

Title: Southern IFCA Minimum Conservation Reference Size Byelaw Impact Assessment IA No: Southern IFCA 017 RPC Reference No: N/A Lead department or agency: Southern Inshore Fisheries and Conservation Authority (IFCA) Other departments or agencies: Department for the Environment, Fisheries and Rural Affairs (Defra), Marine Management Organisation (MMO)	Impact Assessment (IA)			
	Date: 11/06/2020			
	Stage: Development/Options			
	Source of intervention: Domestic			
	Type of measure: Secondary legislation			
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1 Summary: Intervention and Options	RPC Opinion: RPC Opinion Status
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Cost of Preferred (or more likely) Option (in 2017 prices)			
Total Net Present Social Value	Business Net Present Value	Net cost to business per year	Business Impact Target Status
£-150,866.50	£-9,736.70	£1,131.20	Qualifying provision

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

The application of Minimum Conservation Reference Sizes (MCRS) is an effective tool for the sustainable management of fisheries and enables the sustainable development of fisheries within the district.

Regulation (EU) 2019/1241 establishes that MCRS apply only in relation to commercial fishing and removes the existing prohibition on the transshipping, landing, transporting, storing, selling and displaying or offering for sale undersize marine organisms. For those species not listed in relevant Southern IFCA minimum size byelaws, there is no effective enforcement regime in respect of undersized fish and shellfish for recreational fishers and no enforcement in respect of trans-shipment, landing, transporting, storing, displaying and offering for sale of undersized fish and shellfish. The proposed byelaw will amalgamate MCRS measures which currently exist under a range of legislation and apply these to all fishery participants in the Southern IFCA district.

In addition, the byelaw will introduce increases to the MCRS for grey mullet species and crawfish to support the sustainable management of these fisheries, and a new statutory MCRS will be applied to wrasse species, adopting measures previously applied through fishery guidance in the district.

What are the policy objectives and the intended effects?

Through the protection of juvenile marine species, to:

- i) enhance the sustainability of fisheries of the Southern IFCA district;
- ii) make a contribution to the achievement of sustainable development; and
- iii) balance the different needs of persons engaged in the exploitation of sea fisheries resources in the district.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

0. Do nothing.
1. Create a single Southern IFCA Minimum Conservation Reference Size Byelaw.
2. Voluntary measures.

All options are compared to Option 0, the preferred option is Option 1.

Will the policy be reviewed? It will be reviewed. If applicable, set review date: 03/2023					
Does implementation go beyond minimum EU requirements?			N/A		
Is this measure likely to impact on trade and investment?			N/A		
Are any of these organisations in scope?		Micro Yes	Small Yes	Medium Yes	Large Yes
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded:		Non-traded:

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 Chair: Date:

2 Summary: Analysis & Evidence

Policy Option 1

Description:

FULL ECONOMIC ASSESSMENT

Price Base Year 2017	PV Base Year 2017	Time Period Years 10	Net Benefit (Present Value (PV)) (£)		
			Low: Optional	High: Optional	Best Estimate: -171,127.90

COSTS (£)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional	Optional	Optional
High	Optional	Optional	Optional
Best Estimate	11,044.38	20,288.50	171,127.90

Description and scale of key monetised costs by 'main affected groups'

The total first-year monetised costs for the UK fishing industry associated with the introduction of the proposed measures are estimated to be £11,785.09. These costs are likely to arise as a consequence of loss of catch as a consequence of the increased minimum conservation reference size for grey mullet species, equating to approximately 12% of all catches. It is not anticipated that Southern IFCA will incur any additional costs associated with ensuring compliance with the new measures. It is estimated that the cost of introducing the recommended byelaw including the costs associated with legal review and advertising the new byelaw will be approximately £11,044.38.

Other key non-monetised costs by 'main affected groups'

As a consequence of loss of catch there is the potential for fishers and related businesses to experience a loss in income as a result of the recommended byelaw. There is also the potential for the displacement of fishing effort to other areas, potentially creating additional conflict with other users and reducing the sustainability of fisheries and the marine environment.

BENEFITS (£)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional	Optional	Optional
High	Optional	Optional	Optional
Best Estimate	0	0	0

Description and scale of key monetised benefits by 'main affected groups'

It is not possible to estimate monetised benefits at this point.

Other key non-monetised benefits by 'main affected groups'

It is anticipated that the proposed measures will benefit the sustainability of fish and shellfish populations through a reduction in fishing mortality of juvenile species. A reduction in juvenile fish and shellfish mortality will increase the potential for these populations to reproduce, which will benefit adjacent fisheries, both commercial and recreational. The amalgamation of MCRS measures for all fish and shellfish species in the Southern IFCA district under a single byelaw has the potential to improve the understanding of these measures and as a consequence, compliance with the measures. The proposed byelaw will apply to all persons at all stages of the supply chain, from take to sale, removing any uncertainty associated with how different MCRS restrictions may apply to different fishery users.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5
Information has been gathered from stakeholders through stakeholder consultation meetings and liaison. A key assumption of intervention is that there will be compliance with the measures and that the measures will achieve the policy objective. Costs to fishers have been calculated using MMO landings data.		

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £:			Score for Business Impact Target (qualifying provisions only) £: 5,655.8
Costs: 1,283.10	Benefits: 0.0	Net: 1,283.10	

Evidence Base

1 Introduction

- 1.1 This Impact Assessment (IA) is for the Southern Inshore Fisheries and Conservation Authority (IFCA) Minimum Conservation Reference Size Byelaw. This byelaw will affect all persons who fish for sea fisheries resources in the Southern IFCA district. There is the potential for those fishers who catch grey mullet species (*Chelon spp.*) and crawfish (*Palinurus spp.*) in the Southern IFCA district to incur a monetised cost as a result of the proposed measures. The IA indicates why the option being recommended is the preferred option for management.
- 1.2 Southern IFCA has consulted the community on the development of these measures prior to the making of the byelaw through informal consultation¹.

2 Rationale for intervention

- 2.1 The nationally agreed vision of the IFCAs is that they will:

“...lead, champion and manage a sustainable marine environment and inshore fisheries within their Districts by successfully securing the right balance between social, environmental and economic benefits to ensure healthy seas, sustainable fisheries and a viable industry...”

- 2.2 Southern IFCA has a duty to manage the exploitation of sea fisheries resources in the district to ensure that it is carried out in a sustainable manner, whilst balancing the different needs of persons engaged in the exploitation of sea fisheries resources in the district.
- 2.3 Fishing can potentially cause negative outcomes as a result of ‘market failures’. These failures can be described as:
 - Public goods and services – A number of goods and services provided by the marine environment such as biological diversity are ‘public goods’ (no-one can be excluded from benefiting from them, but use of the goods does not diminish the goods being available to others). The characteristics of public goods, being available to all but belonging to no-one, mean that individuals do not necessarily have an incentive to voluntarily ensure the continued existence of these goods which can lead to under-protection/provision.
 - Negative externalities – Negative externalities occur when the cost of damage to the marine environment is not fully borne by the users causing the damage. In many cases no monetary value is attached to the goods and services provided by the marine environment and this can lead to more damage occurring than would occur if the users had to pay the price of damage. Even for those marine harvestable goods that are traded (such as wild fish), market prices often do not reflect the full economic cost of the exploitation or of any damage caused to the environment by that exploitation.
 - Common goods - A number of goods and services provided by the marine environment such as populations of wild fish are ‘common goods’ (no-one can be excluded from benefiting from those goods however consumption of the goods does diminish that available to others). The characteristics of common goods (being available but belonging to no-one, and of a diminishing quantity), mean that individuals do not necessarily have an individual economic incentive to ensure the long term existence of these goods which can lead, in fisheries terms, to potential overfishing. Furthermore, it is in the interest of each individual to catch as much as possible as

¹ Summary of responses: <https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/SIFCA-Netting-Review-Summary-Responses.pdf>

quickly as possible so that competitors do not take all the benefits. This can lead to an inefficient amount of effort and unsustainable exploitation.

2.4 This byelaw aims to redress these sources of market failure in the marine environment through the following ways:

- Management measures will support continued existence of public goods in the marine environment, for example conserving the range of biodiversity in the Southern IFC District.
- Management measures will also support continued existence of common goods in the marine environment, for example ensuring the long term sustainability of fish stocks in the IFC District.

3 Policy objectives and intended effects

3.1 The policy objectives of this byelaw are, through the protection of juvenile marine species, to:

- i) enhance the sustainability of fisheries of the Southern IFCA district;
- ii) make a contribution to the achievement of sustainable development; and
- iii) balance the different needs of persons engaged in the exploitation of sea fisheries resources in the district.

3.2 Section 153 of the Marine and Coastal Access Act (MaCAA), 2009² requires that for the management of inshore fisheries:-

- (1) The authority for an IFC district must manage the exploitation of sea fisheries resources in that district.
- (2) In performing its duty under subsection (1), the authority for an IFC district must:
 - (a) Seek to ensure that the exploitation of sea fisheries resources is carried out in a sustainable way,
 - (b) Seek to balance the social and economic benefits of exploiting the sea fisheries resources of the district with the need to protect the marine environment³ from, or promote its recovery from, the effects of such exploitation,
 - (c) Take any other steps which in the authority's opinion are necessary or expedient for the purpose of making a contribution to the achievement of sustainable development, and
 - (d) Seek to balance the different needs of persons engaged in the exploitation of sea fisheries resources in the district.

3.3 The Southern IFCA 'Minimum Fish Sizes', 'Skates and Rays - Minimum Size', 'American Hard Shelled Clams - Minimum Size' and 'Grey Mullet - Minimum Size' legacy byelaws set out a series of minimum conservation reference sizes (MCRS) for the conservation of sea fisheries resources in the Southern IFCA district. These sizes apply to all fishers.

3.4 Article 13 of Regulation (EU) 2019/1241 of the European Parliament sets out a series of fisheries minimum conservation reference sizes (MCRS) for the conservation of fisheries resources and the protection of marine ecosystems.

3.5 Regulation (EU) 2019/1241 was published by the European Union on 25 July 2019. These regulations deal broadly with managing fishers, applying an ecosystem approach as well as providing for 'regional' management of fisheries across Europe. The intentions of this legislation

² <http://www.legislation.gov.uk/ukpga/2009/23/contents>

³ Section 186 of MACAA states "the marine environment" includes—

- (a) geological or physiographical features of marine or coastal areas;
- (b) features of archaeological or historic interest in such areas;
- (c) flora and fauna which are dependent on, or associated with, a marine or coastal environment.

It is the view of Defra, stated in a letter addressed to IFCA Chief Executive Officers on 13th May 2014, that within this context salmon *and sea trout fall* within the definition of "marine environment" and therefore the Marine and Coastal Access Act provided IFCAs with the powers to introduce a byelaw to manage fishing for sea fisheries resources where this fishing is adversely impacting salmonids as part of the marine environment.

come from the reformed Common Fisheries Policy. Importantly, these regulations revoke and replace the measures implemented through Council Regulation (EC) 850/98. Critically, Regulation (EU) 2019/1241 establishes that the MCRS apply only in relation to commercial fishing and removes the existing prohibition on the transshipping, landing, transporting, storing, selling and displaying or offering for sale undersize marine organisms.

- 3.6 As a result, for those species not listed in relevant Southern IFCA minimum size byelaws, there will be no effective management regime in respect of undersized fish and shellfish for recreational fishers and unlicensed fishing vessels, and no enforcement in respect of trans-shipment, landing, transporting, storing, displaying and offering for sale of undersized fish and shellfish. This would cause enforcement issues in circumstances where a licensed fishing vessel is not used or where there is any uncertainty about the origin of the product once it has left a licensed fishing vessel. Table 1 provides a summary of the existing application of MCRS for each species referred to in the proposed byelaw.

Table 1: A summary of the current application of MCRS for each species referred to in the proposed byelaw.

Species	Current Application		
	Legislation	Applied to commercial fishers?	Applied to recreational fishers?
Ballan wrasse (<i>Labrus bergylta</i>)	Wrasse Fishery Guidance	✓	✗
Black seabream (<i>SpondylIOSOMA cantharus</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Brill (<i>Scophthalmus rhombus</i>)	Byelaw – Minimum Fish Sizes	✓	✓
American hard-shelled clam (<i>Mercinaria mercinaria</i>)	Byelaw – American Hard-shelled Clams Minimum Size	✓	✓
Grooved carpetshell clam (<i>Ruditapes decussatus</i>)	Regulation (EU) 2019/1241	✓	✗
Manila clam (<i>Ruditapes philippinarum</i>)	Regulation (EU) 2019/1241	✓	✗
Surf clam (<i>Spisula solida</i>)	Regulation (EU) 2019/1241	✓	✗
Warty Venus clam (<i>Venus verrucosa</i>)	Regulation (EU) 2019/1241	✓	✗
Cod (<i>Gadus morhua</i>)	Regulation (EU) 2019/1241	✓	✗
Conger eel (<i>Conger conger</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Corkwing wrasse (<i>Symphodus melops</i>)	Wrasse Fishery Guidance	✓	✗
Crawfish (<i>Palinurus spp.</i>) *	Regulation (EU) 2019/1241	✓	✗
Dab (<i>Limanda limanda</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Edible crab (<i>Cancer pagurus</i>)	Regulation (EU) 2019/1241	✓	✗
Flounder (<i>Platichthys flesus</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Grey thick-lipped mullet (<i>Chelon labrosus</i>) **	Byelaw – Grey Mullet Minimum Size	✓	✓
Grey thin-lipped mullet (<i>Chelon ramada</i>) **	Byelaw – Grey Mullet Minimum Size	✓	✓
Golden grey mullet (<i>Chelon aurata</i>) ***	Byelaw – Grey Mullet Minimum Size	✓	✓
Goldsinny wrasse (<i>Ctenolabrus rupestris</i>)	Wrasse Fishery Guidance	✓	✗
Horse mackerel (<i>Trachurus spp.</i>)	Regulation (EU) 2019/1241	✓	✗
Lemon sole (<i>Microstomus kitt</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Lobster (<i>Homarus gammarus</i>)	Regulation (EU) 2019/1241	✓	✗
Mackerel (<i>Scomber spp.</i>)	Regulation (EU) 2019/1241	✓	✗
Plaice (<i>Pleuronectes platessa</i>)	Regulation (EU) 2019/1241	✓	✗
Pollack (<i>Pollachius pollachius</i>)	Regulation (EU) 2019/1241	✓	✗
Queen scallop (<i>Chlamys spp.</i>)	Regulation (EU) 2019/1241	✓	✗
Razor clam (<i>Ensis spp.</i>)	Regulation (EU) 2019/1241	✓	✗
Red mullet (<i>Mullus surmuletus</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Rock cook wrasse (<i>Centrolabrus exoletus</i>)	Wrasse Fishery Guidance	✓	✗
Scallop (<i>Pecten maximus</i>)	Regulation (EU) 2019/1241; The Scallop Fishing (England) Order 2012	✓	✗
Skate or ray	Byelaw – Skates and Rays Minimum Size	✓	✓
Sole (<i>Solea spp.</i>)	Regulation (EU) 2019/1241	✓	✗
Spinous spider crab (<i>Maja squinado</i>) - Female	Regulation (EU) 2019/1241	✓	✗
Spinous spider crab (<i>Maja squinado</i>) - Male	Statutory Instrument 2000/1502 The Undersized Spider Crabs Order 2000	✓	✗

Turbot (<i>Scophthalmus maxima</i>)	Byelaw – Minimum Fish Sizes	✓	✓
Velvet crab (<i>Necora puber</i>)	Regulation (EU) 2019/1241	✓	✗
Whelk (<i>Buccinum spp.</i>)	Regulation (EU) 2019/1241	✓	✗
Whiting (<i>Merlangius merlangus</i>)	Regulation (EU) 2019/1241	✓	✗
Witch flounder (<i>Glyptocephalus cynoglossus</i>)	Byelaw – Minimum Fish Sizes	✓	✓

* Subject to MCRS increase from 95mm to 110mm carapace length

** Subject to MCRS increase from 300mm to 420mm length

*** Subject to MCRS increase from 300mm to 360mm length

- 3.7 The Authority has established priorities for the management of fishing activities in the inshore waters in the Southern IFCA district through an agreed five-year legislative forecast⁴. Within this forecast it has been agreed that the Authority will formally review its minimum size byelaws between 2021 and 2023 and states that “*the protection of juvenile fish from exploitation is an important part of fisheries management. The main role of protecting juvenile fish from exploitation is to avoid the impact of growth over fishing; whereby fish are removed before they have an opportunity to reproduce and thus contribute to the stock biomass. Furthermore, larger fish can be associated with more value – to the spawning stock biomass, to the recreational fishing community in terms of sport and in markets.*” It is anticipated that this review will proceed within the planned schedule and it is likely that further evidence will potentially inform the revision of the MCRS for species outlined in the proposed byelaw. This will require considerable resourcing associated with the collation of existing evidence, the gathering of additional evidence and, due to possible changes in legislation, extensive consultation and engagement with the community.
- 3.8 Due to the immediate risk posed to the sustainability of fisheries within the Southern IFCA district, particularly associated with the application of Regulation (EU) 2019/1241, there is the need to introduce the proposed byelaw in advance of the Authority’s planned review of minimum sizes.

4 Background

- 4.1 The removal of fish and shellfish only once they have reached a MCRS (usually related to a breeding size) is a common fisheries management measure used around the world^{5,6}. As a management measure it is relatively cheap, simple and effective to apply and easy for fishers to understand why this is used as a management measure. The measure, applied to all fishery participants and set at an appropriate level, is an effective tool for the sustainable management of fisheries and enabling sustainable development of fisheries within the district.
- 4.2 The application of MCRS measures across all fisheries, to all participants and throughout the supply chain will ensure continuity and increased understanding of the manner in which fishery management measures are applied in the Southern IFCA district.
- 4.3 It should be noted that the proposed measures are not intended to conflict with the landing obligation (implemented through EU 1380/2013), but only to catches where the landing obligation doesn’t apply.

Grey Mullet

- 4.4 The current MCRS for grey mullet species in the Southern IFCA district is 30cm, applied through the Southern IFCA ‘Grey Mullet - Minimum Size’ legacy byelaw. Grey mullet reach their northern limit around the coast of the UK and Ireland⁷ with three species found in these waters; the thick-lipped grey mullet (*Chelon labrosus*), the thin-lipped grey mullet (*Chelon ramada*) and the golden-grey mullet (*Chelon aurata*).
- 4.5 Although the grey mullet stock is believed to be transient across fisheries management boundaries, a high percentage of the exploitation of this population takes place within the inshore region,

⁴ Southern IFC Authority Meeting 21st March 2019

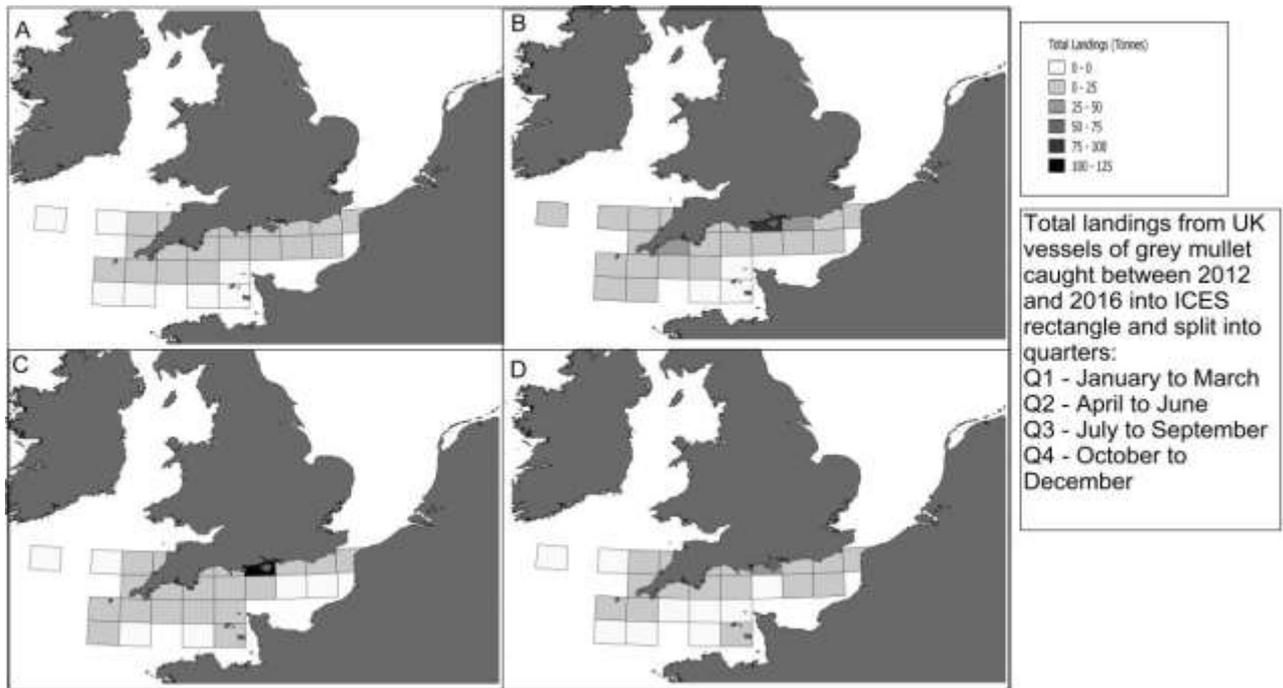
⁵ New South Wales Recreational Saltwater Fishing Guide. (2018) NSW Department of Primary Industries. ISBN web 978-1-76058-242-5

⁶ Florida Saltwater Recreational 2019. Fishing Regulations. Florida Fish and Wildlife Conservation Commission. Issued: Jan. 1, 2019

⁷ Hickling, C. F. (1970). ‘A contribution to the natural history of the English grey mullets [Pisces, Mugilidae]’, Journal of the Marine Biological Association of the UK, 50, pp. 609-633

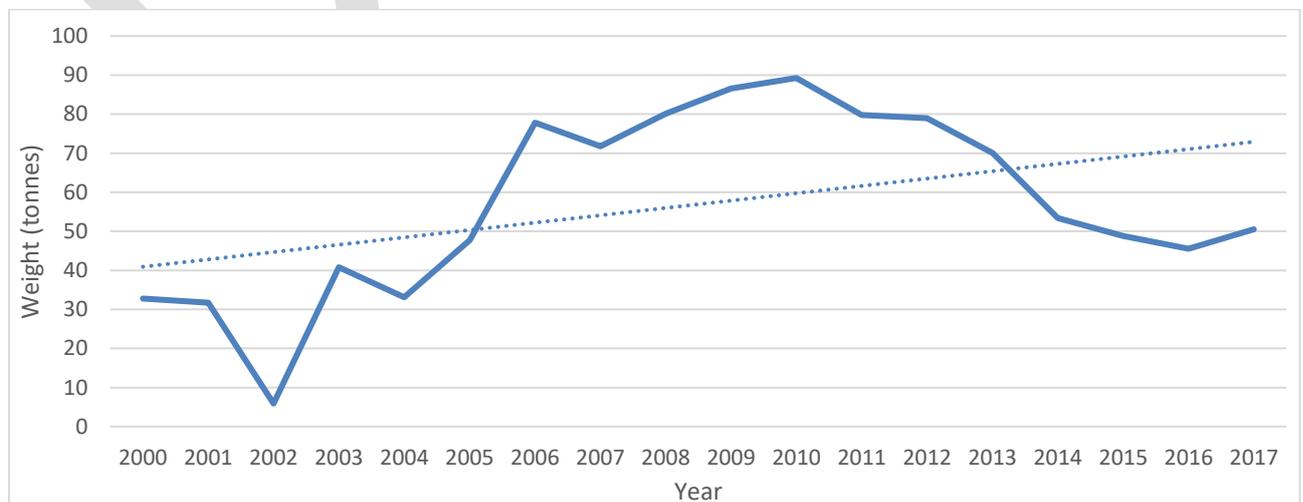
particularly within the Southern IFCA district (figure 1). The application of an increased local MCRS would be an effective tool in the management of sustainable development within this fishery.

Figure 1: UK vessel Grey mullet landings by ICES rectangle, split into quarters between 2012 and 2016 (MMO landings data).



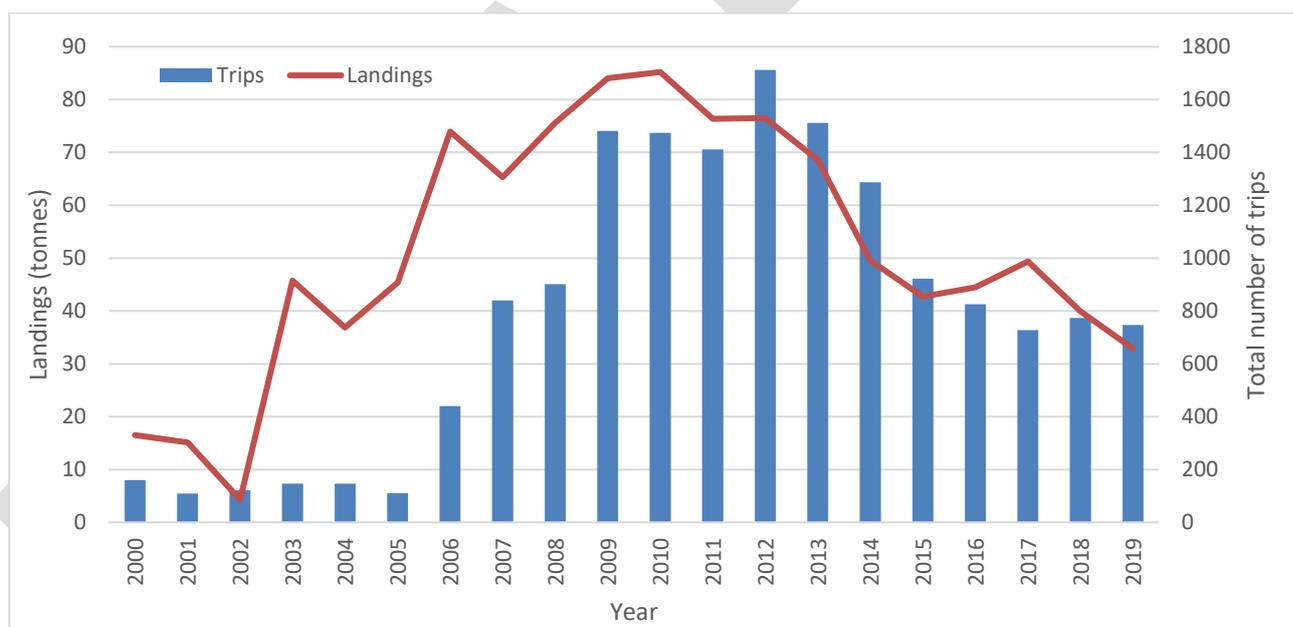
4.6 There is no formal stock assessment and no evaluation of grey mullet stocks by ICES in the north east Atlantic. Although fishery landings data exist within commercial and recreational fisheries, the accurate quantification of Landings Per Unit Effort (LPUE) within these datasets is difficult due to the absence of reliable fishing effort data. Within the Southern IFCA district grey mullet landings (based on MMO landings data) have increased overall between 2000 and 2017 (figure 2), however this is not necessarily representative of the overall fishing effort within this fishery. Anecdotal information from the fishing industry, supported by Southern IFCA vessel registration data, suggests that the number of participants in the grey mullet fishery has reduced since 2010. This is believed to reflect the relatively low value of the species and the overall number of commercially active fishing vessels in the Southern IFCA district. Conversely, anecdotal evidence from long-standing members of the National Mullet Club (NMC) suggests that grey mullet stocks have declined in many areas of the UK and members often have to travel further to obtain reasonable levels of sport. NMC catch statistics suggest mullet stocks are in gradual long-term decline and the average weight of fish caught is also decreasing.

Figure 2: Grey mullet landings into ports in the Southern IFCA district between 2000 and 2017.



4.7 Further analysis of data from landings made into ports within the Southern IFCA district corroborates the information that grey mullet fishing effort has reduced. Figure 3 shows the number of gill net fishing trips (the primary mode of fishing for grey mullet) made by vessels where grey mullet landings exceeded 10kg (indicating that grey mullet were likely to be the target species). This clearly demonstrates a decline in the number of gill net fishing trips where grey mullet were landed from almost 12,000 total trips in 2012 to 533 trips in 2019. The total grey mullet landings from these trips is also represented in figure 3 and demonstrates a clear correlation with the trend for the number of fishing trips. It is important to consider the irregularities in this data. Firstly, there are uncertainties over the reliability of the data prior to 2007, particularly relating to the number of fishing trips and it is believed that multiple landings and trips have been grouped together by vessels prior to this point. The dataset is a record of landings made into ports within the Southern IFCA district, there is no indication whether the fishing activity took place within the district and what the target species may have been. The dataset has been filtered to include only landings made by gill nets as this is the primary catch method and represents the strong majority of grey mullet landings, also, a 10kg threshold has been applied to grey mullet landings in an attempt to represent targeted fisheries rather than bycatch fisheries. This may exclude targeted trips which were effectively a failure where no, or very little catch was recorded. Conversely, this may still include a significant number of trips where a grey mullet bycatch was recorded despite it not being a target species, this is particularly relevant for bass fisheries prior to 2015. In this case it is important to consider the impact that the EU Emergency Bass Measures may have had on the overall gill net fishing effort as, following this date, these measures led to a significant decrease in gill net fishing effort. This can be seen in the data presented.

Figure 3: Gill net fishing trips and total landings where grey mullet landings exceed 10kg and landings were made into Southern IFCA ports.



4.8 Analysis of the overall Landings Per Unit Effort (LPUE) of grey mullet catches in the Southern IFCA district, calculated through dividing the total grey mullet catch by gill nets by the number of gill net trips where grey mullet landings exceeded 10kg, demonstrates that, since 2007 there has been a slight decline in the fishery's LPUE (figure 4). This decline was greatest in the three year period between 2008 and 2011, following which LPUE appears to have stabilised, although at a level lower than that first recorded by reliable data in 2007. A similar analysis for grey mullet landings made into Poole Harbour, the district's largest grey mullet fishing port (in tonnes landed/year), shows a similar trend with a greater decline in LPUE between 2008 and 2011, but a stabilisation in LPUE following this point. It is believed that, following an initial decrease in LPUE of approximately 12%, through increased sustainability in the fishery, provided by a greater spawning biomass, the proposed measures will potentially lead to an overall increase in LPUE over time. This is discussed further in the analysis of costs and benefits in section 7.

Figure 4: Grey mullet landings per unit effort (LPUE) from gill net fishing trips where individual grey mullet landings into all Southern IFCA ports exceeded 10kg.

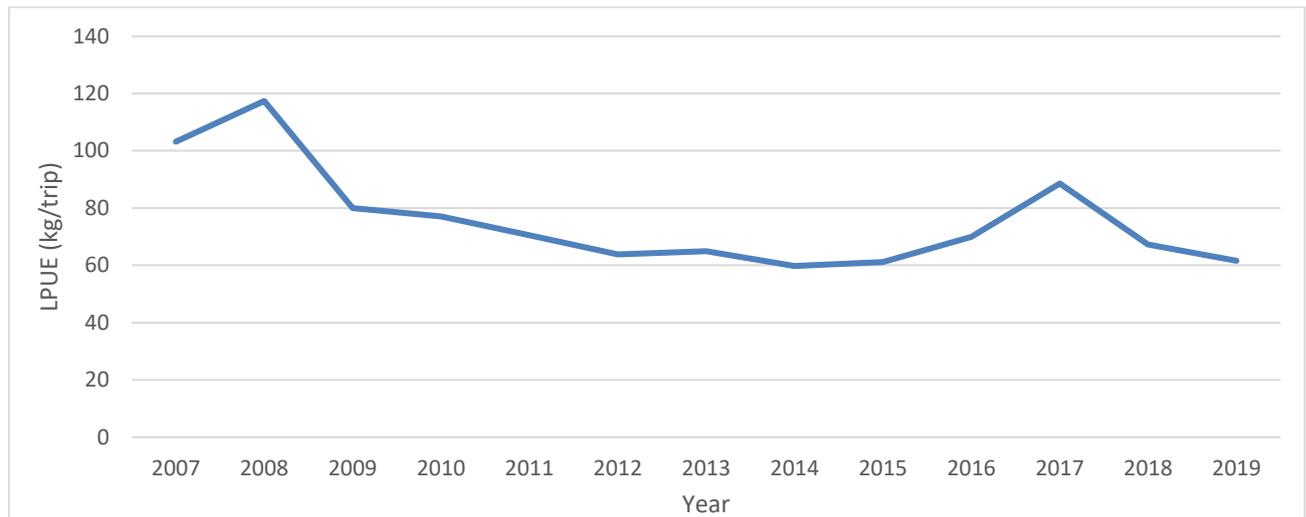
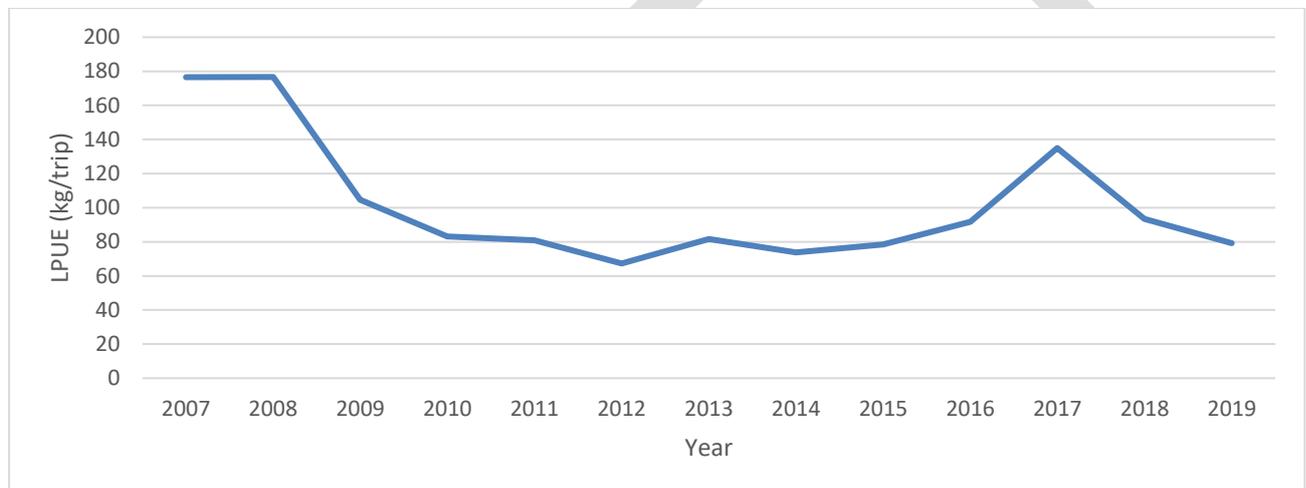


Figure 5: Grey mullet landings per unit effort (LPUE) from gill net fishing trips where individual grey mullet landings into Poole Harbour exceeded 10kg.



- 4.9 Project Inshore is an initiative led by Seafish, Marine Stewardship Council (MSC) and Shellfish Association of Great Britain (SAGB). Project Inshore mapped all English inshore fisheries together for the first time and carried out assessments based on the MSC Standard for sustainable fishing. Tailored sustainability reports⁸ were produced for each IFCA identifying locally important fisheries in their region where IFCA-led management may be appropriate. For Southern IFCA grey mullet was identified as a priority species along with five shellfish species. Specific to grey mullet, it was recommended that fishery-specific harvest control rules were defined. It was also identified that limited information was available on the status of the stock.
- 4.10 Data on the size and age at which the three grey mullet species first reach sexual maturity is limited for the UK and surrounding waters. Annex I provides a review of the literature on grey mullet species in UK and surrounding waters with a focus on spawning, growth and size at sexual maturity.
- 4.11 Hickling (1970) suggested that male *C. labrosus* mature at around 9 years of age and females at around 11 years. The smallest mature individuals found were recorded as 350mm length for males and 380mm length for females with 50% of the males found to be mature at 400mm and 50% of the females at 470mm (n=656). Kennedy and Fitzmaurice (1969)⁹ found similar results around the Irish coast finding mature male individuals aged 9-11 years however immature males were also found at age 10 and 11 years. The smallest size of a mature male was 353mm (n=>900). The smallest gravid

⁸ Project Inshore: Stage 3 – Strategic sustainability review, Southern IFCA

⁹ Kennedy, M. and Fitzmaurice, P. (1969). 'Age and growth of thick-lipped grey mullet *Crenimugil labrosus* in Irish waters', Journal of the Marine Biological Association of the UK, 49, pp. 683-699

females were aged 11 and 12 years, sized at 409 and 416mm respectively. A study by Fahy (1979)¹⁰ however reported mature male fish at a younger age of 8 years with a mean size of 368mm fork length. The study by Tulkani (2017)¹¹ also recorded the ages of fish sampled with the majority being between 8-10 years for males (65.5%) and 8-12 years for females (82.5%) (n=373). Within the sample, 21 female fish were identified as ripe, ranging in size from 490-680mm however there is no data provided on the size at which sexual maturity is first reached. A MCRS of 42cm for this species would serve to increase the sustainability of the fishery in the Southern IFCA district.

- 4.12 The only data available on the size at maturity for *L. ramada* in UK waters shows the size of the smallest mature female to be 420mm with a range of 420-530mm (Hickling, 1970), however this is only based on a sample size of 3 fish. Other studies from the Mediterranean indicate that this species matures at a much smaller size when compared to English waters with sizes of 220mm for males and 260mm for females¹² and 130mm for males and 190mm for females¹³. A MCRS of 42cm for this species would serve to increase the sustainability of the fishery in the Southern IFCA district.
- 4.13 The only data available on the size at maturity for *L. aurata* in waters adjacent to the UK indicates the smallest mature individual to be 217-230mm¹⁴, with data not distinguished between male and female. Hickling (1970) noted that he found no mature *L. aurata* in his samples. *L. aurata* has been noted as being long-lived, reaching similar ages to *C. labrosus* (up to 14 years) however there was a question as to how representative this was for the population as a whole¹⁵. As with the other species, the onset of maturation is more rapid in more southerly populations. Data from the Caspian Sea indicates that the rate of maturation in females is very rapid with the progression from stage 2 of sexual maturity to stage 4 taking only 1.5-2 months¹⁶. A MCRS of 36cm for this species would serve to increase the sustainability of the fishery in the Southern IFCA district.
- 4.14 The Authority recognises the limited availability of data relating to the biology and, in particular size of sexual maturity, for grey mullet species in English waters and will explore opportunities to strengthen the evidence base for this species ahead of their scheduled review of minimum size regulations between 2021 and 2023.

Crawfish

- 4.15 The current MCRS for crawfish (*Palinurus spp.*) in the Southern IFCA district is 95mm carapace length, applied to commercial fishing vessels only through Regulation (EU) 2019/1241. Following a wide-scale population collapse in the 1980s and 1990s the crawfish fishery in south-west England and, specifically, the Southern IFCA district has been very small to non-existent. Crawfish are a high-value species, historically targeted by pot fisheries, divers (both commercial and recreational) and fishing nets. Over-fishing, particularly through the use of targeted trammel-nets, is believed to be a possible cause of population decline¹⁷. In the past two years (2018-2019) however, there have been increased reports that relatively high numbers of juvenile crawfish being observed in the district by divers (SeaSearch pers. comms.) and pot and trawl fishers (South Coast Fisherman's Council pers. comms.). These reports correlate with evidence¹⁸ from Devon, Cornwall and the Isles of Scilly where there is a more established fishery.

¹⁰ Fahy, E. (1979). 'The exploitation of grey mullet *Chelon labrosus* (Risso) in the south east of Ireland', Irish Fisheries Investigations, 19, pp. 1-15

¹¹ Tulkani, R. H. M. (2017). 'Population biology of two species of grey mullet, *Liza abu* in central Iraq (Heckel, 1843) and *Chelon labrosus* (Risso, 1827) in North West Wales', Phd Thesis, Bangor University, United Kingdom

¹² Perlmutter, A., Bograd, L., Pruginin, J. (1957). 'Use of the estuarine and sea fish of the family Mugilidae (grey mullets) for pond culture in Israel', Proc. Tech. Pap. Gen. Fish. Coun. Mediterr., 37, pp. 289-303

¹³ Faouzi, H. (1938). 'Quelques aspects de la biologie des Muges en Egypt', Rapp. P.-v. Reun. Commn int. Explor. Scient. Mer Mediterr., T., 11, pp. 63-68

¹⁴ Thong, L.H. (1969). 'Contribution a l'etude de la biologie des Mugilides (Poissons, Teleosteens) des cotes du Massif Armoricaire', Bulletin de la Societe des Sciences de Bretagne, 44, pp. 137-138

¹⁵ Reay, P. J. (1987). 'A British population of the grey mullet, *Liza aurata* (Teleostei: Mugilidae)', Journal of the Marine Biological Association of the UK, 67, pp. 1-10

¹⁶ Fazli, H., Ghaninejad, D., Janbaz, A. A. and Daryanabard, R. (2008). 'Population ecology parameters and biomass of golden grey mullet (*Liza aurata*) in Iranian waters of the Caspian Sea', Fisheries Research, 93, pp. 222-228

¹⁷ Hunter, E., Shackley, S., & Bennett, D. (1996). Recent studies on the crawfish *Palinurus elephas* in South Wales and Cornwall. Journal of the Marine Biological Association of the United Kingdom, 76(4), 963-983.

¹⁸ <https://www.cornwallwildlifetrust.org.uk/crawfishproject>

- 4.16 The size of sexual maturity in crawfish is believed to vary regionally¹⁹. In Brittany, the mean size of functional maturity (ability to mate and lay eggs) of crawfish was estimated at 95mm carapace length²⁰. In Ireland, the size of 50% physiological maturity of females by the presence/absence of ovigerous setae was estimated to be 82 mm carapace length and for males this was estimated at 84.5mm carapace length²¹.
- 4.17 Within other inshore regions of the south-west, the crawfish fishery is largely managed through the application of a 110mm carapace length measure. This is believed to support the sustainable management of this fishery, furthermore, it is applied to all fishers, including recreational users. The increase in the Southern IFCA MCRS for crawfish to 110mm would serve as a precautionary measure to support the establishment of a sustainable population through providing protection for the breeding population against over-fishing and providing consistency in the management of the fishery.

Wrasse

- 4.18 Since 2015 there has been a fishery for live wrasse within the Southern IFCA district. Live wrasse species are caught by local fishers in fish traps and by handlines and are sold to Scottish salmon farms to act as cleaner fish for the removal of sea-lice as a biological alternative to the use of anti-parasitic chemical treatments. To date the fishery has been managed through Fishery Guidance measures²², including species specific minimum conservation reference sizes. The industry has been responsible in self-implementing these measures, recognising the requirement for sustainable management within this fishery. Through compliance inspections, officers have observed a full uptake of the MCRS measures.
- 4.19 Table 2 provides a summary of the life history characteristics and reproductive strategies for ballan wrasse, corkwing wrasse, goldsinny wrasse and rock cook wrasse. With the exception of ballan wrasse, the proposed MCRS is set at or above the species' estimated size of maturity. Ballan wrasse are protogynous hermaphrodites, which means they are born female and some change their sex to male later in life. Male fish guard a harem of females²³ and sexual inversion depends on the proportion of the sexes in local populations. The size at maturity for female ballan wrasse is estimated to be between 16cm and 18cm. Sexual inversion has not been observed below 25cm. The proposed MCRS of 18cm for ballan wrasse would protect all sexually juvenile female wrasse from fishing mortality, whilst fishery guidance measures would continue to implement a maximum size of 28cm within the live wrasse fishery.

Table 2: Summary of the life history characteristics and reproductive strategies employed by wrasse species exploited in the Southern IFCA district.

Characteristic / Species	Ballan wrasse <i>Labrus bergylta</i>	Corkwing wrasse <i>Symphodus melops</i>	Goldsinny wrasse <i>Ctenolabrus rupestris</i>	Rock cook wrasse <i>Centrolabrus exoletus</i>
MCRS	18cm	14cm	12cm	12cm
Maximum age	29 years – Male 25 years – Female (Dipper <i>et al.</i> 1977)	9 years – Male (Darwall <i>et al.</i> 1992) 6+ years – Female (Sayer <i>et al.</i> 1996)	14 years – Male 20 years – Female (Sayer <i>et al.</i> 1995)	8 years – Male 9 years – Female (Darwall <i>et al.</i> 1992; Treasurer, 1994)
Maximum length	65.9 cm (IGFA, 2001)	28 cm (Quignard & Pras, 1986)	21 cm (Halvorsen <i>et al.</i> 2016)	19 cm (Skiftesvik <i>et al.</i> 2015)

¹⁹ Goñi, R., and Latrouite, D. (2005). Review of the biology, ecology and fisheries of *Palinurus* spp. Species of European waters: *Palinurus elephas* (Fabricius, 1787) and *Palinurus mauritanicus* (Gruvel, 1911). Cah. Biol. Mar. 46, 127–142.

²⁰ Latrouite D. & Noël P. 1997. Pêche de la langouste rouge *Palinurus elephas* en France, éléments pour fixer une taille marchande. ICES CM 1997/BB : 13.

²¹ Mercer J.P. 1973. Studies on the spiny lobster (Crustacea, Decapoda, Palinuridae) of the west coast of Ireland, with particular reference to *Palinurus elephas* Fabricius 1787. Thesis, University College, Galway. 331 pp.

²² <https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/Wrasse-Guidance.pdf>

²³ Darwall, W. R. T., Costello, M. J., Donnelly, R., and Lysaght, S. (1992). Implications of lifehistory strategies for a new wrasse fishery. Journal of Fish Biology, 41: 111–123.

Age at maturity	6-9 years – Female 6-9 years -Male (Darwall <i>et al.</i> 1992)	2-3 years – Female (Darwall <i>et al.</i> 1992) 1-3 year – Male (Uglen <i>et al.</i> 2000; Matland, 2015*)	2-3 years – Female (Darwall <i>et al.</i> 1992) 3 years – Male (Matland, 2015*)	2 years – Female (Darwall <i>et al.</i> 1992; Matland, 2015*) 2 years – Male (Matland 2015*)
Size at maturity	16-18 cm – Female 28 cm – Male (Darwall <i>et al.</i> 1992)	7-10 cm (Fishbase; Darwall <i>et al.</i> 1992) 9 cm – Female 14 cm – Male (Matland, 2015*)	9.5 cm (Darwall <i>et al.</i> 1992) 8 cm – Females 9 cm – Males (Matland, 2015*)	9 cm – Males 8.5 cm – Females (Matland, 2015*)
Growth rate	5cm / year (Darwall <i>et al.</i> 1992)	4cm / year (Darwall <i>et al.</i> 1992)	3cm / year (Darwall <i>et al.</i> 1992)	3cm / year (Darwall <i>et al.</i> 1992)
Spawning period (Atlantic)	April – August (Darwall <i>et al.</i> 1992); peaking in June (Dipper <i>et al.</i> 1977)	April – September (Darwall <i>et al.</i> 1992)	April – September (Darwall <i>et al.</i> 1992)	May – August (Darwall <i>et al.</i> 1992)
Reproductive strategy	Hermaphrodite (Darwall <i>et al.</i> 1992)	Gonochoristic (Darwall <i>et al.</i> 1992)	Gonochoristic (Darwall <i>et al.</i> 1992)	Gonochoristic (Darwall <i>et al.</i> 1992)

* Figures reported from Matland (2015) represent 'critical age' and 'critical length' which is the point at which 50% of the sample are sexually mature.

5 The options

5.1 Option 0: Do nothing

5.2 Under this option the existing minimum conservation size restrictions for species in the Southern IFCA district would remain under a series of byelaws and EU measures until they were reviewed by the Authority between 2021 and 2023.

5.3 Under this option it is likely that Southern IFCA would not fully meet its duties under the Marine and Coastal Access Act, 2009 as grey mullet species, crawfish and wrasse would be potentially vulnerable to over-exploitation through fishing mortality.

5.4 Under this option the MCRS for species listed under Regulation (EU) 2019/1241 will apply only in relation to commercial fishing and will not apply to the transshipping, landing, transporting, storing, selling and displaying or offering for sale of these species.

5.5 RECOMMENDED OPTION

Option 1: Create a single Southern IFCA Minimum Conservation Reference Size Byelaw

5.6 This is the recommended option. Under this option a new Southern IFCA Minimum Conservation Reference Size Byelaw would be created to introduce an increased MCRS for grey mullet species and crawfish and new MCRS for wrasse species. Existing MCRS for other fish and shellfish species will be included under a single byelaw and will apply for the taking, retention on board, transshipping, landing, transport, storage, sale, display or offering for sale of species. These measures will be applied to all participants within the fishery.

5.7 Under this option the existing Southern IFCA 'Minimum Fish Sizes', 'Skates and Rays - Minimum Size', 'American Hard Shelled Clams - Minimum Size' and 'Grey Mullet - Minimum Size' legacy byelaws would be revoked.

5.8 Option 2: Voluntary measures

5.9 The principles of Better Regulation require that statutory regulation is introduced only as a last resort. Due to the range of species that the proposed measures serve to protect and the financial value of these populations it is unlikely that voluntary measures would be successful in achieving compliance in this situation. Furthermore, the risk posed to the sustainability of fish and shellfish populations in the event of non-compliance with voluntary measures would be high and the effects potentially considerable to the sustainability of the district's fisheries, the health of the marine environment and the economy of the local society.

6 Consultation

Informal Consultation

- 6.1 An eight-week period of informal 'pre-consultation' was held between 15th October and 7th December 2018 and sought evidence and feedback on draft management proposals for the minimum conservation reference size for grey mullet species, as well as net management. A Public Consultation document²⁴ outlined the scope of the review including the objectives, proposals and associated rationale as well as providing information on how people could participate. A Supporting Evidence document²⁵ accompanied this document, outlining the evidence considered in the development of draft measures. The Public Consultation document contained a series of 12 questions based around the proposals which participants in the pre-consultation were encouraged to answer. A hard copy of the public consultation document was posted to 207 commercial fishers who had indicated to Southern IFCA that they engage in fishing with nets in the district. Other user groups, individuals and organisations were identified and emailed copies of the consultation documents. In addition, the consultation was advertised on the Southern IFCA website and the Authority's social-media channels.
- 6.2 The Authority held a series of six drop-in style meetings across the district to provide stakeholders with the opportunity to learn more about the proposed measures and to provide views. In total, there were 62 attendees across all six drop-in sessions.
- 6.3 A total of 242 responses were received by the Authority through the duration of the consultation²⁶. From these responses 88 were submitted by individuals but represented an organisation's template view.
- 6.4 Additional informal consultation with fishery representatives took place during January and February 2020.
- 6.5 Members of the live wrasse fishing community were consulted in 2016/17 during the development and adoption of wrasse MCRS measures as Fishery Guidance. These measures are supported by fishery participants in ensuring the sustainability of the fishery.

Formal Consultation

- 6.6 Formal consultation will follow the making of the byelaw in line with guidance issued by Defra to IFCA's on byelaw-making²⁷.

7 Analysis of costs and benefits

Costs

- 7.1 The revocation of the Southern IFCA 'Minimum Fish Sizes', 'Skates and Rays - Minimum Size', 'American Hard Shelled Clams - Minimum Size' and 'Grey Mullet - Minimum Size' legacy byelaws and the creation of the 'Minimum Conservation Reference Size byelaw' may result in the following costs:
- Costs to recreational fishers as a result of reduced access to fish and shellfish catches;
 - direct costs to the fishing industry as a result of reduced grey mullet catches;
 - direct costs to the fishing industry as a result of new gear purchases;
 - indirect costs to the fishing industry associated with displacement to other fisheries; and

²⁴ <https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/Net-Consul.pdf>

²⁵ <https://secure.toolkitfiles.co.uk/clients/25364/sitedata/files/Net-Supp.pdf>

²⁶ Southern IFCA Public Consultation on Net Fishing Management for Estuaries, Harbours and Piers in Dorset, Hampshire and the Isle of Wight: Summary of responses

²⁷ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/182343/ifca-byelaw-guidance.pdf

- costs to Southern IFCA associated with the introduction of the byelaw and compliance and enforcement.

7.2 Costs to recreational fishers as a result of reduced access to fish and shellfish catches are non-monetised.

7.3 Costs to the fishing industry as a result of reduced catches and compliance costs to Southern IFCA can be monetised and these estimated values have been collated and presented as part of this IA.

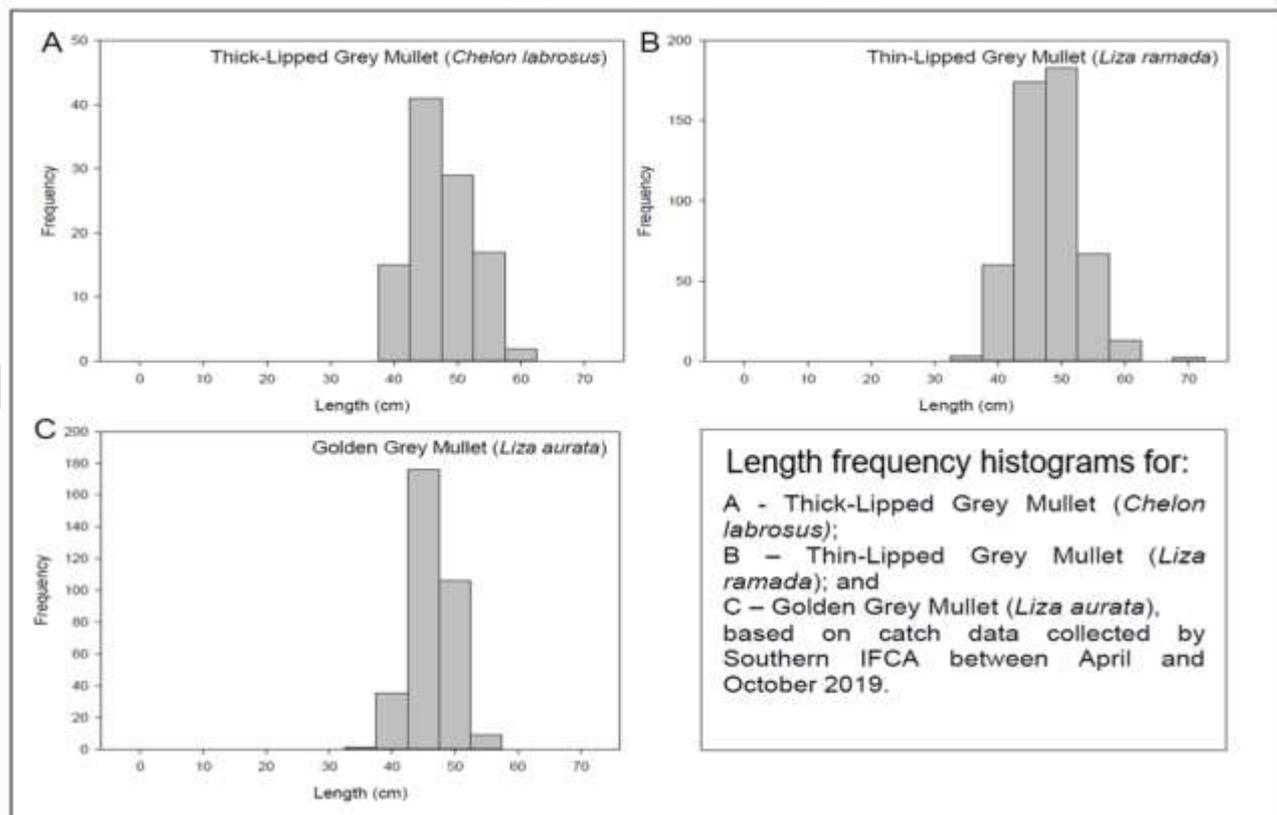
7.4 Costs as a result of new gear purchases and social costs due to the displacement of fishing activity to other fisheries are difficult to value and are therefore described here as non-monetised costs.

Costs to the fishing industry

7.5 To estimate the economic impacts of the proposed management Southern IFCA has undertaken a catch recording study of grey mullet fishers (Annex II). Between April and October 2019, 933 grey mullet were measured for length (tail length). These were identified to species level with 104 thick-lipped grey mullet (*Chelon labrosus*), 502 thin-lipped grey mullet (*Chelon ramada*) and 327 Golden Grey Mullet (*Chelon aurata*) measured.

7.6 From the data obtained, size frequency histograms for each species (figure 6) show that, based on the recommended measures, the fisher would have been able to retain 82% of all currently legal thick-lipped grey mullet, 81% of all currently legal thin-lipped grey mullet and 99% of all golden grey mullet. Across all grey mullet caught the percentage of legally retained catch that would fall below the proposed new MCRS equates to 12%.

Figure 6: Length frequency histograms for samples of grey mullet catches made in the Southern IFCA district between April and October 2019.



7.7 Marine Management Organisation catch data for grey mullet (recorded as 'Mullet – other') landed in the Southern IFCA district during 2016 and 2017 equate to a value of £196,418.06. By dividing the annual catch value (£98,209.03) by the estimated percentage catch loss (12%) it is possible to estimate a first year catch loss of £11,785.09 as a result of the proposed increase in grey mullet MCRS in the Southern IFCA district.

- 7.8 Due to the size of the increase, from 30cm to 36cm for golden grey mullet and 30cm to 42cm for thick-lipped and thin-lipped grey mullet, it is anticipated that the cost to the fishing industry as a result of reduced catches will be greatest in the first two years following the introduction of the measures. Following this point, due to the growth in individual fish within these population size classes, it is anticipated that there will be a reduction in costs incurred as a result of lost catches.
- 7.9 Marine Management Organisation catch data for crawfish landed in the Southern IFCA district during 2016 and 2017 equate to a value of £112.33. Due to the small population size and limited population range of crawfish within the Southern IFCA district there is limited information about the size of individuals within this population and those available to fishing. There are currently no targeted fisheries for crawfish within the Southern IFCA district and therefore there is not anticipated to be a direct cost to the fishing industry as a result of the introduction of the proposed increase in crawfish MCRS.
- 7.10 With the exception of wrasse species, the MCRS for all remaining species listed in the proposed byelaw exist in at least one form of statutory legislation already and therefore the fishing industry will not incur a cost as a result of their adoption under a Southern IFCA byelaw. As previously discussed, the MCRS for wrasse species is applied in the Southern IFCA district through Fishery Guidance and is followed by all fishery participants.

Costs to Southern IFCA

- 7.11 Under section 153 of the Marine and Coastal Access Act 2009, Southern IFCA has the lead responsibility of enforcing an IFCA byelaw. The existing risk based compliance strategy undertaken by the Authority would be the most likely and effective method of enforcing the recommended byelaw. It is difficult to estimate the additional cost to enforcement through introducing the recommended byelaw as likely levels of compliance are not known, however as Southern IFCA already enforces MCRS for fish and shellfish species it is not anticipated that the Authority will incur any additional costs as a result of the proposed measures.
- 7.12 At this juncture only a rough estimate of the costs of the byelaw development process can be made. It is expected that officer time associated with the introduction of the recommended byelaw will be in the order of magnitude of 0.5 FTE over a six month period. It is estimated that the cost of introducing the recommended byelaw including the costs associated with legal review and advertising the new byelaw will be approximately £11,044.38.

Total monetised costs

- 7.13 The total monetised costs associated with the introduction of the proposed measures over 10 years (costs to UK businesses and compliance costs) are estimated to be £101,442.36 (Table 3).

Table 3: Total monetised costs associated with the introduction of the proposed measures over a 10 year period.

Costs (£)	Year										TOTAL
	1	2	3	4	5	6	7	8	9	10	
Compliance	0	0	0	0	0	0	0	0	0	0	0
UK fishing industry	11,785.09	11,386.56	11,001.51	10,629.48	10,270.02	9,922.73	9,587.18	9,262.97	8,949.73	8,647.08	101,442.36
TOTAL	11,785.09	11,386.56	11,001.51	10,629.48	10,270.02	9,922.73	9,587.18	9,262.97	8,949.73	8,647.08	101,442.36

Benefits

- 7.14 The revocation of the Southern IFCA 'Minimum Fish Sizes', 'Skates and Rays - Minimum Size', 'American Hard Shelled Clams - Minimum Size' and 'Grey Mullet - Minimum Size' legacy byelaws and the creation of the 'Minimum Conservation Reference Size byelaw' may result in the following benefits:

- environmental benefits from an increase in fish and shellfish populations;

- direct benefits to the fishing industry as a result of increased catches and the increased size of fish and shellfish caught;
- direct benefits to the fishing industry as a result of increased values of grey mullet;
- direct benefits to recreational fishers as a result of an increase in grey mullet population sizes and the size of individual fish;
- social benefits related to increased participation in recreational angling and diving;
- social benefits related to an increase in the reputation of the fishing industry; and
- social benefits related to an increased understanding and compliance of regulations.

7.15 These benefits are difficult to value and are therefore described here as non-monetised benefits.

7.16 It is anticipated that the proposed MCRS measures will benefit fish and shellfish populations through a reduction in fishing mortality of juvenile marine species. A reduction in juvenile fish and shellfish mortality will increase the potential for these populations to reproduce, which will benefit adjacent fisheries, both commercial and recreational, through two mechanisms: net emigration of adults and juveniles, across borders, termed 'spill over', and the export of an increased volume of pelagic eggs and larvae. Anticipated benefits to commercial and recreational fisheries include an increase in fishing opportunities and catches as a result of larger, more healthy and sustainable fish populations and larger fish within these populations. This has the potential to increase the value of catches, leading to an increased first-sale value in commercial fisheries and a greater level of participation in recreational sea fisheries. Within carefully managed, sustainable fisheries additional fishing opportunities may potentially offer employment opportunities, thus supporting the local economy.

7.17 Recreational sea angling is a popular pastime in the Southern IFCA district. It is estimated that there are 884,000 sea anglers in England, with 2% of all adults going sea angling. These anglers make a significant contribution to the economy – in 2012, sea anglers resident in England spent £1.23 billion on the sport, equivalent to £831 million direct spend once imports and taxes had been excluded. This supported 10,400 full-time equivalent jobs and almost £360 million of gross value added (GVA). Taking indirect and induced effects into account, sea angling supported £2.1 billion of total spending, a total of over 23,600 jobs, and almost £980 million of GVA²⁸. Sea angling also has important social and well-being benefits including providing relaxation, physical exercise, and a route for socialising.

7.18 The amalgamation of MCRS measures for all fish and shellfish species in the Southern IFCA district under a single byelaw has the potential to improve the understanding of these measures and as a consequence, compliance with the measures. Additionally, the proposed byelaw applies to all persons at all stages of the supply chain, from take to sale, removing any uncertainty associated with how different MCRS restrictions may apply to different fishery users.

Uncertainty and data assumptions

7.19 Cost estimates are based on estimates of UK landings values derived from landings into ports within the Southern IFCA district and it is therefore not possible to ascertain what proportion of the total landings value was actually derived directly from district itself. Grey mullet landings are not broken down by species, but are instead grouped for each of the three grey mullet species and, less relevantly, red mullet. For the purpose of this IA it has been assumed that all 'Mullet – other' recorded as being landed in ports within the Southern IFCA district are grey mullet caught from fisheries within the district. Due to the catch method and seasonality of these landings it is likely that a high percentage of the fish recorded as being caught are grey mullet from inshore waters. In the same manner, the catch location for crawfish landed in the Southern IFCA district is unknown, however the small overall weight of landings makes this of less relevance.

7.20 Displacement of fishing effort is difficult to quantify, and impossible to predict where exactly activities will be displaced to.

7.21 Estimated costs to the fishing industry are likely to be an overestimate, as fishers are likely to adapt their practice and gear to avoid interaction with smaller fish.

²⁸ <https://webarchive.nationalarchives.gov.uk/20140305101647/http://www.marinemangement.org.uk/seaangling/finalreport.htm>

One In Three Out (OITO)

7.22 OITO is not applicable for byelaws implemented for the management of Designated Sites as they are local government byelaws introducing local regulation and therefore not subject to central government processes.

Small firms impact test and competition assessment

7.23 No firms are exempt from this byelaw as it applies to all firms who use the area, it does not have a disproportionate impact on small firms. It also has no impact on competition as it applies equally to all businesses that utilise the area.

South Marine Plan

7.24 As per paragraph 58(3) of the MaCAA, Southern IFCA must have regard to the South Marine Plan when undertaking any decision which is not an authorisation or enforcement decision. By definition, as per paragraph 58(4), a byelaw would fall under the definition of 'authorisation or enforcement decision'.

7.25 That said, the proposed measures ensure compatibility with the following objectives and policies of the South Marine Plan:

- **Objective 3:** To support diversification of activities which improve socio-economic conditions in coastal communities: specifically **S-FISH-1**;
- **Objective 5:** To avoid, minimise, mitigate displacement of marine activities, particularly where of importance to adjacent coastal communities, and where this is not practical to make sure significant adverse impacts on social benefits are avoided: specifically **S-FISH-2** and **S-FISH-3**;
- **Objective 10:** To support marine protected area objectives and a well managed ecologically coherent network with enhanced resilience and capability to adapt to change.

8 Conclusion

8.1 Southern IFCA has a duty to manage the exploitation of sea fisheries resources in the district to ensure that it is carried out in a sustainable manner, whilst balancing the different needs of persons engaged in the exploitation of sea fisheries resources in the district.

8.2 A new Southern IFCA Minimum Conservation Reference Size Byelaw would be created to introduce new increased MCRS for grey mullet species and crawfish and a new statutory MCRS for wrasse species. Existing MCRS for other fish and shellfish species will be included under a single byelaw and will apply for the taking, retention on board, transshipping, landing, transport, storage, sale, display or offering for sale of species. These measures will be applied to all participants within the fishery and at all stages of the supply chain.

8.3 Due to the size of the increase, from 30cm to 36cm for golden grey mullet and 30cm to 42cm for thick-lipped and thin-lipped grey mullet, it is anticipated that the cost to the fishing industry in the first year following the introduction of the proposed measures will be in the region of £11,785.09. The fishing industry is not anticipated to incur any costs associated with the introduction of MCRS for the remaining species.

8.4 It is anticipated that the proposed MCRS measures will benefit fish and shellfish populations through a reduction in fishing mortality of juvenile marine species contributing towards the sustainable development of fisheries within the Southern IFCA district.

Recommended option:

The revocation of the Southern IFCA 'Minimum Fish Sizes', 'Skates and Rays - Minimum Size', 'American Hard Shelled Clams - Minimum Size' and 'Grey Mullet - Minimum Size' legacy byelaws and the creation of a Southern IFCA Minimum Conservation Reference Size Byelaw.

Annex I-



A review of the literature on grey mullet species in UK and surrounding waters with a focus on Spawning, Growth and Size at Sexual Maturity

Birchenough, S.

1. General information

The term grey mullet is used to represent a number of species which belong to the family Mugilidae. These species are chiefly found in the tropics and sub-tropics and form one of the major commercial resources in tropical and warm-temperate estuaries (Bartulovic *et al.*, 2011). The grey mullet reach their northern limit around the coast of the UK and Ireland (Hickling, 1970) with three species found in these waters; the thick-lipped grey mullet (*Chelon labrosus*), the thin-lipped grey mullet (*Liza ramada*) and the golden-grey mullet (*Liza aurata*).

Although there are differences between the three species in growth rate, spawning period and size at maturity, all three exhibit some general characteristics of grey mullet species. All three species are known to feed by sucking up sediment, straining off fine material from suspended sediment or by scraping vertical and horizontal surfaces (Hickling, 1970; Cardona, 2016). They ingest a mixture of organic matter and sediment with the sediment acting as a grinding paste (Hickling, 1970; Fazli *et al.*, 2008). Principle food items include sessile diatoms, filamentous algae, harpacticoid copepods and nematodes as well as detritus and other small invertebrates (Hickling, 1970; Fazli *et al.*, 2008).

Fish of the family Mugilidae are known to be highly opportunistic and are able to occupy a wide variety of coastal habitats that show differences in temperature and salinity (Whitfield, 2016). They have been recorded in riverine, estuarine, marine and hyperhaline environments with their success attributed to their flexible physiology and an ability to exploit a number of available food resources (Whitfield, 2016). The thin-lipped grey mullet (*Liza ramada*) is thought to be the most euryhaline species and has been recorded as the most abundant in freshwater habitats. Claridge and Potter (1985) found that *L. ramada* dominated the population in the Severn Estuary and Bristol Channel when compared to the thick-lipped grey mullet (*Chelon labrosus*), and suggested that juvenile *L. ramada* exhibited a greater ability to survive longer periods in freshwater and were therefore able to penetrate further into estuaries. *C. labrosus* is known to be the most abundant and widespread of the three species in northern Europe (Hickling, 1970; Wheeler, 1978) and has been found to be dominant in different areas including estuaries and the wider coastal zone (Hickling, 1970). The golden-grey mullet (*Liza aurata*) has historically been the least common species around the UK (Reay, 1987). It has been noted in estuarine and lagoon systems, preferring a muddy sediment type, but has been noted to rarely enter areas of significant freshwater around the Adriatic coast (Kraljevic *et al.*, 2011). A study by Reay (1987) however found this to be the dominant species in Langstone Harbour between 1972 and 1973. He postulated that the conditions of the harbour which provided a marine nursery area were the driving factor behind the increased numbers seen.

There is thought to be a general migration pattern for grey mullet species. Young grey mullet, before maturity, are found in estuaries and inshore waters and are seen to move out to sea after reaching maturity in order to spawn. After spawning, adults are seen to return to inshore and estuarine areas (Quingnard and Farrugio, 1981). In addition, grey mullet have been seen to leave estuarine areas and shallow waters in cold weather with the potential for populations to suffer heavy mortality if they are unable to move further out into the coastal zone (Hickling, 1970). Individuals return to these areas during the spring following an increase in water temperature.

2. Spawning

The onset of sexual maturity most often occurs within estuaries, however spawning almost always takes place at sea (Thomson, 1966). It is thought that this may be linked to the more stable conditions for eggs and larvae found offshore when compared to the fluctuations in temperature, salinity and other parameters found in estuarine systems (Whitfield, 2016). There are differences in the spawning period found for the three different UK species and even for an individual species, slight differences have been noted in different studies.

2.1 *Chelon Labrosus*

Hickling (1970) found that the gonads of thick-lipped grey mullet were ripe in January to April and suggested that this period forms the spawning season for this species. He found recently spent females in estuaries in Devon from February onwards and in the Isles of Scilly from April and noted that young fish were appearing at approx. 1 cm length in May and at 2.5cm by July and August.

This spawning period was partially corroborated in a study by Kennedy and Fitzmaurice (1969). Their assessment of the population of *C. labrosus* in the coastal waters around Ireland suggested that the spawning period peaked in May but that it would last for several weeks. They did note surface swimming fry in July of a size similar to that seen by Hickling (1970) during this period (1.2-2cm). Both Hickling (1970) and Kennedy and Fitzmaurice (1969) noted that it was likely that the eggs were shed in more than one spawning event and that this may occur over a period of a few days. It was also noted that while all large males taken before or during the spawning season were ripe or ripening, this was not the case for females suggesting that not all mature females will spawn within a given year (Kennedy and Fitzmaurice, 1969).

The most recent study on *C. labrosus* however indicates a different pattern. For a population in Northwest Wales, the spawning season is suggested to last from October to December with the potential for the onset to be earlier, occurring in September (Tulkani, 2017). This was based on mullet being observed in the developing stages of maturity between March and August for males and April and August for females with ripe individuals observed between October and December.

2.2 *Liza ramada*

Hickling (1970) found that the spawning season for this species was later than that of the thick-lipped grey mullet, occurring in the autumn. Two ripening females were found in August and September and a spent female was found in October along the south west coast of the UK. It is important to note that these findings are based on a sample of only three fish. Similar spawning periods have been noted for this species however these relate to areas outside the UK.

Other studies however do not agree with these findings suggesting a spawning period between April and June for the Bristol Channel and Devon coastline (Claridge and Potter, 1985). Similarly to the pattern observed for *C. labrosus*, the spawning season for this species was seen to last for a few months.

2.3 *Liza aurata*

Several studies on *L. aurata* suggest that the spawning season occurs during the period from June to early September although there is little data on this species from UK waters. Reay (1987) noted that in Langstone Harbour, on the south coast, the adults present in the harbour in the autumn appeared to have recently spawned. This is reflected in other work on the Atlantic coast of Brittany where spawning was thought to occur from late June to early September (Thong, 1969). The same study did however note that recruitment can be seen as early as July with some fish having grown to 5.8cm by September, suggesting that the estimated spawning season for this species may start earlier than first thought or that the species exhibits a shorter pre-recruitment phase (Thong, 1969).

For all three species there is no definitive consensus on the timing of the spawning season with only *L. aurata* showing more consistent similarity between the majority of studies, however the number of studies for this species outside the Mediterranean and Adriatic are limited. Recognising the difference in findings, it has been postulated that the spawning period of grey mullet in British waters may be protracted or markedly different between areas and/or years (Claridge and Potter, 1985).

3. Growth

There is often little agreement in growth rate data between different studies of the grey mullet species. The rate of growth of these species is thought to be based on many different factors including differences in fish shape, physiological changes, hydrological environmental conditions, different food sources and availability during different stages of the life cycle and environmentally driven breaks in growth (Hotos and Katselis, 2011; Kraljevic *et al.*, 2011). Differences have also been attributed to the different methods used to estimate growth rate. There does seem to be a complete cessation of growth over the winter period, driven by low temperatures, reducing metabolism and resulting in period of winter fasting (Kennedy and Fitzmaurice, 1969). Grey mullet were observed to cease feeding at temperatures below 8°C, sporadic feeding was observed between 8-9°C and active feeding resumed at temperatures above 10°C.

Whilst variation in growth rate is seen, there does seem to be some agreement that growth rate is highest during the first 1-2 years of life and then slows significantly after the onset of sexual maturity (Quingnard and Farrugio, 1981). There have been some differences in growth rate noted between males and females, however, in the main bulk of the studies there is no observed significant difference between the sexes. Where differences were observed, it is the females who show faster growth rates, but only after year 2. Female fish are also noted to live longer than the males or are, at least, found to be dominant amongst adult populations (Hickling, 1970; Quingnard and Farrugio, 1981).

3.1 *Chelon labrosus*

C. labrosus is thought to be a slow growing and long-lived species (Kennedy and Fitzmaurice, 1969; Hickling, 1970). They are also seen to grow to the largest maximum sizes of the three species with studies recording sizes of 580-680mm (Kennedy and Fitzmaurice, 1969; Hickling, 1970; Tulkani, 2017). Juveniles were seen to first appear in June-July in the Isles of Scilly and July-August in the South Devon estuaries and by winter they were seen to have grown to 4-5cm (Hickling, 1970). A similar pattern was also seen for populations around the Irish coast where it was postulated that the growth season for *C. labrosus* is the date of hatching to

October for O-group fry, from the end of May to the end of October for older juveniles and from the end of June to the end of October for adults (Kennedy and Fitzmaurice, 1969).

From the most recent study on this species, total length varied between 373-580mm for males and 380-680mm for females for the majority of fish sampled, with four males recorded between 115-170mm and 1 female at 160mm (Tulkani, 2017). For males, 79.9% were between 401-525mm and 19.3% between 476-500mm. For females, 70.7% were between 426-500mm and 21.5% between 476-500mm (n=373).

3.2 *Liza ramada*

L. ramada has also been suggested to be a slow growing species in English waters (Hickling, 1970). There is less data available on this species compared to *C. labrosus* but one study by Claridge and Potter (1985) noted that a mean length of 55-58mm was reached after approximately 10-12 months for this species in the Bristol Channel and surrounding area, compared to a mean length of 181-191mm attained by the same species over the same time frame in southern areas such as the Mediterranean. This study also noted that the growth rate of *L. ramada* was similar to that of *C. labrosus* in the Bristol Channel area.

From available data on UK waters, the maximum sizes seen ranged from 326mm (Reay, 1987) to 530mm (Hickling, 1970). The largest dataset (n=4905) indicated sizes between 20-455mm from the Severn Estuary, Bristol Channel and SW Wales (Claridge and Potter, 1985).

3.3 *Liza aurata*

Much of the data for this species comes from studies undertaken in the Mediterranean and Adriatic where growth rates were seen to correspond to the general pattern of fast growth up to year 3 followed by a slower growth period (Fazli *et al.*, 2008). Growth rates were seen to be similar for males and females although females dominated older age classes (Hotos and Katselis, 2011). Hickling (1970) suggested that this species, like *C. labrosus* and *L. ramada*, is slow growing, a statement supported by work by Reay (1987) who noted that *L. aurata* shows similar growth rates to *C. labrosus*. Reay (1987) did note however that individuals of *L. aurata* do not generally reach as large a size as *C. labrosus* finding a size range of 21-503mm (n=419). Smaller maximum sizes were also seen in other studies i.e. 410mm (n=73) (Hickling, 1970) when comparisons were made across multiple species. It is postulated that this is due to different responses to environmental parameters by the two species with *C. labrosus* gaining a growth advantage as a result of an earlier onset of the spawning period (Reay, 1987). These maximum sizes are also small when related to data from the same species from the Iranian coast and Greece where samples showed maximum lengths of 610mm (n=38,417) (Fazli *et al.*, 2008) and 590mm (n=1146) (Hotos and Katselis, 2011) respectively.

4. Sexual maturity

Data on the size and age at which the three grey mullet species first reach sexual maturity is limited for the UK and surrounding waters.

4.1 *Chelon labrosus*

Hickling (1970) suggested that male *C. labrosus* mature at around 9 years of age and females at around 11 years. The smallest mature individuals found were recorded as 350mm length for males and 380mm length for females with 50% of the males found to be mature at 400mm and 50% of the females at 470mm (n=656). Kennedy and Fitzmaurice (1969) found similar results around the Irish coast finding mature male individuals aged 9-11 years however immature males were also found at age 10 and 11 years. The smallest size of a mature male was 353mm (n=>900). The smallest gravid females were aged 11 and 12 years, sized at 409 and 416mm respectively. A study by Fahy (1979) however reported mature male fish at a younger age of 8 years with a mean size of 368mm fork length.

The study by Tulkani (2017) also recorded the ages of fish sampled with the majority being between 8-10 years for males (65.5%) and 8-12 years for females (82.5%) (n=373). Within the sample, 21 female fish were identified as ripe, ranging in size from 490-680mm however there is no data provided on the size at which sexual maturity is first reached.

4.2 *Liza ramada*

The only data available on the size at maturity for *L. ramada* in UK waters shows the size of the smallest mature female to be 420mm with a range of 420-530mm (Hickling, 1970), however this is only based on a sample size of 3 fish. Other studies from the Mediterranean indicate that this species matures at a much smaller size when compared to English waters with sizes of 220mm for males and 260mm for females (Perlmutter *et al.*, 1957) and 130mm for males and 190mm for females (Faouzi, 1938).

4.3 *Liza aurata*

The only data available on the size at maturity for *L. aurata* in waters adjacent to the UK indicates the smallest mature individual to be 217-230mm (Thong, 1969), with data not distinguished between male and female. Hickling (1970) noted that he found no mature *L. aurata* in his samples. *L. aurata* has been noted as being long-lived, reaching similar ages to *C. labrosus* (up to 14 years) however there was a question as to how representative this was for the population as a whole (Reay, 1987). As with the other species, the onset of maturation is more rapid in more southerly populations. Data from the Caspian Sea indicates that the rate of maturation in females is very rapid with the progression from stage 2 of sexual maturity to stage 4 taking only 1.5-2 months (Fazli *et al.*, 2008).

5. Data Tables

Data from the studies on grey mullet species; *Chelon labrosus*, *Liza ramada* and *Liza aurata* from UK and surrounding waters are presented in the following tables. Data is given on sample numbers, size range and size at maturity, where available. Where possible, information is also provided on the methodologies used.

5.1 *Chelon Labrosus*

Author of study	Study location	Total No. of individuals surveyed	No. of individuals (n)		Length Data		Total No. of individuals	No. of individuals (n)		Size at Maturity Data						Comments
					Size range (mm)			M	F	Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size range of mature individuals (mm)		
					M	F				M	F	M	F	M	F	
Tulkani (2017)	Northwest Wales	373	168	205	373-580 (x4 115-170)	380-680 (x1 160)	21	0	21	-	490	-	-	-	490-680	Samples obtained from commercial gill nets and shallow water seine nets (small %)
Hickling (1970)	English coast	1377	-	-	230-530	230-600	645	-	-	350	380	400	470	-	-	
Kennedy and Fitzmaurice (1969)	Irish coast	>900	-	-	15-585 (*not distinguished as male or female)	-	-	-	-	353	409	-	-	-	-	Methods used: beach-seine, hand-nets, gill-nets, miniature-seine (1/4-inch mesh, 10yd long, 3ft deep). Some obtained from fish merchant from commercial fishers using gill net of 1 ½-inch and 1 ¾-inch mesh. Only data on smallest individuals found to be mature is given, no indication of what no. of fish were found to be mature.
Reay (1987)	Langstone Harbour	Quoted as 'several hundred'	-	-	230 (*not specified as male or female, only minimum size given)	-	-	-	-	-	-	-	-	-	-	Juveniles from 25m long sandeel seine (min. mesh size 12mm) and larger fish purchased from local fishers working seine nets (mesh size 70mm).
Claridge and Potter (1985)	Severn Estuary, Bristol Channel and SW Wales	93	-	-	61-218 (*not distinguished as male or female)	-	-	-	-	-	-	-	-	-	-	Samples collected from power station intake plus some purchased from fishers in the Bristol channel. Samples taken between Sept 1974 and June 1977.
Fahy (1979)	South coast of Ireland	>2000	-	-	Approx. 250-530 (*not specified as male or female, sizes taken from length/frea graph, no actual data provided)	-	-	-	-	368 (*based on the mean size of an 8 year old fish, determined to be average age at maturity)	-	-	-	-	-	Samples taken from fish captured by the mullet fishery during 1977 using stake nets (300-400m length, set dusk to dawn) and ring nets. Length measurement is Fork Length.

5.2 *Liza ramada*

Author of study	Study location	Total No. of individuals surveyed	No. of individuals (n)		Length Data		Total No. of individuals	Size at Maturity Data								Comments
					Size range (mm)			No. of individuals (n)		Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size range of mature individuals (mm)		
			M	F	M	F		M	F	M	F	M	F	M	F	
Hickling (1970)	English coast	44	-	-	300-530	300-530	3	0	3	-	420	-	-	-	420-530	For no. of mature individuals two females were ripening (440 and 530mm). Size range data is not separated in males or females.
Reay (1987)	Langstone Harbour	1	-	-	326 (*not distinguished as male or female)		-	-	-	-	-	-	-	-	-	Juveniles from 25m long sandeel seine (min. mesh size 12mm) and larger fish purchased from local fishers working seine nets (mesh size 70mm).
Claridge and Potter (1985)	Severn Estuary, Bristol Channel and SW Wales	4905	-	-	20-455 (*not distinguished as male or female)		-	-	-	-	-	-	-	-	-	Samples collected from power station intake plus some purchased from fishers in the Bristol channel. Samples taken between Sept 1974 and June 1977.

5.3 *Liza aurata*

Author of study	Study location	Total No. of individuals surveyed	No. of individuals (n)		Length Data		Total No. of individuals	Size at Maturity Data								Comments
					Size range (mm)			No. of individuals (n)		Size of smallest mature individual (mm)		Size at 50% maturity (L ₅₀) (mm)		Size range of mature individuals (mm)		
			M	F	M	F		M	F	M	F	M	F	M	F	
Hickling (1970)	English coast	73	-	-	200-410 (*not distinguished as male or female)		0	0	0	-	-	-	-	-	-	Size range data is not separated in males or females.
Reay (1987)	Langstone Harbour	419 (*sex not distinguished for all)	24	29	21-503 (*not distinguished as male or female)		-	-	-	-	-	-	-	-	-	Juveniles from 25m long sandeel seine (min. mesh size 12mm) and larger fish purchased from local fishers working seine nets (mesh size 70mm). Fish below 300mm were dominated by <i>Liza aurata</i> .
Thong (1969)	Brittany coast, France	127	-	-	13-550 (*not distinguished as male or female)		-	-	-	217-230 (*not distinguished as male or female)		-	-	-	-	Taken from data provided in Reay (1987). Size given as total length.
Claridge and Potter (1985)	Severn Estuary, Bristol Channel and SW Wales	3	-	-	-	-	-	-	-	-	-	-	-	-	-	Samples collected from power station intake plus some purchased from fishers in the Bristol channel. Samples taken between Sept 1974 and June 1977.

6. Data from other geographic locations

For comparison to data obtained for the UK and surrounding waters, the following table illustrates some of the available size range and size at maturity data for the three grey mullet species from other geographical areas. This data was compiled in part from a table provided in the paper by Tsikliras and Stergiou (2014).

Species: <i>Chelon labrosus</i>					
Author of study	Country of study	Year of study	Sample size (n)	Size range (mm)	Length at maturity (mm)
Farrugio and Quingnard (1973)	Tunisa	1972-73	41	539 (*only max size given)	31.0-37.2
Brusle and Brusle (1977)	Tunisia	1969-1971	69	230-435	320-360
Species: <i>Liza ramada</i>					
Koutrakis (1994)	Greece	1989-1990	39	230-386	327
Minos (1996)	Greece	1990-1995	144	180-548	273-296
Farrugio and Quingnard (1973)	Tunisa	1972-73	43	414 (*only max size given)	264-276
Ergene (2000)	Turkey	1992-1994	201	369 (*only max size given)	287-290
Brusle and Brusle (1977)	Tunisia	1969-1971	206	190-415	300-330
El-Halfawy <i>et al.</i> (2007)	Egypt	2002-2003	238	350 (*only max size given)	186-198
Koutrakis (2011)	Greece	1989-1990	127	228-468	320-332
Species: <i>Liza aurata</i>					
Hotos (1999)	Greece	1992-1994	705	220-500	244-249
Fazli <i>et al.</i> (2008)	Iran		38,417	180-610	-
Hotos and Katselis (2011)	Greece		1146	97-590	-

7. Catch Data

The following graph (Figure 1) illustrates the landings data collated by the Marine Management Organisation for commercial landings of grey mullet species into ports in the Southern IFCA District. The data represents the period 2005 to 2017 and reflects the ports of Poole, Christchurch, Lymington, Southampton and Portsmouth. It is important to note that the three grey mullet species are not differentiated and are recording on landings documents as 'grey mullet' for all species.

Data indicates that landings are constant for most ports with the exception of Poole where a decline was seen between 2009 and 2014 followed by an increase. This indicates that the effort level of the fishery is predominantly stable across the Southern IFCA District, the changes in Poole likely reflect changes in the number of vessels engaged in the fishery over this period. This is supported by anecdotal information from local fishers.

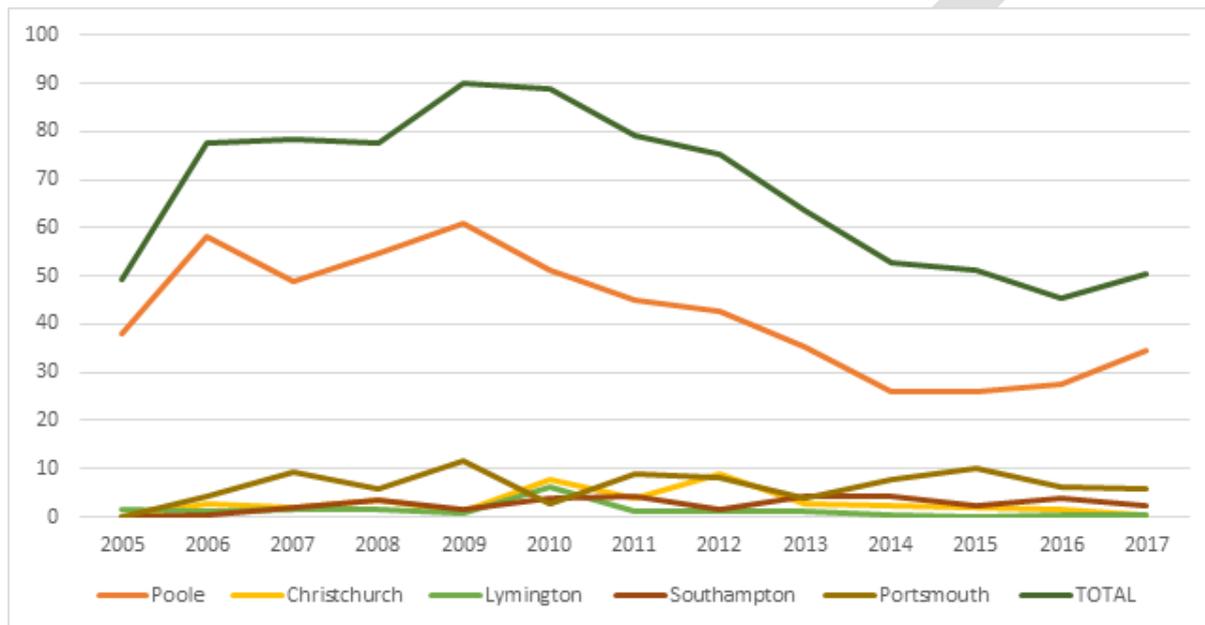


Figure 1: Landings data for grey mullet species across the Southern IFCA District for the period 2005 to 2017. Quantities are shown in tonnes.

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Summary of results from data gathering on inshore netting practices in the Southern IFCA District

April to September 2019

DRAFT

1. Premise for data gathering

At a meeting of the byelaw working group in May 2019 Members of the Southern IFCA considered a literature review of Grey mullet species reproductive biology in the UK and local waters. Members expressed a desire to achieve L50 for all species through the setting of minimum legal sizes. Members determined that they wished to increase the minimum legal size through a stepwise approach, initially increasing the size of grey mullet species to 42cm for Thick and Thin-Lipped Grey Mullet and 36cm for Golden Grey Mullet. It was proposed that a second increase could occur with a review of the Fish Minimum Sizes byelaw, at a time when more evidence was available to inform an appropriate size in line with L50.

Where there are data gaps, Officers aimed to help address this through gathering extra data on sizes of grey mullet (and other species) being landed as a result of netting activity within the Southern IFCA District. It was proposed that this would be done through monthly sampling from fishers in Poole, Christchurch and Southampton, measuring all fish caught (including bycatch), plus collecting data (where possible) on fish that is landed from other vessels. It was agreed that sampling would take place between May and September.

2. Sampling methods and locations

Sampling was carried out in two ways:

On-board observations – Southern IFCA Officers accompanied local fishers on netting trips between May and September. During these trips all fish which were caught by various net methods were recorded and the length of the fish measured (tail length). Details about the location of the fishing trip, the type of net and the net construction were recorded along with the total weight of the catch. Any bycatch was also recorded, this consisted of non-target species. Where the non-target species was sizeable and a commercially viable species they were mostly retained (retention of bass only occurred if the vessel had a bass entitlement), where non-target species were either undersized or not commercially viable (smoothound) they were returned to the sea.

13 fishing trips were completed with on-board observations across 7 different vessels based in Poole, Christchurch and Southampton Water.

Landings data – Where Officers were able to land netting vessels, data was gathered on the weight of catch and length measurements recorded for all fish species (tail length). In addition, where skippers were present, data on the type of and construction of net used was also recorded. This was primarily for vessels targeting grey mullet species. Data from this source was also available for April 2019.

7 landings inspections were carried out for 6 different vessels across the Southern IFCA District.

3. Grey mullet data

Between April and the end of September 2019, 933 grey mullet species were measured for length (tail length). These were identified to species level with 104 Thick-Lipped Grey Mullet (*Chelon labrosus*), 502 Thin-Lipped Grey Mullet (*Liza ramada*) and 327 Golden Grey Mullet (*Liza aurata*) measured.

For each species, the average length was calculated for each month along with the size of the largest fish, the smallest fish and the number of fish sampled. This data is presented in figures 3.1-3.3. Size frequency histograms have also been produced for each species, combining data from all months sampled, these are presented in figure 3.4-3.6.

Based on the proposed increase of the minimum legal size agreed by Members (42cm for Thick and Thin-Lipped, 36cm for Golden Grey), the average length of Thin-Lipped Grey Mullet was above 42cm for all months. The average length of Thick-Lipped Grey Mullet was above 42cm for all months except May 2019 where the average length was 41cm, this was however only based on measurements from 10 fish. For Golden Grey Mullet, the average length was above the proposed legal size of 36cm for all months sampled.

For all three species, for all months sampled, no fish were below the current minimum legal size of 30cm.

The percentage of fish caught that would have been able to be retained by the fisher or would have to have been returned (as under the proposed new minimum legal size) was calculated for each species across all the months sampled. For Thick-Lipped Grey Mullet 82% of the catch across all months would have been able to have been retained, for Thin-Lipped 81% and for Golden Grey 99%. Data for Thin-Lipped Grey Mullet was fairly consistent until September 2019 where a much larger proportion of fish under the proposed new minimum legal size were caught. During this month 42% of the catch would have to have been returned as under the minimum legal size.

During the sampling three spawning fish were detected. These were all Thin-Lipped Grey Mullet measured at 42cm, 48cm and 55cm (tail length). The two fish at 42 and 48cm were found in August and the 55cm fish in September.

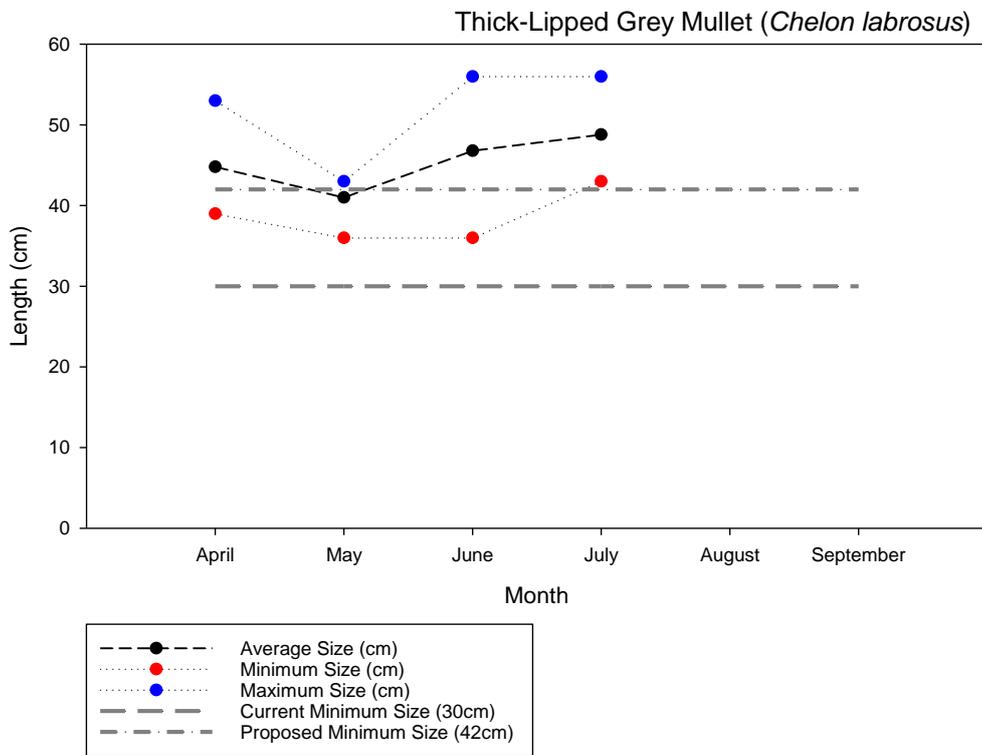


Figure 3.1: Tail length (cm) measurements of Thick-Lipped Grey Mullet (*Chelon labrosus*) from sampling carried out in the Southern IFCA District between April and September 2019. Average length (cm) is shown (black) along with maximum size (blue) and minimum size (red). The current minimum size (30cm) and the proposed minimum size (42cm) are also shown for reference.

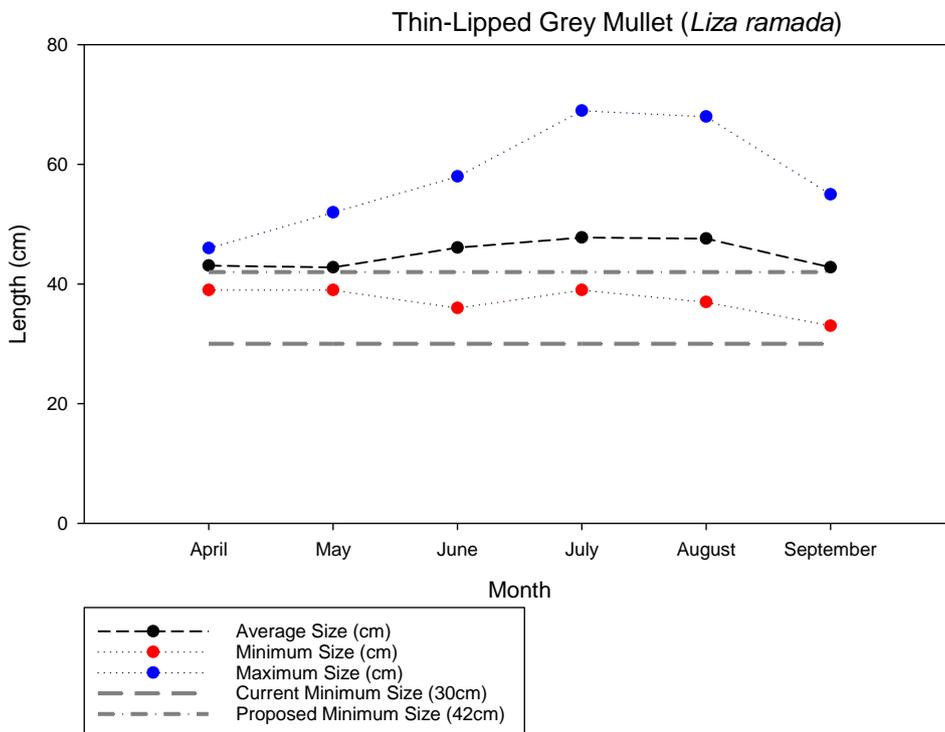


Figure 3.2: Tail length (cm) measurements of Thin-Lipped Grey Mullet (*Liza ramada*) from sampling carried out in the Southern IFCA District between April and September 2019. Average length (cm) is shown (black) along with maximum size (blue) and minimum size (red). The current minimum size (30cm) and the proposed minimum size (42cm) are also shown for reference.

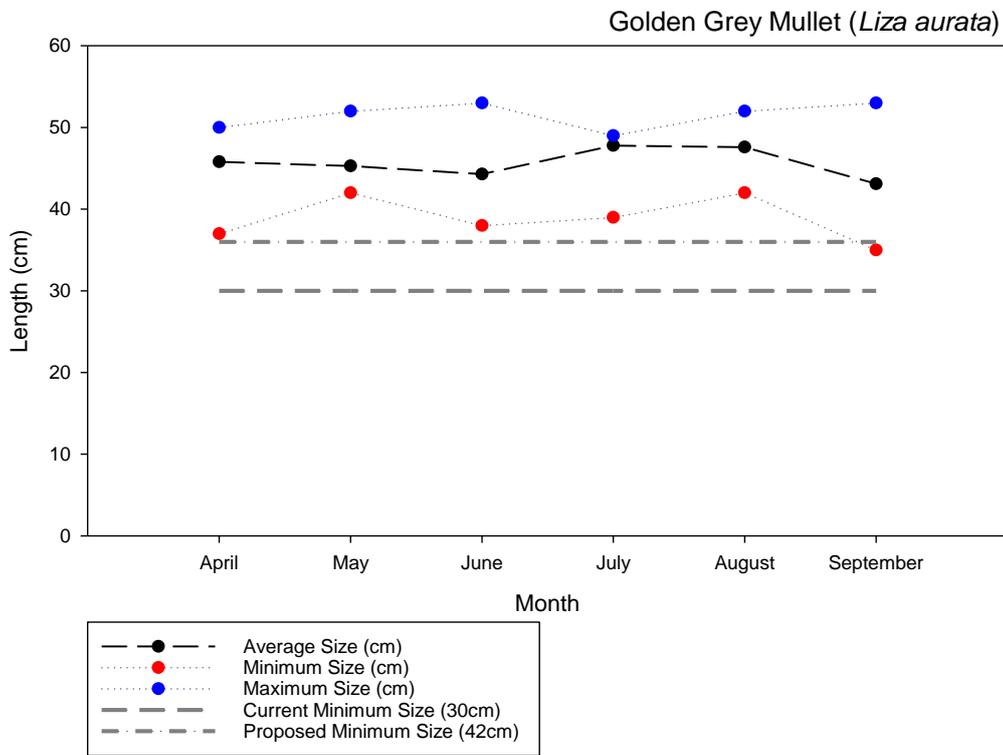


Figure 3.3: Tail length (cm) measurements of Golden Grey Mullet (*Liza aurata*) from sampling carried out in the Southern IFCA District between April and September 2019. Average length (cm) is shown (black) along with maximum size (blue) and minimum size (red). The current minimum size (30cm) and the proposed minimum size (42cm) are also shown for reference.

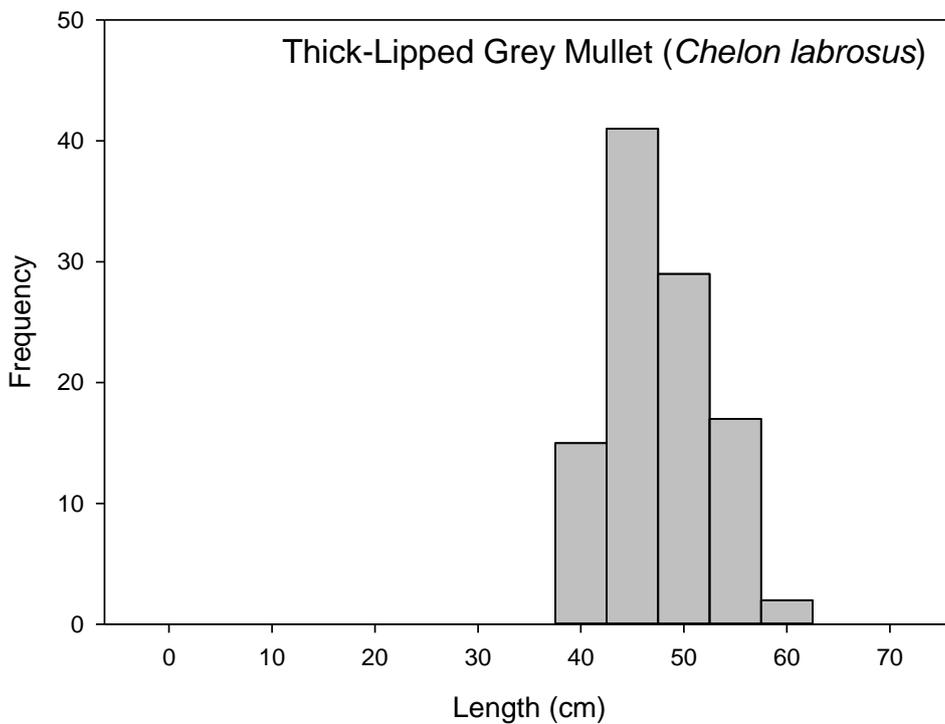


Figure 3.4: Length frequency histogram for Thick-Lipped Grey Mullet (*Chelon labrosus*) for all data from all months sampled (April to September 2019)



Figure 3.5: Length frequency histogram for Thin-Lipped Grey Mullet (*Liza ramada*) for all data from all months sampled (April to September 2019)

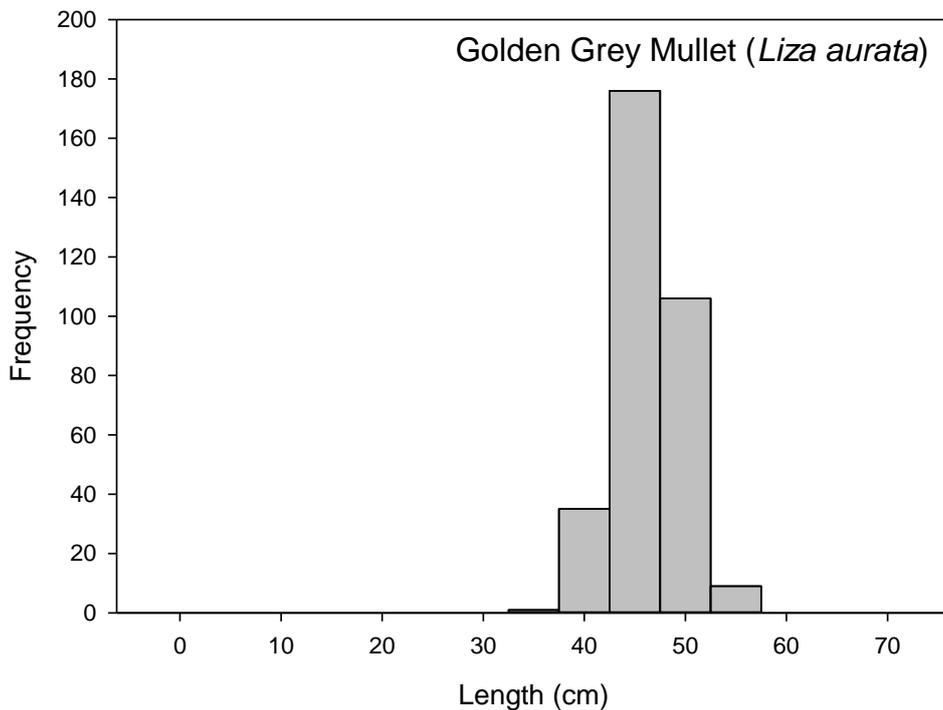


Figure 3.6: Length frequency histogram for Golden Grey Mullet (*Liza aurata*) for all data from all months sampled (April to September 2019)

4. Bycatch

As part of the on-board sampling with netting vessels, data on bycatch was recorded (Table 4.1). The majority of vessels from which data was obtained were operating either a ring net or drift net, mesh sizes have been shown where these were recorded. The species is recorded along with the

size (length cm) and the area. In some cases fish are reported as being 'u/s', this refers to undersized. The smoothhound recorded at 70+ reflects that the length of the measure used by Officers only went up to 70cm.

Species	Size (cm)	Month Caught	Area Caught	Net Method	Mesh Size
Bass	45	June	Solent	Ring net	4
Bass	48	June	Solent	Ring net	4
Bass	47	June	Poole Harbour	Ring net	3 5/8
Bass	u/s	June	Poole Harbour	Ring net	3 5/8
Bass	u/s	June	Poole Harbour	Ring net	3 5/8
Bass	u/s	June	Poole Harbour	Ring net	3 5/8
Bass	u/s	June	Poole Harbour	Ring net	3 5/8
Bass	u/s	June	Poole Harbour	Ring net	3 5/8
Bass	u/s	June	Poole Harbour	Ring net	3 5/8
Bass	30	June	Mudford	Ring net	
Bass	42	June	Southampton Water	Drift net	
Bass	40	June	Southampton Water	Drift net	
Bass	41	June	Southampton Water	Drift net	
Bass	36	June	Hamble Estuary	Ring net	3 5/8
Bass	44	August	Southampton Water	Ring net	4
Bass	46	August	Southampton Water	Ring net	4
Bass	43	August	Southampton Water	Ring net	4
Bass	39	August	Southampton Water	Ring net	4
Bass	41	August	Southampton Water	Ring net	4
Bass	41	August	Southampton Water	Ring net	4
Bass	14.5	August	Southampton Water	Ring net	4
Black Bream	29	July	Poole Harbour	Ring net	3 5/8
Black Bream	31	July	Poole Harbour	Ring net	3 5/8
Flounder	22	June	Solent	Ring net	4
Flounder	23	June	Solent	Ring net	4
Flounder	22	August	Southampton Water	Ring net	4
Flounder	31	August	Southampton Water	Ring net	4
Flounder	24.5	August	Southampton Water	Ring net	4
Flounder	26	August	Southampton Water	Ring net	4
Gilthead Bream	31	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	31	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	37	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	38	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	28	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	31	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	29	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	20	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	31	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	31	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	32	July	Poole Harbour	Ring net	3 5/8
Gilthead Bream	31	July	Poole Harbour	Ring net	3 5/8
Smoothhound	60	June	Southampton Water	Drift net	
Smoothhound	70+	June	Southampton Water	Drift net	
Smoothhound	41	September	Poole Harbour	Ring net	3 5/8

Bycatch levels were observed to be low. Ring nets in particular were observed to be very selective and this, combined with the skill of the individual fisher, resulted in low levels of non-target species, even when target species catches were high. The highest level of bycatch in a single net comprised 17% of the total catch, 16 non-target species to 78 target species (bycatch was primarily made up of Gilthead Bream). For 19 out of 30 nets no bycatch was recorded. Where bycatch was of legal minimum size and of commercial value it was often retained (retention of bass only occurred if the vessel had a bass entitlement). Where bycatch had to be returned it was observed to be returned alive. It was noted that bycatch was very rarely physically damaged.

5. Other types of netting (Demersal Sole Net)

In addition to the data gathering for grey mullet species fisheries, an on-board observational trip was conducted on a vessel using a demersal sole net. These nets are a type of fixed net which are anchored to the seabed and extend no more than 3ft from the seabed up into the water column, the mesh size was 100-150mm. They are commonly left to soak overnight before the catch is retrieved.

The same recording process was followed with fish caught in the net measured (tail length). The fish species caught using this method included; Sole, Flounder, Gurnard, Brill, Plaice, Thornback Ray, Red Mullet, Bass, Pout and Mackerel. Any individuals which could not be retained (under minimum size or other reasons) were returned alive. Length frequency histograms have been produced for fish species caught using the demersal sole nets, these are presented in figure 5.1.

6. Salmonids

Throughout the sampling period (April to September 2019) no bycatch of Atlantic salmon (*Salmo salar*) or sea trout (*Salmo trutta*) was recorded for any netting trip where Officers were collecting data on-board.

Information provided by fishers who engaged in this data gathering stated that no salmonids were caught on netting trips carried out when Officers were not present on-board.

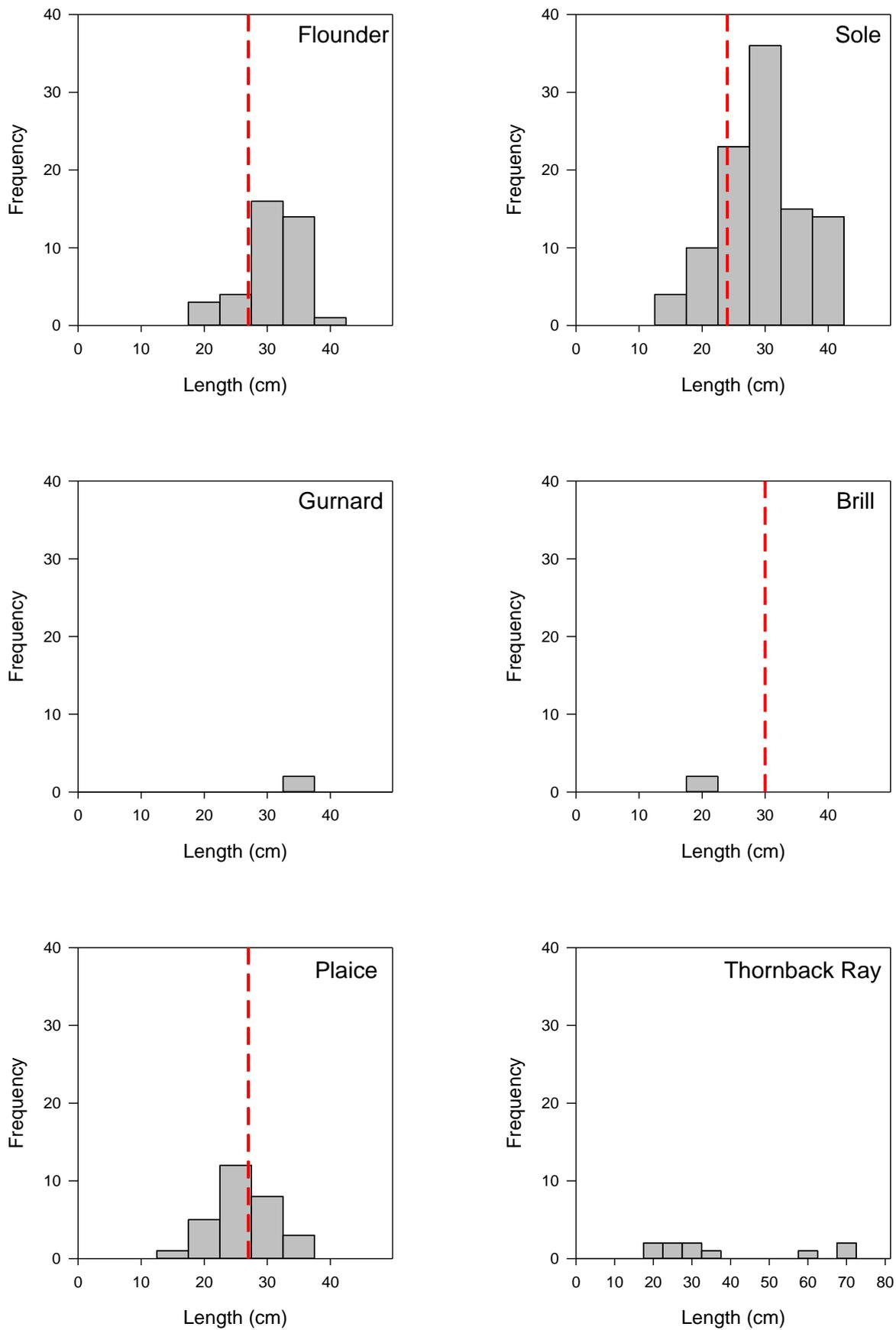


Figure 5.1: Length frequency histograms for species caught in demersal sole nets. Red dashed lines indicate where a minimum legal size exists for that species.

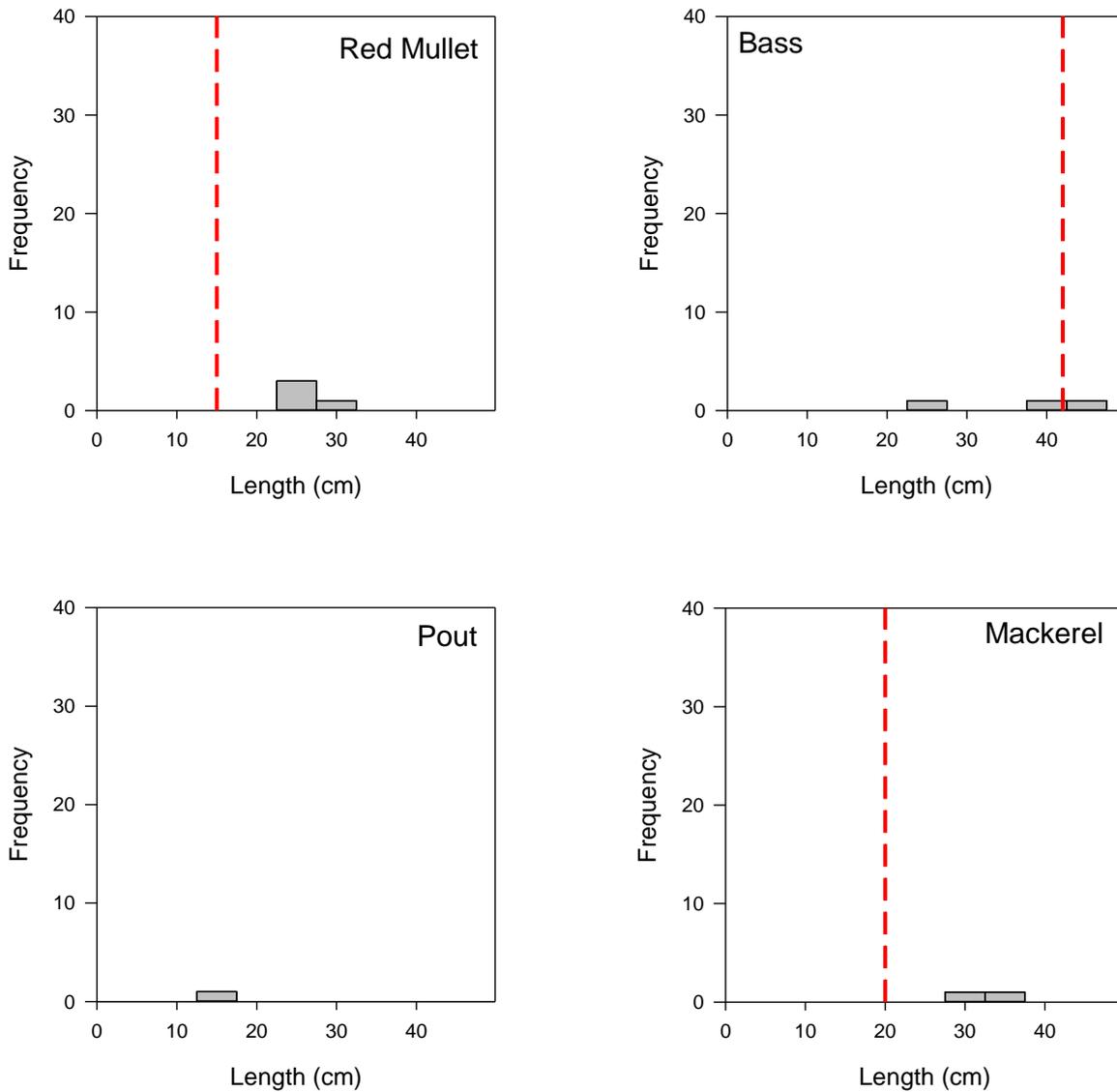


Figure 5.1: Length frequency histograms for species caught in demersal sole nets. Red dashed lines indicate where a minimum legal size exists for that species.

7. Other information (anecdotal provided by fishers)

During the process of gathering data from fishing vessels, fishers have provided additional information on netting practices. This information is a valuable contribution to the knowledge base about netting activities in the district. A summary of information is presented below.

Grey Mullet species

Grey mullet species tend to shoal, this can result in large catches. When this does happen, catches are seen to comprise sizeable fish. When a shoal occurs, the catch is often only a small percentage of that shoal as many of the larger and smaller fish will not be retained due to the selectivity of the net as a result of the specific mesh size range. When there is a large catch in the net, it is often necessary to completely haul the net before it can be sorted. This is a safety requirement, particularly for small vessels. Once the net is fully hauled, the vessel can be secured and the net sorted safely. At the present minimum legal size (30cm) it is almost guaranteed that all the fish in the net will be sizeable and able to be retained. At the proposed increased sizes, there is a higher chance that a proportion

of the fish will be undersized. Due to the need to haul the net fully before sorting there is a greater chance that these undersized fish will not survive and will have to be returned dead to the water.

The three grey mullet species appear to be very much orientated according to salinity. Thin-lipped grey mullet are much more prevalent toward freshwater inputs, thick-lipped and golden grey are found more seaward where salinities are higher.

The populations of grey mullet species are seen to decline in areas after spawning has taken place. This is most evident for Thin-Lipped grey mullet which are noted to be spawning primarily in August. Stocks are seen to decline from this point on to the beginning of December. Golden Grey tend to stay in estuarine areas longer than the other two species. It is believed that thin-lipped and golden-grey spawn from July to late summer (August to early September). Thick-lipped are thought to be different but the exact timings are not known.

It can be identified when grey mullet species have been actively feeding. This can result in smaller fish (36-39cm) being retained in the net when they commonly wouldn't be. Usually fish of this size will pass through a 3 5/8 type net but the extended stomach from feeding results in them being retained. For some fishers, all fish 36-37cm were returned alive as they are not commercially desirable.

The fishing season for mullet has historically been the end of March to December, however the start of the season has been noted to occur later each year for the past few years.

Ring nets

Both Ring and Beach D nets have a soak time of a maximum of 15 mins or less. This is the time it takes to enter into the net circle 'scare' the fish, exit the circle and then begin hauling.

Ring and Beach nets do not drift. Netters target the tides i.e. high, low or slack to avoid the drifting motion of the net

Other observations

Nets are only set when fish can be 'seen' in the water. Fishers will go out and not set any nets if no fish can be seen.

Fishers use different size meshes depending on the season and what fish are being targeted. For example, later in the season when immature bass are come through fishers will move to a larger mesh size to avoid unwanted and undersized bycatch.

Large fish (of all species) beyond a certain size tend not to get caught in nets. They tend to bounce off rather than becoming enmeshed or are only caught superficially so they drop out of the net as it is hauled.