of vessels, currently active within the Isle of Man queen scallop fishery, are using nets > 12 fathoms and would thus be affected by the introduction of such a regulation. A survey undertaken by Duncan (2009) to investigate the levels of bycatch in the Isle of Man queen scallop trawl fishery recorded the gear variables for 12 of the 15 vessels that were actively fishing queen scallops in 2009 within the 12 nm limit (additional boats were fishing in Manx waters but were landing into UK ports). The results show that trawl nets employed during the 2009 survey ranged from 6 to 12 fathoms in foot-rope length (10.97 – 21.94 m), the mode (most frequent) being a 10 fathom net (18.3 m) (Duncan, 2009). Based on these data from 2009 none of the 12 vessels within the survey would have been impacted by the introduction of this regulation. However, at present, insufficient data and research exists to make a full assessment of the potential impacts (Environmental, ecological and socio-economic) of this proposed regulation on the current and future fishery for queen scallops within the Isle of Man's Territorial Sea.

3. References:

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