Evaluation of Fisheries Control and Enforcement

Final Report

30 November 2020

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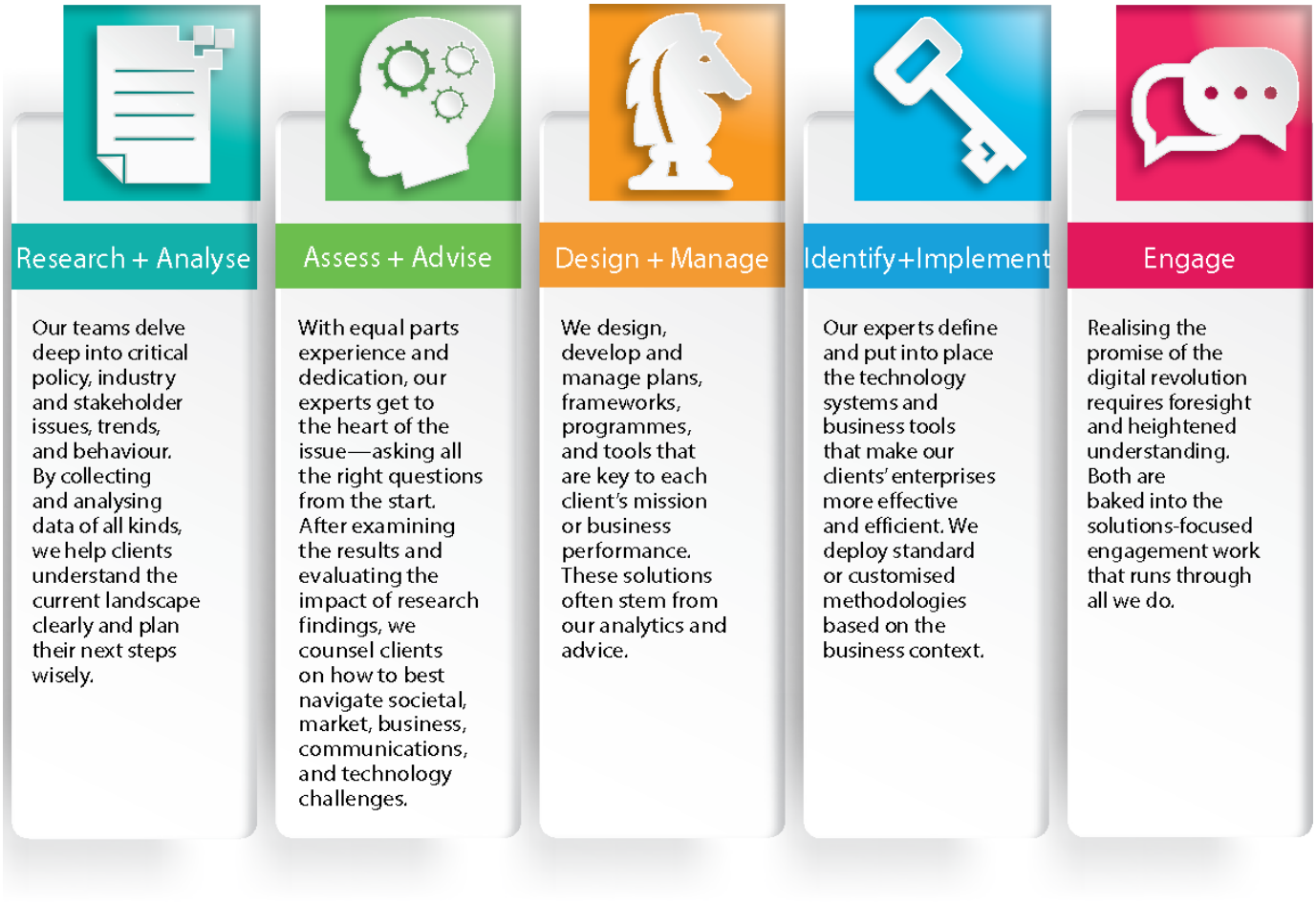

Evaluation of Fisheries Control and Enforcement

Final Report

A report submitted by ICF Consulting Services Limited
in association with

MacAlister Elliott & Partners, Howell Marine Consulting

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Executive summary

Background

In response to the UK's exit from the European Union (EU), the Marine Management Organisation (MMO) was allocated additional resources to enhance fisheries control and enforcement activity. From late 2018/19 to 2019/20 an additional £16.5 million was provided as part of a requested budget increase for a full four-year period. This additional resource represented a significant increase, more than doubling the expected control and enforcement budget for the period.

The MMO is responsible for control and enforcement of all fishing activities in English waters. The primary goal of control and enforcement action is ensuring compliance with fisheries rules and regulations. The MMO's approach to fisheries control and enforcement is risk-based and intelligence-led. Data (satellite, catch recording and intelligence) is used to guide where assets (typically at sea vessels) and resources (predominantly people) are deployed to undertake inspections, investigate offences and deliver enforcement actions (e.g. official warnings, financial penalties) when appropriate. In addition, MMO provide advice and guidance to industry to facilitate compliance.

Compliance is influenced by the motivations and abilities of fishers. Regulator responses that seek to improve compliance can be tailored to respond to fishers' rationales for being non-compliant or compliant. There are two categories of compliance driver – deterrence and voluntary. Deterrence drivers reflect the potential risk (i.e. through enforcement of regulations) to fishers of non-compliant activity, whilst voluntary drivers reflect the influences of social norms, fisher attitudes towards regulations and their awareness and capacity to comply.

Evaluation objectives and approach

ICF, MacAlister Elliott & Partners and Howell Marine Consulting were commissioned by the MMO to carry out an evaluation of MMO control and enforcement activities relating to fisheries management. The evaluation aimed to:

- Assess what has been delivered by the increased control and enforcement budget, and whether the resources are operating as intended.
- Assess the effectiveness of the MMO's control and enforcement actions and the impact of the increased resources on this.
- Develop an understanding of the levels of compliance within the fishing industry, including factors that influence compliance.

The evaluation did not assess the extent to which control and enforcement resourcing is sufficient to ensure that fishing activity in English waters can be effectively managed when the UK is an independent Coastal State; nor the extent to which the MMO will be able to address potential compliance issues that could occur following the UK's departure from the EU.

The evaluation drew on four main strands of research.

- An extensive face-to-face survey of over 200 fishers operating from English ports undertaken between December and February 2020. The survey sought information on compliance levels, drivers of compliance, opinion on fisheries control and enforcement, and perceptions of changes between 2019 and 2020.
- An existing baseline survey of over 400 fishers, covering similar topics to the above survey, delivered online one year earlier.

- Interviews, conducted either face-to-face or by telephone between January and February 2020, with 21 English fishers who have received sanctions for fisheries offences.
- In depth telephone interviews with 18 MMO and seven other UK fisheries agency staff, conducted between February and March 2020.
- Analysis of MMO control and enforcement data sets.

The evaluation was not able to undertake primary research with the non-UK fishing industry.

The evaluation research was conducted less than one year after the full budget increase came on stream. As such, the extent to which the evaluation was able to conclude on the impact of the increased resources was constrained, as many of the anticipated effects take time to materialise.

Fisher Compliance

Findings

Most fishers consider themselves to be largely compliant.

- Two-thirds of Fisher Survey respondents rated themselves as fully compliant with fisheries regulations overall (self-assessed compliance score of 10 out of 10), increasing to 80% including those rating themselves as nearly full compliance (score of 9 out of 10).
- This is in line with the views of MMO interviewees, who also thought that most fishers are largely compliant.

Most fishers consider their own compliance to be better than that of others.

- Fisher Survey respondents considered the compliance of other fishers in their local fishery to be lower than their own compliance. Around a quarter of respondents rated other local fishers as being fully compliant / almost compliant (score of 9 or 10), with another quarter reporting low compliance in the local fleet (score of 5 or less).
- Perceptions of fleet compliance in 2019 was broadly in line with that of 2018, according to Fisher Survey respondents.

Compliance varies across different aspects of fisheries rules and regulations.

- The highest compliance levels (approximately four fifths of respondents rated themselves as fully compliant) were reported for Access Restrictions and Licence Conditions.
- The lowest compliance was reported for Catch Reporting, which may have been influenced by the launch of the under 10m vessel catch app in 2019.
- Fixed gear fishers reported higher compliance levels than towed gear fishers. This mirrors the distribution of MMO sanctions across vessel gear types.

The MMO data collection system provides limited support for monitoring or assessing compliance and performance.

- The datasets collated by the MMO are not well set up for monitoring or assessing compliance performance indicators or to feed into operational management on the ground.
- There is no coherent data collection on fisher behaviour that could be used to better monitor performance against compliance indicators. This is particularly important given the inherent challenges in obtaining data on rates of compliance.

Implications

- *Self-reported compliance rates imply that the MMO's risk-based approach to control and enforcement is appropriate.*

- *MMO data collection is extensive but does not support analysis of defined (non)compliance metrics. Such metrics could however be used to demonstrate performance against regulatory objectives, better target and design interventions that address the range of compliance drivers, as well as supporting live decision making by officers on the ground by providing them with valuable background information on fishers.*

Delivery of the increased control and enforcement resources

Findings

The increased budget has delivered an increase in human resources and assets broadly in line with what was planned.

- A total of 58 new control and enforcement operational roles were recruited into, of which 53 are still in post, compared to a plan for 62 new roles.
- A new recruit training programme was successfully rolled out and delivered warranted officers faster than previously. Some weaknesses, including lack of trainee support from mentors and gaps in the development of Marine Enforcement Officers' (MEO) softer skills, were identified.
- Coastal offices saw a net increase in MEO numbers but a net loss in experience, as established MEOs were promoted to staff new fisheries patrol vessels (FPVs) and/or train new recruits and most new recruits had low levels of experience.
- New central intelligence and investigations teams were established.
- Two new dedicated fisheries patrol vessels (FPVs) were brought into operation in 2019, under agreement with a commercial provider, and have enabled the MMO to have an effective at sea presence independent of other providers.
- A new Memorandum of Understanding with the Maritime and Coastguard Agency (MCA) provides for a flexible increase in aerial surveillance capacity if it is needed.

The increase in capacity has enabled the MMO to achieve a stronger, multi-location physical presence and inspect a greater proportion of the fleet and premises more often.

- The number of inspections delivered between April and December 2019 increased significantly on the same period in 2018[1]: inspections of vessels in port (up 79%), vessels at sea (up 171%), of markets/premises (up 119%) and of vehicles (up 167%). All were significantly higher than at any point since 2011[2] (2012 for at-sea vessel inspections). Inspection targets were newly implemented, although were not always met.
- Fisher Survey, Sanctioned Fisher and MMO interview evidence indicated that fishers are aware of this increase in activity ashore, but are less aware of it at sea. Comparing fisher perceptions to the Baseline Survey, the proportion reporting that the MMO has a visible presence at sea decreased in 2020 (30%, down from 42% in 2019). In terms of perceived changes relative to the previous year, 11% reported that the MMO had become more visible in the last 12 months, but the majority (68%) perceived no change, and 15% said the MMO was less visible at sea. These patterns were recorded for both 10m and under and over 10m vessel operators.
- The proportion of Fisher Survey respondents who had been inspected at sea at least once in the previous 12 months increased from 36% in the Baseline Survey to 57% in the Fisher Survey, and the proportion inspected more than once increased from 25% to 37%. The

[1] The increase in resources came on stream from the start of the 2018/29 financial year.

[2] The earliest year for which data was available.

equivalent for ashore inspections saw an increase in those inspected at least once from 48% to 77%, and more than once from 32% to 61%.

- The spatial, temporal and fleet coverage of inspections increased. The spatial footprint and intensity of surveillance and inspections at sea and on land increased. More vessels were inspected more often. Out of hours inspections increased in line with the increase in standard hours inspections.

More informed, responsive, and coordinated tasking was supported by the FPVs and central intelligence team. However, informal intelligence is not systematically captured. An increased case load is being better managed.

- The increased capacity and control over at-sea assets enabled by the FPVs has allowed the MMO to be more reactive to intelligence. The central intelligence team has supported more systematic use of intelligence. When it occurred, the tasking of the FPVs in response to aerial surveillance is reported to have worked well.
- MEOs were able to spend more time engaging with fishers (via inspections and informally), which should improve the flow of information from fishers. However, weaknesses remain in capturing informal intelligence by MEOs and information proactively reported by fishers.
- The value of intelligence is undermined by IT system limitations coupled with a relatively inexperienced team, as well as issues with the quality of communication between central and local teams.
- The additional team members within the dedicated intelligence and investigations team appear to have enabled more investigations to be carried out and closed over shorter time periods, although current data prevents accurate analysis.

The new FPVs had a marked impact on the capacity of the MMO to conduct inspections.

- The infringement detection rate of at sea inspections increased markedly in 2019 (up from 20% in 2018 to 31% in 2019). It is unclear whether this reflects a higher quality of inspection delivered by MMO staff on FPVs compared to RN fisher officers, or a benefit of the improved tasking and responsiveness of the FPVs to investigate high-risk fisheries.
- For other types of inspection, the detection rate remained in line with previous years – there has been no drop off resulting from the increased capacity.
- The efficacy of each hour of FPV inspection time relative to the number of infringements detected is greater than for other inspection types (although FPV inspections also have a different cost profile and focus to other inspection types).
- The MMO as an organisation is developing at-sea inspection capacity and experience that can be advanced with the dedicated FPVs. Interviews highlighted that significant responsibility is placed on relatively inexperienced boarding officers to lead FPV patrols with attendant considerations for patrol efficiency, effectiveness, and safety at sea.

Sustaining these improvements is dependent on resources being maintained.

- Many of the benefits arising from the investments are at risk if the new staff recruited and trained on short term contracts are not retained at the end of the funding period. Uncertainties about contracts being extended was given as a reason for trained MEOs leaving the MMO.
- Resourcing the FPVs is challenging. Crews may have to travel significant distances to staff the FPVs and patrol in areas for which they have little local fisheries knowledge. Resourcing is reliant on MEOs 'volunteering' for at-sea patrols.

Implications

- *Addressing weaknesses in MEO training and contracting is important to better support MEO retention and MEO-fisher relationships.*
- *Further refinement is necessary to calibrate appropriate inspection targets. Revisiting inspection target levels and issues (see following bullet) in line with a clear strategy and process that links inspections, (non)compliance indicators, data collection and analysis would support tracking and measurement of inspection efficacy.*
- *Performance targets could cover a broader set of issues (such as time informally engaging fishers) to better reflect the wider role of an MEO. This may provide greater incentive for delivering non-inspection activities that can positively influence voluntary compliance drivers.*
- *There were notable improvements in MMO's presence at sea enabled by having full exclusive command of the new FPVs. This arrangement should be maintained to further enhance MMO visibility at sea and to avoid reliance on the RN, and to continue the development of MMO staff at-sea experience.*
- *Long term patrol plans may help to manage staff and vessels better and avoid at-sea staff attrition. An increased proportion of MEOs contractually obliged to participate in at-sea patrols may ensure the longer-term viability of the FPVs. This may require additional employee incentives and training. Incentives for at sea patrols should be sufficient to ensure full utilisation of at- sea assets and to build experience over an extended period.*
- *Improvements to better leverage the value of informal intelligence may include tools and guidance to support MEOs record informal intelligence on MMO systems that interface with inspection reports and other intelligence sources.*
- *A clear process for anonymous provision of intelligence by fishers could be established and promoted, which should be supported by a transparent structured system to record, process and action received intelligence, (linking to the broader data system improvement recommendation).*

Creating an effective deterrence effect

The deterrence logic model developed for the evaluation proposes that control and enforcement activity will deter non-compliance due to increasing the risks of inspection, detection and sanction. This was explored in the research.

Findings

Deterrence drivers (severity of sanctions and likelihood of inspection and detection) were considered important in deterring non-compliant behaviour, regardless of a fisher's level of compliance

- Respondents to the Fisher Survey were asked to rate how important different drivers were to them when making decisions about whether to comply with fisheries regulations. Eleven drivers were presented to fishers (9 voluntary drivers and two deference drivers) and the two deterrence drivers were ranked fourth and sixth: 69% reported the 'potential severity of sanctions' to be important, and 65% considered the 'likelihood of inspection or infringement detection' as important.
- A regression analysis of drivers of compliance using Fisher Survey data found that deterrence drivers do not explain variation in fisher compliance. This means that deterrence drivers (e.g. the likelihood of being inspected, whether the severity of sanctions are a concern) were not good predictors of differences in compliance levels. This is not the same as saying that deterrence drivers do not have an impact on compliance.

Chances of being inspected were perceived to be low, more so for at sea than in port, but have increased since the roll out of the additional resources

- 50% of respondents felt there was a greater than 25% chance of being inspected in port on their next fishing trip, which was 8 percentage points up on the baseline survey.
- Perceptions of the chances of being inspected at sea were lower, with 31% feeling there was a greater than 25% change of being inspected on their next fishing trip; this also was up 8 percentage points on the baseline survey.
- When asked explicitly about the change in chances of inspection over the last year, just over one third (37%) felt chances of inspection had increased in port and just over a quarter (27%) at sea.

Chances of infringements being detected were also felt to have increased over the last year

- Overall, a similar proportion of Fisher Survey respondents reported it to be likely that infringements would be detected during an inspection as reported it to be unlikely.
- Of Fisher Survey respondents, 32% thought that the chances of an offence being detected had increased over the last year compared to 6% who said it had decreased (no comparable question was asked in the Baseline Survey).

The severity of sanctions were a concern to fishers

- The majority (62%) of Fisher Survey respondents agreed that a detected offence would result in a sanction, and that the severity of sanctions was a concern to them (77%).

Positive relationships were found between regulators' control activity (MMO visibility and frequency of inspections) and the control-related deterrence drivers (likelihood of being inspected and likelihood of infringements being detected).

- Fishers who thought that the visibility of the MMO was high were more likely to also think that the likelihood of inspection and detection was high.
  - Nearly 85% of Fisher Survey respondents who reported a greater than 50% chance of being inspected ashore during or after their next fishing trip agreed that the MMO is visible ashore, compared to 60% of those who reported a less than 50% chance.
  - Nearly 55% of Fisher Survey respondents who reported a greater than 50% chance of being inspected at sea during or after their next fishing trip agreed that the MMO is visible at sea, compared to 29% at-sea of those who reported a less than 50% chance.
  - 83% of Fisher Survey respondents who think the MMO have a visible presence felt infringement detection in port / ashore was likely, compared to 48% who thought it was unlikely.
- Fishers recently inspected by the MMO were more likely to think they would be inspected again (just 7% of Fisher Survey respondents who had not been inspected felt the inspection likelihood in port on their next fishing trip was greater than 70% compared to 23% who had been inspected three times or more). A weaker relationship was found between inspection history in port and perceived likelihood of offence detection.
- Neither receiving a sanction, opinion on the effectiveness of the MMO, nor the likelihood of hearing about sanctions applied to other fishers were associated with differences in fishers'

opinions on the likelihood that an offence would result in a sanction or on the severity of sanctions.

- A number of the variables which may influence these deterrence drivers also increased (such as experience of being inspected, MMO visibility in port). A notable exception was MMO visibility at sea, which was reported to be lower than in the baseline despite the evident increased MMO presence at sea.

No direct evidence to conclude on the extent to which increases in control and enforcement activity have deterred non-compliant behaviour

- The research did not aim to assess differences in levels of compliance before and after the increased resources due to the complexities of measuring compliance, having no solid baseline, and the lack of time between the implementation of the new resources and evaluation activity.
- A crude assessment of fishers' perceptions of compliance within the local fleet in fisher surveys before and after the increased resources did not show any significant variation between the two years.
- A small number of examples of the effectiveness of the increased deterrence were identified. These related to the role of the FPVs.
- Given that survey respondents regard the likelihood of inspection and infringement detection important compliance drivers, and that many perceive there to be an increased chance of these happening over the last year, the signs are positive.

There remain challenges with creating a sufficient deterrence effect

- At fleet level, some examples of general deterrence impacting positively on local fleets were identified. At a more granular level, the picture is more nuanced.
- Among fishers who have been sanctioned, examples were identified of fishers taking corrective action to avoid reoffending, but also examples of sanctioned fishers whose rule-breaking continued post-sanction.
- Persistent offenders appear to be less influenced by deterrence drivers with some taking active steps to avoid detection, including studying MMO operating patterns. Anecdotal reports suggest some fishers may include potential sanction costs in their operating model.
- Some MMO interviewees raised questions regarding the effectiveness of fines and whether there is sufficient focus placed on seeing infringements through the sanctions process.

Implications

- *Where appropriate, tighter regulatory controls may be needed, alongside control and enforcement investment, to sufficiently affect deterrence. Should additional regulatory change be necessary, the MMO should fully explore the impacts on fishers' operational flexibility, particularly for the coastal fleet*
- *For persistent offenders and those determined to ignore regulations, alternative control and enforcement models may be required. For example, imposing full transparency of fishing operations.*
- *The apparent deterrence effect linked to MMO visibility (e.g. behavioural change within the vicinity of an FPV) suggests mandatory use of remote surveillance technologies could create a more permanent effect of being surveyed, but with reduced MMO physical presence required.*

- *Procedures through which decisions are made for proceeding with prosecutions could be reviewed to ensure all viable cases are being taken on.*
- *Investigations may be better supported with financial analyses of the offending business and vessel-specific compliance performance data to support sanctions being set at appropriate levels and better targeted to the circumstances and fisher history.*
- *This evidence base could support increased awareness in courts of the rationale for recommended sanctions.*

Encouraging voluntary compliance

The voluntary logic model developed for the evaluation proposed that regulator activity can increase fisher capability to comply as well as positively impacting attitudes towards regulations and the regulator, social norms and personal morals so that fishers choose to comply, irrespective of the deterrence effect of control and enforcement.

Findings

Voluntary drivers (e.g. fishers attitudes towards regulations and the regulator) were ranked by fishers as being of greater importance than deterrence drivers and were found to explain more of the variation in compliance levels

- The three compliance drivers that fishers stated as being of most importance to their compliance were all voluntary drivers. Around four fifths of Fisher Survey respondents rated as 'very important' or 'important' 'your reputation as a fisher' (85%), 'your awareness and understanding of the regulations' (83%), and 'sense of moral duty / do the right thing' (77%).
- However, in general, less compliant fishers appear less concerned about 'positive' voluntary drivers, such as their reputation and other fisher approval.
- Based on a regression analysis using Fisher Survey data, 'awareness of the regulation' and 'disapproval of other fishers' were found to be the drivers that explained the largest amount of variance in fisher compliance, for three of the four regulation categories (Technical Conservation Measures, Catch Reporting and Control Requirements, Licence Conditions).
- Compliance with Access restrictions had a notably different set of drivers to these three – it was the only category where the opportunity to save costs / improve catch value was significant (and this was the only significant variable).

When explaining their reasons for offending, fishers typically cited voluntary drivers.

- Being unaware they were doing something wrong was the joint most common reason given by fishers responding to the Fisher Survey and Sanctioned Fisher interviews for their non-compliance.
- Whilst most fishers agree with the principle of regulation (87% of Fisher Survey respondents agree that fisheries regulation are necessary), disagreement with actual regulations was the joint most common reason given for non-compliance by Fisher Survey respondents.
- Lack of regulatory awareness and disagreement with regulations may enable fishers to justify their non-compliance based on (actual or fictitious) claims of poor regulatory design and communication, and the challenges of operating a fishing business faced with a changing regulatory environment.
- By far the most frequently cited reason for infringement of Catch Recording was that it was 'too difficult' to comply with.

Awareness of regulations is one of the most important drivers of compliance and is an area the MMO could readily target for improvement.

- Less compliant fishers tend to have lower levels of awareness of fisheries rules and regulations.
- The role of MEOs to directly educate and raise awareness of regulations is recognised by the MMO and fishers. However, responses to the Fisher Survey indicate that fishers consider other fishers, social media (for 10m and under fishers) and Producer Organisations (for Over 10m fishers) to be more important sources of information.
- Fishers and the MMO recognised that there are issues with the volume and complexity of information provided by the MMO and with inconsistent advice being provided by MEOs. Fishers indicated that this undermines their engagement with, and trust of, MMO communications and advice.
- MMO interviewees and Fisher Survey respondents indicated that the increased resources have allowed for greater MEO-fisher interaction and hence the potential for provision of advice. It is not clear whether this has impacted on general awareness levels.

Attitudes towards the regulations and regulator are important drivers of compliance, but the MMO's current approach to control and enforcement is unlikely to deliver significant changes in fisher attitudes

- Fishers generally agree with the principle of regulation, but do not always agree with the actual regulations. Fishers may disagree with regulations for a variety of reasons, including: impact on profitability / threat to livelihoods, perceived fairness, appropriateness for the issue being addressed, appropriateness for local conditions and local fishery characteristics, and responsiveness / flexibility of the regulations and underpinning scientific data to changing conditions.
- Negative attitudes to the regulations and regulator are nearly always associated with negative opinions on fishers' relationships with the MMO and extent of involvement in fisheries management. Many Sanctioned Fisher and Fisher Survey respondents reported that MEO-fisher relations suffer from an "us versus them" mentality.
- Fisher Survey responses indicate that fishers with poor MMO relationships, and those who feel like they have less of a say in fisheries management, are more likely to have negative views on the regulations.
- Several MMO interviewees indicated that the increased interaction with fishers, enabled by having more MEOs, was improving MEO-fisher relations, and that this was appreciated by fishers. However, fishers raised issues regarding the experience and attitudes of MEOs, particularly new MEOs.
- Most Fisher Survey respondents (57%) stated that they have a good relationship with the MMO. This is broadly unchanged to opinion in the previous year (58%).
- The lack of meaningful involvement of fishers in fisheries management was raised by all stakeholder groups: MMO interviewees, Sanctioned Fisher Interviewees and Fisher Survey respondents. Only 15% of Fisher Survey respondents agreed that they have a say in how fisheries are managed.

Social norms may be of greater importance to more compliance than less compliant fishers

- Of Fisher Survey respondents, 76% agreed that other fishers would disapprove if they were non-compliant. Concern for their reputation was the top ranked driver that Fisher Survey respondents stated to be of importance when making decisions about compliance (85% said it was very important / important)

- Opinion on whether other fishers would disapprove of non-compliance was found to be a significant explanatory variable of levels of compliance with three of the four categories of regulations. However lower compliance is also associated with lower concern about reputation, and lower expectation that other fishers would disapprove.
- Fisher Survey respondents indicated that the compliance of others was important to them (91% agreed). However, it was one of the lower ranked drivers that Fisher Survey respondents stated to be of importance when making decisions about compliance (53% said it was very important / important). Other fishers not complying was the least frequently reported reason for why Fisher Survey respondents had been non-compliant.

Implications

- *MMO communications design and delivery may benefit from a review to maximise their reach and usefulness for fishers, taking into account the sources of information highlighted as important to the different groups in the Fisher Survey.*
- *The process by which fisher enquiries are dealt with should be reviewed and strengthened with appropriate recording and actioning processes to ensure adequate formal consideration is given to enquiries received. It should provide opportunity for MEOs to seek adequate support before providing advice, and a system of advice provision verification to ensure accuracy and consistency.*
- *Genuine co-management of fisheries, whereby fishers have a decisive role in shaping the management environment supported by established access rights (as adopted in countries like New Zealand), is recognised to be a challenging proposition in the UK as the organisation and representation of the fleets, particularly the 10 metre and under fleet, is weak. Increased fisher participation offers the chance of more fundamental changes in fisher attitudes, in a way that is unlikely under the current model. A more achievable model, at least in the short-term, could be to further develop and strengthen the existing industry-Government consultation and liaison groups.*
- *Finding a balance between regulatory stability to enable business planning and flexibility to reflect local / regional variability may increase the incentive to comply with regulations, as fishers feel that the regulatory design and implementation better reflects the complexities of fishing businesses and the challenges of investing and operating in small scale fisheries.*
- *The MMO could make greater use of the idea of earned recognition – as embodied in the MMO's 'trusted customer model' – linked to a flexible approach to control activities, whereby fishers more directly recognise the benefit of voluntary compliance.*
- *Greater focus could be placed on equipping MEOs with the skills, experience and opportunities to better build relationships with fishing communities. For example, spending time as invited observers aboard fishing vessels to gain familiarity with fishing operations and to develop positive relationships with vessel masters and owners. Increasing MEO awareness of the practicalities and challenges of fishing operations may further improve relationships between MMO and the fishing industry.*
- *MMO may consider how to create stronger compliance incentives through the fisheries supply chain. For example, there may opportunities to engage with sustainable fisheries certification marques that emphasise transparency in the supply chain (e.g. Marine Stewardship Council), to strengthen audit sections related to control and enforcement, target communications and dialogue with important buyers of nationally caught seafood to encourage buyer-directed pressure of fishing businesses to comply with regulations, or other possible assurance schemes.*

Acronyms

AIS	Automatic Identification System
BF	Border Force
Defra	Department for Environment, Food and Rural Affairs
EEZ	Exclusive Economic Zone
EU	European Union
FAPs	Financial Administrative Penalties
FPV	Fisheries Patrol Vessel
IFCAs	Inshore Fisheries and Conservation Authorities
IUU	Illegal, Unreported and Unregulated Fishing
JMOCC	Joint Maritime Operations Coordination Centre
MCA	Maritime Coastguard Agency
MCSS	Monitoring Control and Surveillance System
MEO	Marine Enforcement Officers
MMO	Marine Management Organisation
NM	Nautical Miles
NMIC	National Maritime Information Centre
OBC	Outline Business Case
PFV	Prosecution File Vessels
RN	Royal Navy
SFM	Sea Fisheries Management
VMS	Vessel Monitoring System

1 Introduction

In response to the UK's exit from the European Union (EU), the Marine Management Organisation (MMO) was allocated additional resources for fisheries control and enforcement activity from late 2018/19 to 2019/20, totalling £16.5 million as part of a requested budget increase for a full four-year period. This additional resource represented a significant increase (140% higher than the anticipated budget), in the available resources for control and enforcement.

ICF, MacAlister Elliott & Partners and Howell Marine Consulting were commissioned by the MMO to conduct an evaluation of control and enforcement delivered by the MMO in relation to fisheries management. The evaluation assessed what the additional resources are delivering, how effective control and enforcement activities are at ensuring compliance with fisheries management rules and regulations, and developed a more general understanding of compliance in fisheries management in England.

This evaluation report is structured as follows:

- Section 1: An overview of the evaluation context, aims and scope.
- Section 2: The evaluation framework, summarising the key evaluation questions and approach to address them.
- Section 3: Analysis of current levels of compliance.
- Section 4: Findings of the process evaluation, which explores the changes delivered by the increased budget and their impact on the MMO's operational effectiveness.
- Section 5: The drivers of compliance, examining the extent to which different drivers motivate compliance and non-compliance.
- Section 6: Analysis of inspection and detection deterrence drivers, to understand their relationship with control activities, and investigate changes in those deterrence drivers resulting from the increased budget.
- Section 7: Analysis of enforcement deterrence drivers, to understand their relationship with enforcement activities, and investigate changes in those deterrence drivers resulting from the increased budget. The section also includes an analysis of the patterns of MMO enforcement and sanctioning activity.
- Section 8: Analysis of voluntary compliance drivers, identifying those that are most influential in supporting voluntary compliance, the extent to which the increased budget has influenced them and how they might be further enhanced to incentivise good compliance.
- Section 9: Conclusions based on insights from the evaluation evidence.

1.1 Context

1.1.1 Control and enforcement context

The MMO is responsible for control and enforcement of all fishing activities in English waters. The MMO's approach to fisheries control and enforcement is risk-based and intelligence-led. Data (satellite, catch recording and intelligence) is used to guide where assets (typically at sea vessels) and resources (predominantly people) are

deployed to undertake inspections. In addition, MMO provide advice and guidance to industry to facilitate compliance.

Box 1 Defining control and enforcement

For the purposes of this evaluation, the following terminology is adopted for 'control' and 'enforcement':

Control

The operational activities and processes related to the monitoring of sector activity.

- Vessel licensing
- Remote surveillance – not all vessels
- Surface surveillance
- Aerial surveillance
- Reporting by fishing vessels and fish merchants – varies by fleet segment
- Inspections (at sea and shore-based) - any official check regarding compliance with fishing rules and regulations and which is noted in an inspection report
- Data analysis, including collection, validation and verification of fishing activity data and intelligence
- Communications – advice and guidance
- Remote Electronic Monitoring – pilot projects only
- Intelligence sharing

Enforcement

Actions taken to investigate detected offences and implement the application of sanctions

- Oral advice
- Advisory letter
- Official written warning
- Financial Administrative Penalties
- Seizure and disposal of goods and fish, e.g. illegal fishing gear
- Imposition of conditions on operating
- Variations of permits or licences
- Prosecution and points applied to English-registered licences if convicted of a serious infringement and possible suspension or revocation of licence
- Sanctions under the IUU fishing regime
- Proceeds of Crime proceedings

Following EU Exit and after the transition period the UK will be leaving the Common Fisheries Policy. The UK will become an independent coastal state and will need to control and manage access for those permitted to fish in the UK's territorial waters and Exclusive Economic Zone (EEZ). Under differing EU Exit scenarios, existing fishing arrangements may or may not continue to apply. Under 'no deal' the English waters will be closed to EU vessels that have a strong economic imperative to continue to fish in them. Under an Implementation Period, existing arrangements may continue, potentially leading to frustration in the UK fishing fleet who may be anticipating economic benefit from immediately 'taking back control.' As such there may be increases in non-compliance among non-UK vessels no longer permitted to fish in English waters, and/or an increase in non-compliance among the domestic fleet.

EU Exit will bring new control and enforcement requirements, particularly in English waters. Geography (i.e. proximity to the EU), history (in terms of where EU vessels have traditionally fished), and the numbers of EU fishing vessels operating in English waters mean that in any EU Exit scenario (e.g. a 'no deal' scenario or 'implementation period' scenario), there will be significant new control and enforcement challenges.

In addition, evolution in fisheries policy and control and enforcement operations outside of that associated with EU Exit is also presenting new challenges for the MMO. For example, the introduction of electronic catch recording for the under 10m fleet, the implementation of the landings obligation, and the introduction of Inshore Vessel Monitoring Systems are altering the monitoring and control environment with likely implications for compliance.

1.1.2 Fisheries control and enforcement budget

1.1.2.1 Increased budget: level and duration

In view of the anticipated control and enforcement challenges arising from EU Exit, and wider changing context, the MMO requested a four-year budget increase. The MMO received an additional £3.3m in 2018/2019 and £13.2m in 2019/20 bringing the total increase in budget to £16.5m (see Table 1.1). The additional funds increased the expected budget for the 2018/19 and 2019/20 period of £11.8m by 140%, and reversed budget declines seen in recent years. To-date, a further one-year extension has been granted, providing a further additional £11.1m for the period 2020/21.

Table 1.1 MMO control and enforcement budget: baseline and additional funding

	2010/11	2016/17	2017/18	2018/19	2019/20
Baseline actual/expectation[(a)]	£14.6m	£7.0m	£6.3m	£5.9m	£5.9m
Additional funding provided[(b)]	-	-	-	£3.3m	£13.2m
Combined total	£14.6m	£7.0m	£6.3m	£9.2m	£19.1m

Source: (a) MMO (2018). Marine and Fisheries Control and Enforcement (FI002). Outline Business Case (OBC). Version No: Draft 1.5. Issue Date: 1st August 2018; (b) MMO pers com (29.06.20)

1.1.2.2 Aims of the increase in control and enforcement budget

The requested budget increase aims to strengthen operational control measures to ensure that fishing activity in English waters can be effectively managed when the UK is an independent Coastal State. UK government anticipates that stronger control and enforcement will be necessary to maintain the integrity of English waters, to demonstrate compliance with international sustainable fishing obligations, and to manage the increased risk of non-compliant fishing.

The specific investment objectives[3] of the increased budget are:

- Detect, deter and enforce against illegal, unreported and unregulated (IUU) fishing in English waters to demonstrate control.
- Demonstrate regulatory equivalence and sustainability to enable trade in seafood products.
- Ensure control and enforcement systems are functional, resourced and supported to facilitate delivery of the two investment objectives, above.

[3] As stated in the budget increase business case (MMO (2018). Marine and Fisheries Control and Enforcement (FI002). Outline Business Case (OBC). Version No: Draft 1.5. Issue Date: 1st August 2018)

1.2 Evaluation objectives and scope

1.2.1 Objectives

The primary aim of this project was to carry out an evaluation of MMO control and enforcement activities relating to fisheries management. More specifically, this evaluation aimed to:

- Assess what has been delivered by the increased control and enforcement budget, and whether the resources were operating as intended.
- Assess the effectiveness of the MMO's control and enforcement actions and the impact of the increased resources on this.
- Develop an understanding of the levels of compliance with fisheries rules and regulations within the fishing industry, including factors that influence compliance.

In delivering against these aims, the evaluation provides evidence and lessons that can support the MMO in making decisions about where, how and at what level additional resources may be most effectively committed; including how best to implement changes in resource levels.

The evaluation focused on the current situation regarding control and enforcement and compliance, and how it is being affected by changes in capacity and capability delivered by the increased budget. The evaluation did not assess the extent to which control and enforcement resourcing and effectiveness is sufficient to ensure that fishing activity in English waters can be effectively managed when the UK is an independent Coastal State; nor the extent to which the MMO will be able to address potential compliance issues that could occur following EU Exit. Both points were outside the scope of the evaluation.

1.2.2 Evaluation scope

The key parameters of the evaluation are:

- The additional increased budget allocated to the MMO since April 2019[4].
- All fisheries and fishing activity within English waters, including UK and foreign (non-UK)[5] vessels.

The evaluation places greatest emphasis on English vessels, and less emphasis on non-English vessels and on the non-catching sector (e.g. merchants). Constraints on primary research (see Section 2) with non-English vessels meant that evidence on non-English vessels is very limited.

The counterfactual situation represents the state of control and enforcement (and any given indicator) had the increased budget not been implemented. Under the counterfactual it was assumed that current budget would have been the similar to the previous year (as shown in Table 1.1).

[4] However, the evaluation recognises that the budget increase commenced prior to this date and preparatory work, including hiring of some new staff, was undertaken before this date. Much of the performance and outcome data is considered for the calendar year of 2019, however key output data (e.g. number of inspections) are also analysed for the 9-month period from April to December 2019.

[5] Practical and political constraints meant the evaluation research focussed on English vessels.

2 Evaluation Framework

2.1 An intervention logic for the increased control and enforcement budget

This section sets out the causal pathways through which the increased control and enforcement budget aims to achieve its fisheries management objectives. It is based on a literature review, familiarisation interviews undertaken with the MMO at the start of the evaluation, as well as feedback on drafts provided to the MMO.

The primary goal of control and enforcement action is ensuring compliance with fisheries rules and regulations. The extent of compliance, along with the adequacy of regulatory design, and external factors (e.g. environmental conditions), collectively determine whether fisheries management objectives are met.

Compliance is determined by the motivations and capacity of fishers. The role and nature of these can be explained via theories of compliance. Regulator responses that seek to improve compliance can be tailored to respond to fishers' rationales for being non-compliant or compliant[6]. Hence understanding what behavioural drivers are influential, and the extent to which control and enforcement activity is able to influence those drivers, can support improved control and enforcement investment and operational decision making.

Understanding of the drivers of compliance has evolved over time. Initial theories recognised motivations of short-term economic self-interest[7], which expected fishers to balance the potential financial rewards of non-compliance with the risk of costs if enforcement action were taken against them. A regulatory 'deterrence' strategy responds to this theory by seeking to shift the perceived risk-reward balance. A far broader set of potential drivers on fisher compliance are now also recognised, which consider the influence of capabilities, attitudes towards regulations and the regulator, social norms and personal morals. Regulatory responses that influence these drivers seek to encourage fishers to voluntarily comply, regardless of the prevailing deterrence effect of control and enforcement. Ultimately, several different deterrence and voluntary drivers may act in concert[8], hence regulators may deploy a combined strategy that seeks to ensure compliance through both deterrence and voluntary means.

Control and enforcement activity can influence the behaviours of fishers by affecting the drivers of compliance, such that fishers choose and are able to undertake their fishing activity in compliance with rules and regulations. Control and enforcement activity may directly and indirectly influence both deterrence and voluntary drivers. Although other contextual factors may also influence fisher behaviour.

Figure 2.1 and Figure 2.2 present logic models for the enhanced control and enforcement budget. A logic model is a visual representation of the main activities of an intervention and what they are expected to achieve. The logic models include:

- Activities: activities that deliver the control and enforcement regime
- Outputs: what is directly produced by the activities

[6] This idea is encapsulated in the responsive 'regulatory pyramid' proposed by Ayres, I. and Braithwaite, J. (1992) Responsive Regulation: Transcending the Deregulation Debate. Oxford University Press, New York.

[7] Becker, G.S. (1968). Crime and punishment: an economic approach. Journal of Political Economy, 76: 169-217

[8] Étienne, J. (2010). Compliance Theories. A literature review. Presses de Sciences Po. Revue française de science politique, 60: 493 – 517

- Operational outcomes: the operational results delivered by one or multiple activity outputs[9]
- Compliance driver outcomes: factors that affect fisher compliance – which can be classified as either deterrence or voluntary driver outcomes
- Compliance impacts
- Fisheries management objective impacts

Changes in outputs and operational outcomes influence fishing behaviour by influencing the drivers of that behaviour. Control and enforcement has a clear and direct link to deterrence drivers. Conversely the relationship between control and enforcement and voluntary compliance drivers is less well established. Two logic models are presented: one shows links between control and enforcement and deterrence drivers (Figure 2.1), and the other the links between control and enforcement and voluntary compliance drivers (Figure 2.2).

The principal impact presented in the logic model is that of compliance. The implementation of the increased budget is expected to influence both deterrence and (some) voluntary compliance drivers so as to improve compliance.

The logic model recognises two other indirect impacts. Firstly, that good levels of compliance, by indicating the operational robustness of the control and enforcement regime is important for supporting access to international markets. Secondly, that good levels of compliance are only one factor[10] influencing wider fisheries management objectives such as achieving Maximum Sustainable Yield.

[9] Based on operational objectives stated in the increased budget business case (MMO (2018). Marine and Fisheries Control and Enforcement (FI002). Outline Business Case (OBC). Version No: Draft 1.5. Issue Date: 1st August 2018)

[10] Other factors include the appropriateness of the regulation/rules being enforced, climatic conditions/weather, etc.

Figure 2.1 **Deterrence** logic model for the increased budget

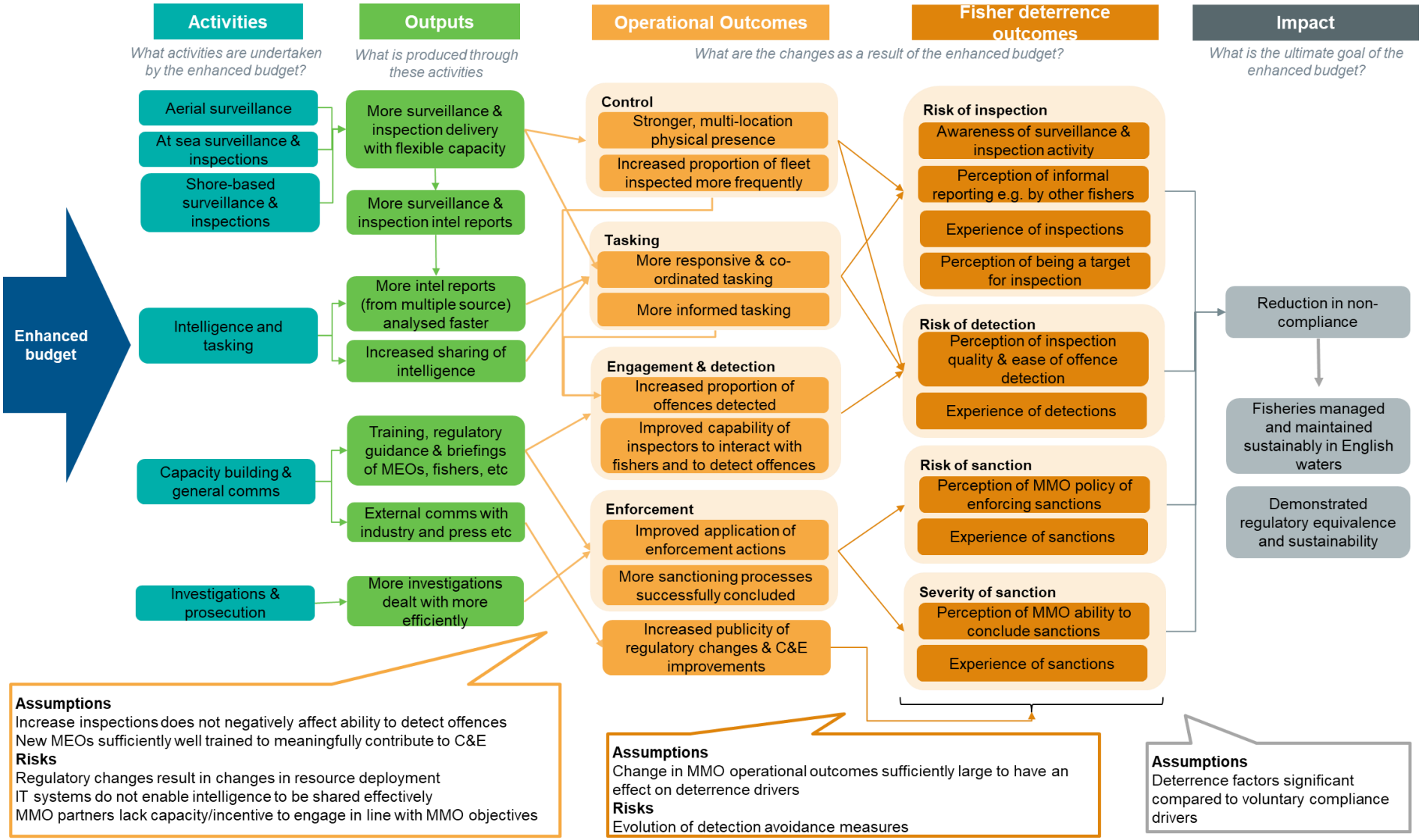
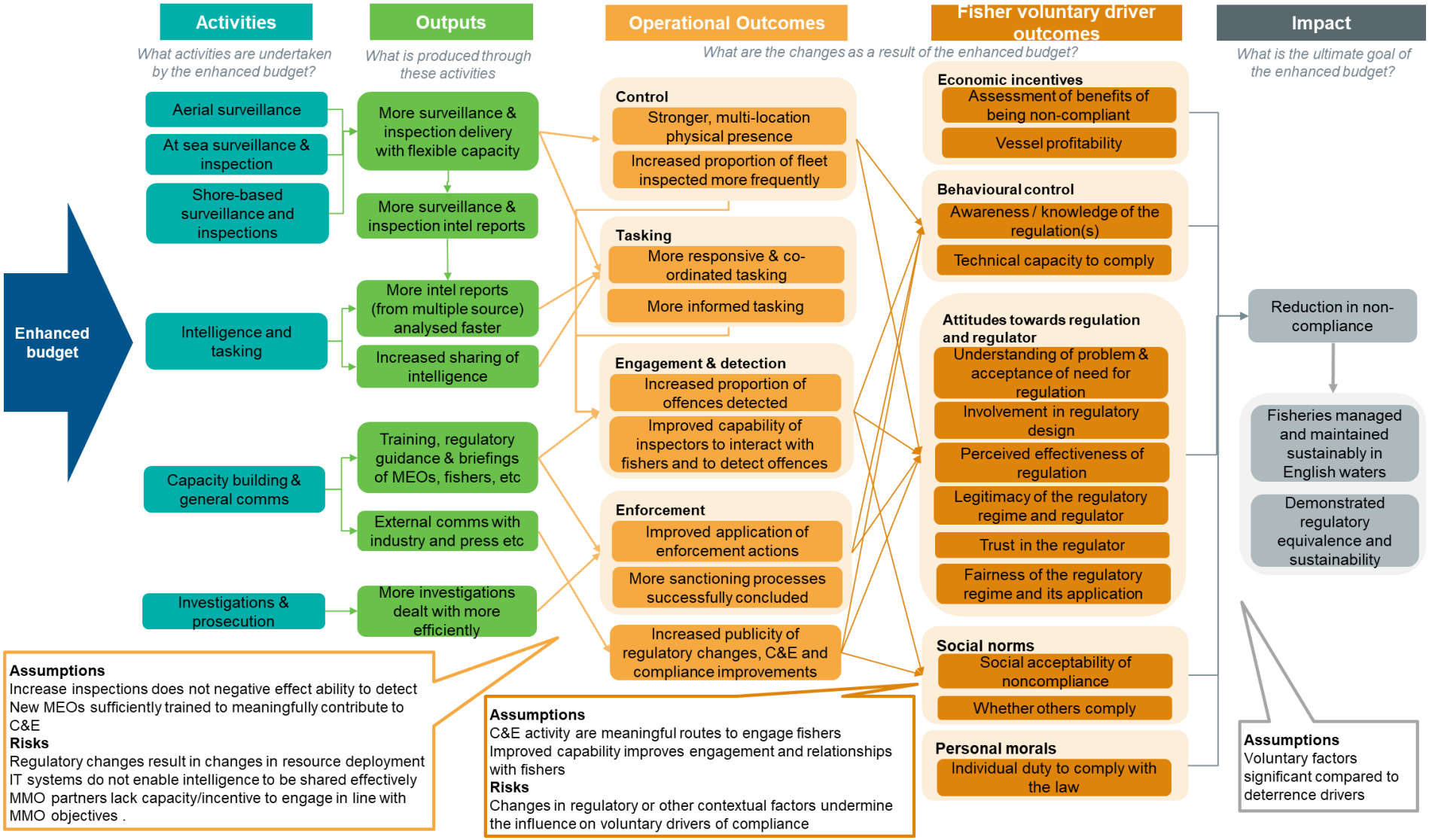


Figure 2.2 **Voluntary compliance** logic model for the increased budget



2.2 Evaluation questions

Evaluation questions are used to guide the evaluation research in relation to the overall objectives. An initial set of evaluation questions were reviewed and edited during the evaluation design phase. The final schedule of questions is presented in Table 2.1. They consider aspects of impact, process and learning. This evaluation report responds to these questions, to the extent permitted by the evidence collected.

Table 2.1 Evaluation questions and location of responding evidence in this report

Evaluation questions	Report section (hyperlinked)
Levels of compliance	
■ What is the current level of compliance within the fleet?	Section 3.2
■ Does compliance vary according to fleet characteristics?	Section 3.3
■ How have any contextual changes impacted on compliance and non-compliance?	Section 3.4
Delivery of the increased control and enforcement resources	
■ What has been delivered through the increased budget to date, and how does this compare to previous years?	Section 4.2
■ To what extent have the new resources contributed to their intended operational outcomes?	Section 4.3
■ What has worked well and less well in delivering the enhanced control and enforcement budget?	Sections 4.3 & 4.4
Local implementation of the increased control and enforcement resources	
■ How have the new resources been used by area offices?	Section 4.2.1
■ Have new approaches been tried? How successful have they been?	Section 4.3.1.3
■ What factors have impacted positively and negatively on delivery of the enhanced control and enforcement resources and activities at a local level?	Sections 4.3.1.3 & 4.4.1.2
Voluntary compliance:	
■ To what extent do different factors drive non-compliance?	Section 5
■ How can voluntary compliance be encouraged?	Section 8
■ What role does control and enforcement play in encouraging compliance?	Section 8
Compliance via control and enforcement:	
■ To what extent do different 'deterrence' factors influence compliance?	Section 5
■ What is the relative contribution of deterrence and voluntary factors in influencing compliance?	Section 5
Impact of control measures	
■ Is there evidence of changes in fishing behaviour that can be related to delivery of control measures?	Not addressed[11]
■ How are fishing locations and port landings affected by regulatory presence at sea and in the air?	
Impact of enforcement actions	
■ What enforcement actions are available to the MMO?	Section 6.3.4

[11] Insufficient evidence was available to enable the question to be responded to.

Evaluation questions	Report section (hyperlinked)
■ Which enforcement actions are the most effective and in what circumstances?	Section 6.3.4
■ What is the pattern of enforcement activity including offender characteristics, offence types, seasonality of offending and geographical areas covered?	Section 6.3.4
Relative contribution of control and enforcement activities	
■ What contribution does each strand of control and enforcement activity make to fishing behaviour?	Section 6
■ How effective is each strand?	Section 6
Industry perceptions / attitudes	
■ How have industry perceptions and attitudes of the factors that drive compliance changed and what contribution did the increased budget make to these changes?	Sections 6.3 & 7.5 & 8.3.2
Evidence of specific and general deterrence	
■ Has the increased budget resulted in an increase in the specific deterrence effect?	Sections 6.3.4 & 7.4
■ Has the increased budget resulted in an increase in the general deterrence effect?	Sections 6.3.4**Error! Reference source not found.** & 7.4
Interaction of surface and aerial surveillance	
■ What is the interaction between surface and aerial surveillance?	Section 4.5
■ What is the impact of the interaction in terms of effectiveness and efficiency?	Section 4.5
■ Has the increased budget delivered such effectiveness and efficiency gains?	Section 4.5

2.3 Evaluation research tools

The evaluation draws on four strands of research. A face-to-face Fisher Survey of English fishers, an interview programme with fishers who have received sanctions, an interview programme with MMO and other fisheries agency staff, and analysis of MMO control and enforcement secondary data sets.

This section provides a summary of the purpose, methods, and strength and limitations of each research tool - further details are provided in Annex 2.

2.3.1 Fisher Survey

Purpose: To provide evidence from the English fishing fleet active in English waters on:

- Compliance levels
- Drivers of compliance
- Changes in perceptions of control and enforcement, and other drivers of compliance, between 2019 and 2020

Method: A face-to-face survey was piloted among a sub-sample of 14 fishers in November 2019. The final survey was launched to the wider sample during January and February 2020. A total of 209 fishers (masters and/or owners) participated, representing approximately 7% of England administration registered fishing vessels. Questionnaires were completed in person at local ports. A ballot box approach[12] was used for questions on compliance.

Strengths and limitations: It is notoriously difficult to undertake surveys with fishers in person due to their highly flexible, non-standard working hours and practices. The sampling approach therefore drew on pre-arranged interviews with existing contacts, which were combined with next-to-pass[13] and snowballing[14]. This approach supported rapid achievement of the survey sample, minimising the extent to which the team were reliant on approaching fishermen on the quayside in the winter (when days were short and cold, and the weather, and therefore fishing opportunity, was very unpredictable), and the likelihood that the data collection period would have straddled other significant events (e.g. EU Exit) which may have undermined the validity of the collected data. It also aided the representativeness of the sample, by enabling engagement with fishers who may not have participated in surveys conducted through other media – most notably fishers with lower literacy who may not have participated in an online or postal survey. However, the non-random sampling approach means that a degree of sampling bias may have occurred, which may have negatively influenced the representativeness of the sample.

The survey successfully gathered information on a sensitive topic (compliance), which has not been sought from English fishers on such a comprehensive basis before. The ballot box approach provided a direct and clearly understandable approach to reassure fishers that their responses would remain anonymous, encouraging honest responses. However, the sensitive nature of the questions mean that a degree of response bias may have occurred.

Where comparisons (mainly by gear type, vessel length and main fishing area) are made between groups of respondents, only statistically significant differences are included in the report. Given the non-random sampling approach, these are only indicative of potential differences in subgroups within the general population. Further, the total sample (209) is relatively small, limiting the options for statistical analysis.

The sample of 209 responses was a significant achievement given the length of the survey, the subject matter, the fishing context, and the condensed timeframes for data collection. However, the sample represents approximately 7% of the population of registered English vessels, meaning caution should be taken when generalising from the results.

Some questions in the Fisher Survey mirror those of a 2019 Baseline Survey - an online survey with England fishers undertaken by the MMO in March 2019 with a sample of 361. Comparison of the results from these questions provide an indication of change between the two periods. Caution should be taken when comparing results from the two surveys due to differences in the survey methodologies and population sample compositions.

[12] An approach used to encourage honest responses to sensitive questions. See Annex A2.1 for further details

[13] Interviewees recruited through chance encounters when surveyor is visiting a port.

[14] Interviewed fishers were asked to pass on the interview invitation to, and directly suggest, fishers who may be willing to participate

2.3.2 Sanctioned fisher interview

Purpose: To gain both general and specific compliance insights from a sanctioned fisher's perspective covering the topics of:

- Drivers of compliance in relation to the offence(s) for which they were sanctioned.
- Whether their opinions/attitudes/compliance have changed as a result of receiving enforcement action.
- General opinions on compliance drivers and the role of control and enforcement.
- Opinion on changes in control and enforcement resulting from the MMO's increased resources.

Method: A mixed recruitment approach was adopted due to the challenges of identifying and contacting sanctioned fishers. This drew on: a follow-up request post-Fisher Survey; evaluation team networks; MMO email communication to a random sub-sample of fishers via the MMO's database; MMO local office direct engagement with fishers; and snowballing[15].

A total of 21 interviews were carried out between 31st January 2020 and 28th February 2020 through a combination of telephone and face to face. Interviews were recorded (where permission was granted) and transcribed or documented based on interviewer notes. A thematic analysis of interview transcriptions and notes was undertaken.

Strengths and limitations: The sampling approach and interview questionnaire design was successful in recruiting and completing the targeted number of interviews with a hard to identify subgroup of fishers on a particularly sensitive topic, which was explored in-depth to understand why fishers were non-compliant in specific situations. Evidence of this nature has not previously been gathered. A non-random sampling approach was necessarily adopted, which introduces an interviewee self-selection bias. The self-selection bias and small sample size (21) means the sample is unlikely to be representative of the sanctioned fisher population, hence the evidence is used to draw insights on the issues rather than make generalisations.

2.3.3 MMO and other fisheries agency interviews

Purpose: To provide information and opinions on both process and impact evaluation questions, specifically:

- The operational changes brought about by the increased budget and what worked well and less well.
- The impact of control and enforcement action in general, and as a result of the MMOs increase in resources.

Method: The interview sample included MMO marine enforcement officers, marine area managers, and individuals from relevant organisations who work in partnership with the MMO (e.g. Inshore Fisheries and Conservation Authorities (IFCAs), Department for Environment, Food and Rural Affairs (Defra) and devolved administrations). The total sample was 25, of which 18 were MMO staff. Interviews were conducted by telephone during February and March 2020. Interviews were recorded (where permission was granted) and transcribed or documented based on interviewer notes. A thematic analysis of interview transcriptions and notes was undertaken.

[15] Interviewed fishers were asked to pass on the interview invitation to, and directly suggest, fishers who may be willing to participate.

Strengths and limitations: This strand of evidence provided an opportunity for in-depth interviews with individuals involved with the operation and delivery of the programme, directly and indirectly. Response and social desirability bias may occur depending on an individual's awareness of and involvement in the increased budget planning and delivery. To mitigate this, MMO respondents were selected by the consultants to ensure a range of managerial and operational roles at differing levels of seniority were represented in the sample and responses were provided anonymously.

2.3.4 MMO secondary data analysis

Purpose: To support the assessment of control and enforcement activity, compliance and how the additional resources funded by the increased budget have been delivered and to what effect.

Method: A long list of potential indicators was identified based on preliminary discussions with the MMO about their datasets. An initial short list of over 40 indicators addressing 13 of the 27 evaluation questions was identified based on preliminary insights on the data held by the MMO. The MMO Statistics and Analysis team extracted the relevant datasets and made these available to the evaluation team. As the evaluation team worked through the datasets, additional data limitations were identified and discussed with the MMO. A final set of 18 indicators were deemed viable given the available data and were taken forward for analysis. A range of analyses were undertaken to develop the indicators.

Strengths and limitations: The MMO's data provide measures of the activity of the MMO, such as the number of vessel inspections being undertaken. This supported analysis of the nature of control and enforcement activity as well as changes in activity levels delivered during the 'with additional budget' period compared to preceding years, providing for a simple before-and-after analysis.

The MMO's repository of secondary data is extensive and detailed. However, identifying what data is available was not straightforward, and the data are not easy to use for analytical purposes. As a result, the initial list of 40 indicators identified at the inception phase was reduced to 18 viable indicators once data limitations were understood. MMO report this is a function of the main objective of the data collected, which is to record activity rather than to aid monitoring and analysis regarding control and enforcement measures.

The analytical challenge stemmed primarily from the following main limitations:

- Analysis of sanction data where data needed to be combined from multiple datasets was limited. The main restriction was being unable to link infringements identified during ashore inspections through the investigation process to the associated sanction outcome recorded in a separate dataset. Such outcomes for infringements which led to an investigation were not updated on the initial dataset following the closure of the case.
- Consistency of data entry across all datasets was a further limitation, including null values, free text entries, MMO port names, data anomalies for boarding inspection times, inconsistent categorisation of various fields; all of which required significant data cleaning time to produce suitable datasets for analysis and in some cases the exclusion of data.
- Missing patrol data and limited spatial data for RN FPVs which does not allow a link to time spent on patrol in a given area.

2.4 Evaluation challenges, strengths and weaknesses

2.4.1 Contextual considerations

2.4.1.1 Impacts of major political events on evaluation delivery timescale and scope

The primary research fieldwork period was delayed multiple times due to (i) the General Election in December 2019, which meant data collection was not permitted between 6th November and 12th December; and (ii) changes in the expected EU Exit date, the straddling of which was deemed a risk to the validity of the data collected if a no deal EU Exit occurred. The survey was ultimately launched in early January 2020, with a significantly compressed target timetable of one month compared to the originally planned three months. A no deal EU Exit did not occur during the data collection period.

Primary research was initially planned with English and non-English fishers, given that fishers from a range of nations are active in English waters. However, due to the sensitivities regarding EU Exit negotiations on future fishing arrangements in English waters, engagement with non-English fishers was not undertaken.

2.4.1.2 COVID-19 impact on quality of evidence base

Case studies were initially incorporated as part of the mixed methods evaluation but were not implemented. Three 'port focussed' case studies were designed to gather evidence on the impacts of the additional control and enforcement budget on compliance (and associated drivers) in the local catching and non-catching sectors. The case studies were designed to draw primarily on face-to-face interviews and to commence in late March. However, due to the impacts of the COVID-19 pandemic on the fishing sector and lock down provisions in place from late March, it was not considered practical or ethical to deliver the case studies during this time. There was no time in the project timetable to delay the commencement of case studies. Cancellation of the case study research impacted the evaluation evidence base and, in particular, the extent to which questions on the impact of the increased resources could be concluded on.

2.4.2 Analysis

2.4.2.1 Estimating the level of compliance

The level of compliance refers to the extent to which the fishing fleet comply with the management regime under which they operate. Measuring fisheries' compliance is not straightforward. Readily computable indicators drawing on MMO offence detection data establish 'observed' compliance rates. The observed compliance is a function of fisher compliance as well as control and enforcement effort, effectiveness, and approach (i.e. balance between which inspections are risk-based or random). Therefore, the observed rate is unlikely to reflect actual compliance rates and changes in the observed rate can be difficult to interpret.

The evaluation used Fisher Survey data to develop indicators of compliance. The indicators use a 0 to 10 scale, hence do not provide precise measures of compliance. The indicators are open to bias as compliance is self-assessed by the respondent, and inconsistency in respondents' interpretation of the 0 to 10 scale is likely. The 0 to 10 scale enabled compliance with rules and regulations as a whole, and with sub-

areas of rules and regulations, to be estimated. There was a trade-off between the comprehensiveness of rule and regulation coverage and specificity of the compliance measure. In addition, the approach was informed by pre-engagement with fishers, which indicated that asking more specific compliance questions would be deemed overly incriminating and may result in a high non-response rate.

2.4.2.2 Timescales

The increased budget was requested for a four-year period. The evaluation took place at the end of the first year. The full effects of the additional capacity and capability enabled by the additional budget received to-date was not expected to be evident at this stage. There is expected to be a lag between the receipt of additional funds, their full implementation (in terms of procurement and recruitment), and the meaningful use of those resources as regards their application to control and enforcement activity and their ultimate impact on compliance issues.

2.4.2.3 Attribution

The evaluation adopts a before and after counterfactual design through which to assess and attribute change to the increased budget. More robust designs were prohibited by the lack of suitable comparison groups. The lack of comparison groups, limited extent of compliance baseline data, short timeframe since the increased budget was implemented and potential significance of external factors (e.g. EU Exit), as well as cancellation of the case study research, all place limits on the extent to which the evaluation was able to conclude on the impact of the increased budget .

2.4.2.4 Reliability

The evaluation adopted a mixed-methods approach, seeking primary qualitative and quantitative evidence from a range of stakeholder groups as well as drawing on available secondary data and literature. In responding to the evaluation questions, this evidence has been triangulated, improving the reliability of the findings. The loss of case studies (see Section 2.4.1.1) reduced the means available to triangulate evidence and confirm interpretation reliability, particularly regarding the impacts of the increased budget.

The evaluation relies on primary research with the fishing sector on sensitive topics (e.g. non-compliance). The research tools employed adopted approaches designed to encourage honest and meaningful engagement by the sector and hence maximise reliability (e.g. the use of a ballot box for the Fisher Survey) and to deliver the research within the practical and financial constraints of the project. Primary research samples were non-random, limiting the extent to which results should be generalised. However, the evaluation results provide important insights and build understanding of the relationship between fisheries control and enforcement and compliance, which have not been the subject of such detailed research in England before.

3 Level of compliance

This section examines the extent to which the English fishing fleet comply with the rules and regulations under which they are obliged to operate. Specifically, it addresses the evaluation questions:

- What is the current level of compliance within the fleet?
- Does compliance vary according to fleet characteristics?
- How have any contextual changes impacted on compliance and non-compliance?

Evidence is primarily drawn from the Fisher Survey where respondents self-assessed their own compliance and that of other local fishers using a scale of 0 to 10[16].Where analysis is conducted by compliance bands these are: 10 (fully compliant), 9 (almost fully compliant), 6-8 (moderately compliant), ≤5 (low/poor compliance). Compliance levels were reported by survey participants for four regulation categories[17] as well as for all regulations as a whole. Variation in compliance with fisher characteristics is considered based on respondents' primary fishing gear (fixed or towed) and main ICES area fished (Subarea 4, Divisions 7d,e, Divisions 7f,g, Divisions 7h,j, Division 7a), as well as vessel length (10m and under or Over 10m). The Fisher Survey is based on a non-random (stratified) sample that is representative of the main fleet segments.

Additional inferences on compliance are drawn from MMO statistical data[18], including observed non-compliance. Observed non-compliance is calculated based on inspection and detection data. It reflects instances of compliance and non-compliance identified via inspections. In line with the approach to analysis of MMO statistical data throughout the evaluation, observed non-compliance based on inspections at sea and ashore (shore-side) is examined separately due to the differing nature and characteristics of the inspection types (e.g. the targeted infringement types, the length and complexity of the inspections, the resulting level of inspection activity). As inspections are primarily conducted based on intelligence and risk, rather than at random, the observed non-compliance level does not reflect the true level of compliance and cannot be generalised for the fleet as a whole. Changes in observed non-compliance are difficult to interpret. For example, a decrease in the observed non-compliance rate may reflect an improvement in compliance or a deterioration in the MMO's ability to detect non-compliance.

The interview programme with the MMO and other UK fisheries enforcement agencies, and interviews with sanctioned fishers provide additional contextual information and insight which strengthens the evidence base and extent to which conclusions can be drawn.

3.1 Summary

What is the current level of compliance within the fleet?

The majority of fishers consider themselves to be largely compliant. Two-thirds of survey respondents rated themselves as fully compliant with fisheries regulations

[16] Where 0 represents not at all compliant, and 10 fully compliant.

[17] These are: i) Access restrictions, ii) Technical Conservation measures, iii) Catch Reporting and Control requirements, iv) Licence conditions (see Annex A2.1 for further details).

[18] Specific dataset sources are described in Annex A2.4. The datasets used in this analysis were Inrep (inspections at sea) and Portsum (inspections ashore / in port).

overall (score of 10), increasing to 80% when including those scoring themselves as a 9.

Across different categories of regulation, the highest compliance levels were reported for Access restrictions and Licence conditions (>80% of respondents reported full compliance). Full compliance with Technical Conservation measures was reported by 72% of respondents. The lowest compliance, and greatest range, was reported for Catch Reporting and Control requirements. Just 60% reported full compliance and 12% rated their compliance at 5 or below. This variation between the regulation categories was also seen in the observed non-compliance rates from MMO inspection data.

Fisher Survey respondents generally considered their own compliance to be better than that of their local fleet. Only around a quarter (27%) of respondents rated other local fishers as being fully compliant / almost compliant (score of 9 or 10), with another quarter (24%) reporting low compliance in the local fleet (score of 5 or less) (corresponding proportions of respondents' own compliance were 80% and 4% respectively). Ratings of local fleet compliance, both overall and by fleet segments, were similar between the 2020 Fisher Survey and the 2019 Baseline survey.

Observed levels of non-compliance, based on the MMO's risk-based control and enforcement strategy, are greater for vessels at sea than shore-side inspections (vessels in port, vehicles, markets/premises). However, these findings are as likely to reflect differences in the length and comprehensiveness of inspections and changes in regulators' inspection capacity and capabilities as they are to represent actual differences or changes in compliance.

Does compliance vary according to fleet characteristics?

Overall compliance (both self-reported and observed rates of non-compliance) amongst fixed gear fishers was higher than that of towed gear fishers. By vessel length, the evidence was mixed: there was no significant difference in self-reported compliance, but the observed non-compliance rate was lower for 10m and under vessels. No significant variation was found across ICES areas.

The highest variation in self-reported compliance across fleet segments was associated with Catch Reporting requirements, whereby 10m and under vessel operators reported lower compliance than the Over 10m group. This is consistent with evidence from multiple sources, which may highlight compliance issues with the new under 10m catch reporting app and increased MMO targeting of non-compliance on sales notes and logbooks.

How have any contextual changes impacted on compliance and non-compliance?

According to Fisher Survey respondents, and interviewed MEOs and sanctioned fishers, recent regulatory changes including the under 10m catch reporting app, new Technical Conservation regulations, changes to bass fishing restrictions and the Landing Obligation, may have had a negative impact on current levels of compliance. A range of other contextual factors were also felt to influence compliance, such as economic and political uncertainty/shocks (e.g. EU Exit, COVID-19), weather, climate change, as well as displacement of fishing activity.

3.2 Current levels of compliance within the fleet

3.2.1 Fishers' self-reported compliance rating

3.2.1.1 Reported levels of overall compliance

Approximately **two-thirds (67%) of respondents rated themselves as fully compliant overall**, with an additional 13% classing themselves as almost fully compliant (score of 9). Only 4% considered themselves to have a low compliance score of 5 or less (Figure 3.1). This pattern of compliance across respondents was largely supported by MEO opinion: most interviewees considered the majority of fishers to be compliant, or to at least have a desire to be compliant.

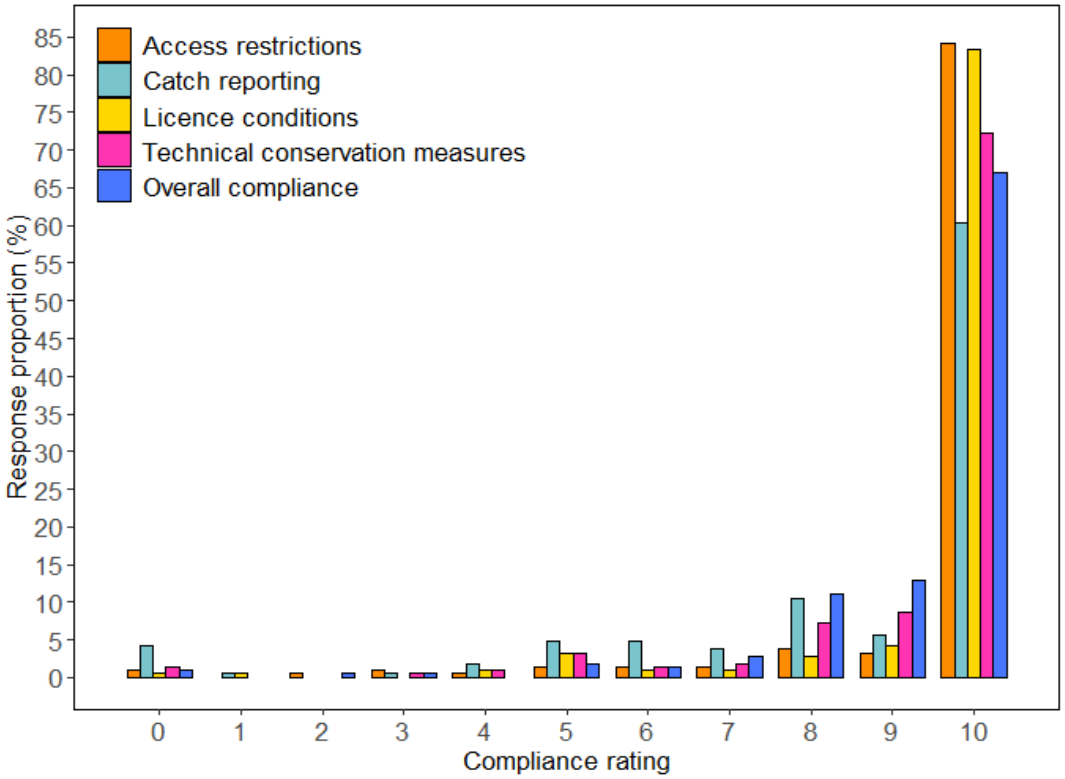
3.2.1.2 Compliance with specific categories of regulation

The highest levels of compliance, with least variation, were reported for Access Restrictions and Licence Conditions (Figure 3.1, Table A3.1). For Access Restrictions, 84% of respondents scored themselves as fully compliant. Just over 50% of the remaining respondents classed themselves as having moderate to almost full compliance (score of 6-9). For Licence Conditions, the distribution of responses was similar.

For Technical Conservation measures, a slightly lower proportion (72%) of respondents classed themselves as fully compliant compared to the Access and Licence categories, although again this was higher than the self-reported levels of overall full compliance, and 6% rated their compliance as low (score of 5 or less; Figure 3.1, Table A3.1).

The lowest level of compliance, and greatest variation in scores, was for Catch Reporting and Control requirements, with this category seeming to be the driving factor in the lower overall levels of full compliance relative to the other three regulation categories. Only 60% of respondents considered themselves fully compliant with this category, and 25% scored themselves as having moderate to almost full compliance (score of 6-9) – lower than the respective proportions for the other three regulation categories. The Catch Reporting and Control category also had the highest proportion of respondents (12%) rating their compliance as low (a score of 5 or less, 4.3% selected a score of 0) (Figure 3.1, Table A3.1).

Figure 3.1 Self-reported fisher compliance overall and by regulation category for the last 12 months (where 0 = Not at all compliant, 10 = Fully compliant)



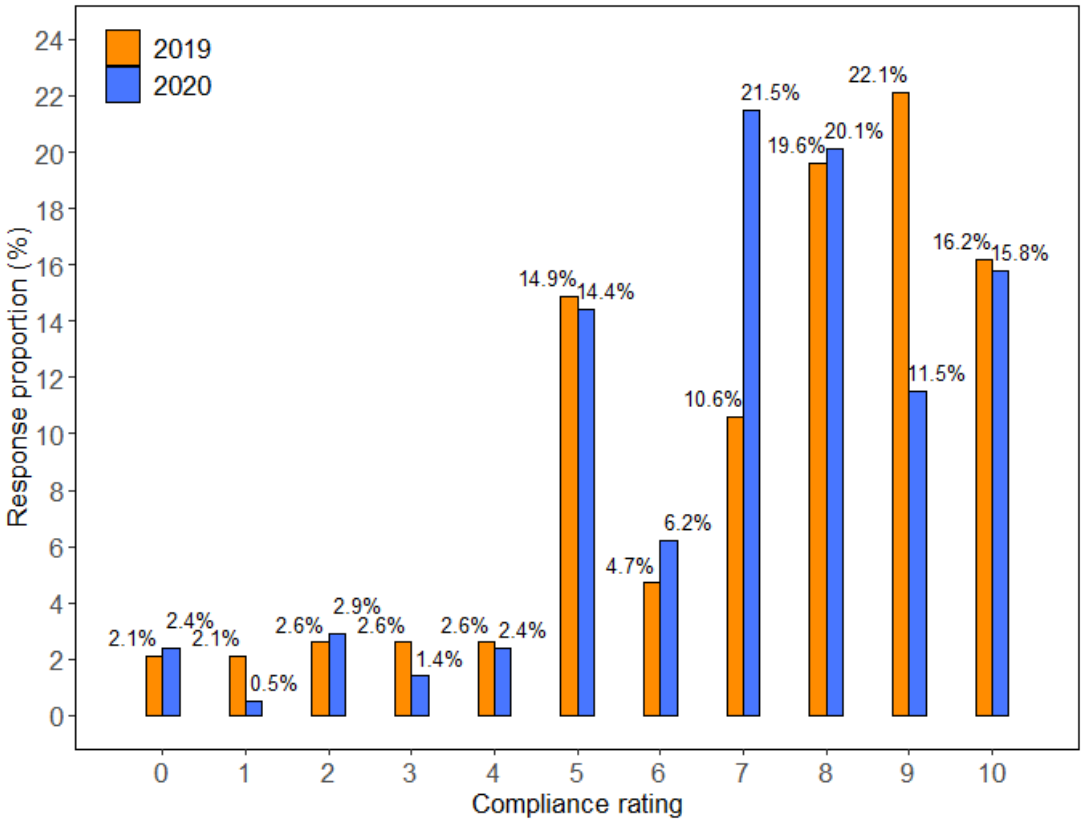
Source: Fisher Survey

3.2.2 Fishers' views on other local fishers' compliance and change between 2019/2020

Fishers' considered the compliance of other fishers in their local fishery to be lower than their own compliance; 27% of respondents rated other local fishers as being fully compliant / almost compliant (score of 9 or 10), with an additional 48% classing other local fishers as having moderate levels of compliance (score of 6-8). Low compliance in the local fleet (score of 5 or less) was reported by 24% of respondents.

The perceived levels of local fleet compliance were similar for both the 2020 Fisher Survey and the 2019 MMO Baseline Survey (Figure 3.2). There was a small difference at the top end of the scale, with respondents in 2020 more likely to select a score of 7, and respondents in 2019 more likely to select 9. UK regulator interviewees considered compliance to be good and to have improved over the years. However, it was also noted that there is significant variation across different metiers (see Section 3.3).

Figure 3.2 Fishers' views on levels of compliance of other local fishers (2019 and 2020, where 0 = Not at all compliant, 10 = Fully compliant).



Source: Fisher Survey (2020) and Baseline Survey (2019)

3.2.3 Observed non-compliance from MMO inspection data

3.2.3.1 Overall observed levels of non-compliance

Observed levels of non-compliance, based on the MMO's risk-based control and enforcement strategy, were assessed through two metrics: number of infringements detected per hour of inspection and the proportion of inspections where at least one inspection was detected.

Observed levels of non-compliance were greater for vessels at sea than shore-side inspections (vessels in port, vehicles, markets/premises). For example, the number of infringements detected per hour of inspection in 2019 was 0.15hr^{-1} for vessels at sea compared to 0.03hr^{-1} for vessels in port and 0.09hr^{-1} for vehicles (with similar figures arising from inspections of markets/premises). Similarly, the proportion of inspections where at least one infringement was detected was 31% for vessels at sea compared to 5-7% for shore-side inspections.

There are also contrasting trends between 2018 and 2019 for at-sea versus shore-side infringement detection. The number of infringements detected per hour of inspection at sea increased between 2018 and 2019 (by 85%). The proportion of inspections detecting at least one infringement also increased (from 20% in 2018). In contrast, the number of infringements detected per hour of shore-side inspection decreased by between 20% for market/premises inspections and 44% for vehicles between 2018 and 2019. The proportion of inspections where at least one infringement was detected also decreased by a small amount (from 7 to 5%, 7 to 6%

and 12 to 7% for vessels in port, markets/premises and vehicles, respectively), despite increases in the total number of shore-side inspections and total number of infringements detected.

These findings are as likely to reflect differences in the length and comprehensiveness of inspections and changes in regulators' inspection capacity and capabilities as they are to represent actual differences or changes in compliance. For example, the reported recruitment of new, inexperienced, shore-based MEOs compared to the increase in MMO at-sea inspections by experienced officers[19] in 2019 could explain the observed changes between 2018 and 2019. This observation highlights the limitations of using the MMO's inspection data as a single measure of fleet compliance.

3.2.3.2 Observed non-compliance with specific categories of regulation

In support of the findings from the Fisher Survey, the majority of categorised[20] infringements detected at-sea in 2019 were associated with Technical Conservation measures (55%), followed by Catch Reporting and Control requirements (39%). This reflects a reduction in the dominance of non-compliance with Technical Conservation measures (from 75% in 2018) and an increase in non-compliance with Catch Reporting (from 22% in 2018). A potential explanation for this change is the increased targeting of non-compliance on sales notes and logbooks (MMO Interviews). Whilst introduction of the under 10m catch app is likely to have influenced fishers' perceptions of compliance levels in the Fisher Survey (see Sections 3.2.1.2 and 3.4.1), the MMO were operating within an educational phase during 2019 and so infringements were either not recorded or were associated with verbal re-briefs (minor sanction) which cannot be reliably attributed to one or more of the regulation categories. Non-compliance with Access Conditions was the least frequently encountered infringement type (Figure A3.1).

For all shore-side inspections, the majority of detected non-compliance in 2019 (and throughout the time-series, 2014-2019) was associated with Catch Reporting and Control requirements (69% for markets/premises, 95% for vehicles, 48% for vessels in port). The proportion of detected infringements associated with this regulation category also increased between 2018 and 2019 for vessels in port and markets/premises, although the increase was less than for vessels at sea. For both markets/premises and vessels, Technical Conservation measures were the second most frequent non-compliance category in 2019 (25% for market/premise and 29% for vessel inspections). Inevitably, non-compliance with Access Conditions only made a very small contribution to the detected shore-side infringements (Figure A3.2). The differences between at-sea and shore-side infringement type detection is because the inspections are targeting different types of potential infringements, and the viability of specific infringement detection varies between inspection types.

[19] See Section 4 for further discussion

[20] Assigned to one of the four regulation categories

3.3 Variation in compliance with fleet characteristics

3.3.1 Fishers' self-reported compliance rating

3.3.1.1 Reported levels of overall compliance

Self-reported compliance was found to vary by gear type, but not by vessel length or ICES area. By gear type, **a higher proportion of those using fixed gear compared to towed gear rated themselves as fully compliant** (72% compared to 58%)[21]. The scores of 5 or less were dominated by the towed gear group (7% compared to 2%), although 36% of towed gear users scored themselves as having moderate to almost full levels of compliance (score of 6-9).

No statistical difference was detected in overall self-reported compliance between respondents from the different vessel length groups.

Much of the observed variation in self-reported compliance between ICES area(s) fished is affected by the variation in sample sizes for the different areas. No statistical difference was detected, although 74% of respondents fishing in Divisions 7d,e consider themselves as fully compliant compared to 60% in Subarea 4 (the two most represented areas in the survey[22]).

Self-reported compliance with Access Restrictions and Licence Conditions was similar between the respondent groups (gear type, vessel length, ICES area fished). For Technical Conservation measures, statistical differences between respondent characteristics were detected for ICES area, with 61% of those who fish mainly in Subarea 4 scoring themselves as 10 (fully compliant) compared to 84% in Divisions 7d,e, although overall >93% of respondents scored themselves as 6 or higher in both areas.

The higher variation in reported compliance with **Catch Reporting and Control measures** compared to the other regulation categories and overall self-reported compliance (Figure 3.1) was supported by a statistically **significant difference in the distribution of responses between the vessel length categories** (but not gear type or ICES area). 57% of 10m and under vessel owner / operators reported full compliance with Catch Reporting and Control requirements and 6.5% scored themselves as 0, compared to 73% of respondents in the Over 10m vessel group rating themselves as 10 and the lowest score being a 3 (selected by only ~2% of respondents)[23].

3.3.1.2 Fishers' views on other local fishers' compliance

Views of other local fishers' compliance were similar regardless of the respondents' main gear type or vessel length. Differences according to the main ICES area(s) fished by the respondents were evident (63% of those who fish in Divisions 7h,j rated other local fishers as fully compliant compared to 17-23% of those who fish in the other areas), although they are likely to have been driven by the small sample size for Divisions 7h,j (n = 8).

[21] Sample sizes for these two groups were towed gear: n = 146, fixed gear: n = 59.

[22] Sample sizes for these two ICES areas were Subarea 4: n = 72, Divisions 7d,e: n = 111.

[23] Sample sizes for these two groups were 10m and under: n = 139, over 10m: n = 64.

3.3.1.3 Observed non-compliance from MMO inspection data

In 2019, the number of infringements detected per hour of at sea vessel inspections was similar across ICES Subarea/Divisions 4, 7d,e and 7f,g. However, in Subarea 4, 29% of inspections detected one or more infringements compared to 33% in Divisions 7d,e and 43% in Divisions 7f,g, suggesting that **non-compliant vessels in Area 4 had broken more rules per inspection compared to the other areas**. The relatively low levels of detected non-compliance in Division 7a may be more likely to be due to low inspection levels than significant differences in fleet compliance.

For **shore-based inspections in 2019, there was generally little variation in observed non-compliance between most of the regions**. The main exception was for vehicle and market/premise inspections in the South West whereby detection rates were higher than all the other regions. For vessels in port, the highest observed non-compliance occurred in the North West and South.

Observed levels of non-compliance at sea were higher for towed gear vessels than those using fixed gear ($0.16hr^{-1}$ and 34% compared to $0.11hr^{-1}$ and 24% respectively). There were also differences in detected non-compliance between vessel length categories with the **10m and under group associated with the lowest observed non-compliance** ($0.11hr^{-1}$ and 18% compared to $0.18hr^{-1}$ and 27% for 10-12m vessels and $0.16hr^{-1}$ and 34% for Over 12m vessels). For at-sea inspections in 2019, the number of infringements detected per hour of inspection was greatest for the Over 10-12m group and lowest for the 10m and under group. Based on the proportion of inspections detecting at least one infringement, again the 10m and under group was associated with lowest observed non-compliance (18%), and it was highest for over 12m vessels (34%). For vessels inspected in port, based on both metrics, the observed non-compliance increased with vessel length category in 2019 (and for the period 2014-2018).

3.4 The impact of contextual changes on compliance and non-compliance

This section considers contextual factors (factors that do not include changes in control and enforcement) that have the potential to influence current compliance. It does not attempt to quantify the impact of such factors on compliance. The identified factors are drawn from the interviews with sanctioned fishers and MMO/other agencies as well as insight from the project team.

3.4.1 Regulatory changes

Whilst the specific impact of recent changes in legislation or regulation cannot be quantified, they are likely to have influenced the estimated level of current compliance, For example, a strong theme to emerge from the Fisher Survey responses to the open question about compliance barriers was challenges arising from changing regulations and/or the complexity of the regulatory environment. Such changes included:

- **The Landing Obligation:** The EU's 'discards ban' came into full force on 1 January 2019[24] after a phased introduction over the preceding four years. For the most part, 2019 was considered as a transitional education phase for English fishers about the new requirements and so minimal enforcement action will have been taken by the MMO. As a result, it is unlikely that the Landing Obligation will

[24] https://www.gov.uk/government/publications/landing-obligation-2019-rules-and-regulations

have had a large effect on observed compliance levels (or issuance of sanctions) in 2019.

- **Bass regulations**[25]: numerous changes to the regulations relating to fishing for bass have occurred over recent years (e.g. minimum landing size, mesh size and quota restrictions). Specific challenges relating to compliance with these regulations were mentioned in Sanctioned Fisher interviews and it was a theme to emerge from the open text responses by Fisher Survey participants. A small number of fishers specifically cited changes to these regulations as a way the MMO could support greater compliance.
- **Under 10m catch reporting requirements**: The MMO introduced the catch recording application[26] at the end of 2019 after a trial period. The application captures the volumes and species of fish being taken from English waters by 10m and under fishing vessel owners. The new requirements were cited by interviewed MEOs as a potential near-term driver of non-compliance during the educational transition phase and potentially beyond due to lack of buy-in to the rationale for its requirement. Both Sanctioned Fisher interviewees and participants in the Fisher Survey cited technical or practical difficulties with complying with the regulation as a reason for non-compliance (e.g. mentioned in 30% of responses to the open survey question). Further, for those respondents who reported non-compliance with Catch Reporting and Control requirements, almost all who provided an open text reason referred to practical or technical issues with using the app, such as not having mobile phone signal or being able to operate the app, and in some cases lack of agreement with the purpose.
- **Technical Conservation measures revision**[27]: changes to the 'tech con' regulation, which largely specifies gear requirements, were introduced in August 2019 in part to help alignment of measures with the Landing Obligation. The MMO introduced the changes through an educational phase and so, like the Landing Obligation, it is unlikely the new regulation will have affected recorded compliance levels (or issuance of sanctions) in 2019. However, in reality some fishers may have been non-compliant with new requirements affecting their operations, either deliberately or because they were unaware of the changes. The MMO anticipate higher levels of compliance going forward however, once behavioural changes are established.

3.4.2 EU Exit

As an independent coastal state, the UK will need to control and manage access for those permitted to fish in the UK's territorial waters and Exclusive Economic Zone. The UK is leaving the Common Fisheries Policy which states that European Union fishing vessels have equal access to waters and resources in all Union waters. Under differing EU Exit deal scenarios, existing fishing arrangements may or may not continue to apply.

There are therefore future potential compliance risks anticipated depending on the final nature of the UK's exit from the EU. For the domestic fleet, these may include:

- Increase in non-compliance if desired quota benefits or access arrangements are not realised

[25] https://www.gov.uk/government/publications/bass-industry-guidance-2019

[26] https://www.gov.uk/guidance/record-your-catch

[27] https://www.gov.uk/government/publications/technical-conservation-2019-rules-and-regulations

- Increase in non-compliance further down the value chain, for example if there is a significant negative effect on market access.

However, as there have not been any significant changes in the status of EU Exit implications for the domestic fleet during the study period there is no reason to assume that either the UK's withdrawal from the EU on 31 January 2020 or the status of negotiations with the EU prior to that date will have had a notable influence on overall compliance levels in the English fishing fleet to date.

Sanctioned Fisher interviewees and Fisher Survey respondents raised issues associated with the EU, which could impact on future compliance depending on how they evolve following the transition period. These included a perceived lack of clarity and inappropriateness of some EU regulations (such as the drift net ban); complaints that non-UK vessels overfish in UK waters impacting on UK fishers' livelihoods and compliance (e.g. "*Stop EU vessels = more fish and shellfish for UK vessels = less regulation = better compliance*"); and that non-UK vessels were not subject to sufficient inspections by UK authorities.

3.4.3 Weather and climate change

Sanctioned Fisher interviewees noted that changes in the natural environment and the unpredictability of weather, including that linked to climate change, have impacted the way in which they fish, contributing to their ability to comply with regulations. Climate change has influenced the seasonal and geographic distribution of fish (with the majority of species moving north) and these changes have not been reflected in quotas or licence conditions, meaning greater restrictions on what smaller vessels can target and hence placing them at financial risk.

3.4.4 Displacement of fishing activity

Temporary or permanent changes in availability of fishing grounds as a result of, for example, marine protected areas, wind farms and dredging activity (specifically mentioned by a few Sanctioned Fisher interviewees and Fisher Survey participants), can lead to displacement of fishing activity into other areas. This can force fishers to change their fishing patterns or operations e.g. target species or gear type, which can in turn influence compliance.

4 Process evaluation findings

This section explores the changes delivered by the increased budget and their impact on the MMO's operational effectiveness. Specifically, this section addresses the evaluation questions:

- What has been delivered through the increased budget to date, and how does this compare to previous years?
- To what extent have the new resources contributed to their intended operational outcomes?
- What has worked well and less well in delivering the enhanced control and enforcement budget?
- How have the new resources been used by area offices? Have new approaches been tried? How successful have they been?
- What factors have impacted positively and negatively on delivery of the enhanced control and enforcement resources and activities at a local level?
- What is the interaction between surface and aerial surveillance?
- What is the impact of the interaction in terms of effectiveness and efficiency?
- Has the increased budget delivered such effectiveness and efficiency gains?

Evidence is primarily drawn from the interview programme with MMO and other UK fisheries enforcement agencies and analysis of MMO statistical data. Supplementary evidence is drawn from the Fisher Survey and Sanctioned Fisher interview programme.

This section sets out:

- The investments that have been delivered using the increased budget.
- What worked well in delivering against the operational outcomes (including at a local level)[28].
- What worked less well in delivering against the operational outcomes (including at a local level).
- A review of the interaction between at sea surface and aerial surveillance assets.

4.1 Summary

The increased budget has funded investments in operational staff including MEOs and a dedicated intelligence and investigations team, chartering of two new Fisheries Patrol Vessels (FPVs), as well as access to flexible aerial surveillance capacity. A bespoke accredited training programme was developed to support the rapid warranting of a significant volume of new recruits.

The investments have contributed to an increase in the volume of inspections and detections, an increased visible MMO presence in port and at sea, and improved intelligence and tasking of assets and MEOs, as well as more rapid case investigations.

Tasking of assets continues to be based on a risk-based, intelligence-led approach. The FPVs have helped to increase capacity and flexibility, supporting an increase in

[28] The operational outcomes are identified in the evaluation logic model in Section 2.1.

the coverage and extent of MMO's at sea presence, enhanced responsiveness to intelligence and an uplift in the effectiveness of at sea inspections and surveillance.

At a local area level, the increased budget has resulted in a net increase in MEOs, but a decrease in experience, as some senior MEOs moved on to other MMO jobs. Local offices have been able to do more of their usual control and enforcement activities, rather than experiment with new approaches.

Investment in additional aerial surveillance capacity was primarily to provide mitigation if non-UK vessels' VMS data was no longer shared in the event of a no deal EU Exit. At the time of writing this scenario had not occurred. A new flexible capacity contract with the Maritime and Coastguard Agency (MCA) was set up to provide this capacity. Low volume use indicates it is working well.

Five delivery areas were identified, which worked less well:

- Resourcing of FPVs: finding MEO crew can be challenging as it is done on a voluntary basis. Concerns were raised about attrition of willing staff and the unsustainability of the current model, which could impact on FPV utilisation.
- Staff retention: Staff were recruited on short-term contracts. If not renewed this could lead to a potential loss of intellectual capital and capacity.
- MEO training programme: weaknesses in the new training programme include mentors not being able to provide the level of support expected, and gaps in emotional intelligence training, softer engagement skills, and seamanship.
- Inspection targets: targets can conflict with a risk-based inspection approach and encourage an increase in more random inspections – opinion was mixed on whether this was good or bad. MMO inspection targets may require further calibration.
- Intelligence: the process and system do not sufficiently enable reporting and recording of informal intelligence. Cultural barriers may also inhibit its formal collation. IT systems present challenges for processing intelligence data.

4.2 What the increased budget delivered

4.2.1 Investment in human resources – capacity and training

4.2.1.1 Capacity

The picture for roles funded by the increased budget is complex due to internal transfers, changes to how posts are funded, as well as new recruits that have since left the organisation. It also alters according to MMO internal arrangements. Table 4.1**Error! Reference source not found.** shows the number of **control and compliance operational** roles recruited as a result of the increased budget was 53, which is less than the 62 indicated in the original business case. Twelve of the posts funded are internal promotions and there are 10 vacancies in active recruitment. At the MEO level, 46% of current roles are funded by the additional budget. A further 10 full-time equivalent roles are funded to support the delivery of the increased budget. There was an initial burden on HR because of the volume of recruiting and training for these roles, however, this has now eased.

There are now 25 Marine Enforcement boarding officers who have experience going to sea and are trained to conduct at sea inspections, which has supported the MMO's increased at sea surveillance activity (see Section 4.3.1).

Across MMO local offices, an additional 27 posts have been created since the increased budget. Whilst most posts were filled by new staff, a small number were filled through transfers of existing staff. The MMO office in Brixham had the largest number of new recruits (six) (see Table A3.2 for data for each MMO office).

MMO interviewees reported that, because of the increase in staff capacity, workload is now spread more evenly. There is now thought to be sufficient resource to cover different areas, and MEOs' ability to react to new intelligence is thought to be faster. One MEO felt that this is the first time the MMO have been 'at capacity' in five years.

The originally intended 24/7 Joint Maritime Operations Coordination Centre (JMOCC) desk office presence (to enable coordinated maritime security and response with other government departments) was not taken forward. Rather an 'enhanced presence' was adopted.

Table 4.1 Recruitment of staff funded by the increase budget

Outline business case function	Plan[29]	Filled Posts
Marine Officers (Coastal)	33	27
Marine Officers (FMC Ops)	6	2
Training Officers	6	5
Investigation Officers	8	8
Intelligence Officers	2	4
Communication Officers	1	1
Operational resilience officers	6	6
Total	**62**	**53**

Source: MMO HR Data

4.2.1.2 Training

The MMO **developed a new bespoke accredited training programme for MEOs**. The programme enables MEOs to be trained faster than they had in the past. Previously, it took 12-18 months to be warranted and significantly longer to be trained to participate in at-sea inspections, but this now takes an average of nine months. The training was conducted in cohorts of new recruits. It involves a combination of online theory-based element, one-to-one coaching and mentoring, and on-the-job training. According to MMO interviewees, 80% of trainees were warranted as a result of the new training regime. Weaknesses in the new training programme were also raised (see Section 4.4.3)

4.2.2 Investment in at sea assets

The MMO already has arrangements, which are still in place, to draw on Royal Navy's (RN) vessels, which are available on a non-exclusive basis. The MMO also has arrangements for at sea cooperation with IFCAs, Border Force, Environment Agency, Police, the devolved administrations and Crown Dependencies. New Memorandums

[29] MMO (2018). Marine and Fisheries Control and Enforcement (FI002). Outline Business Case (OBC). Version No: Draft 1.5. Issue Date: 1st August 2018)

of Understanding (MoUs) with IFCAs and the devolved administrations were put in place to cement the existing relationship and deploy more joint patrols and chartering (on/of IFCA, devolved administration vessels) if necessary[30].

Investments were made in **two dedicated fisheries patrol vessels (FPVs)** - Ocean Osprey and Ocean Dee[31] (henceforth FPVs). The MMO did not previously have such assets. These are available under agreement with a commercial provider. This agreement is said to be working well. Ocean Osprey became operational in April 2019, and Ocean Dee later in November 2019.

There has been no change in the general approach used to task at-sea patrol vessels. **Tasking is based on a risk-based intelligence-led approach** and goes through the central Newcastle operations team, supported by monthly risk meetings and more frequent communication as required.

4.2.3 Investments in aerial surveillance capacity

An increase in aerial surveillance capacity was secured, which can be drawn on flexibly as operational needs demand. Aerial surveillance was previously sourced from aircraft directly chartered by the MMO. It is now provided under an MoU with the Maritime and Coastguard Agency (MCA).

The aerial surveillance contract was reported to be working well and it was felt that, if needed, capacity could be readily ramped up. The number of aerial fishery patrols in English waters was 48 in 2019 compared to zero in 2018, although well below the number of patrols in 2011 (156)[32]. Patrol use has not been at the maximum level the scalable resource arrangements permit. The principal purpose of aerial surveillance was to provide mitigation against the potential absence of non-UK vessel VMS data sharing if there was a no-deal EU Exit. At the time of writing this scenario had not occurred and so the full available capacity has not been needed.

Outside of addressing EU Exit issues, aerial surveillance was also reported as supporting the MMO in reaching places further afield and enhance the MMO's geographical reach. For example, for fishing areas far offshore it can be more efficient to deploy aerial surveillance to investigate a suspected issue than an FPV. See 4.5 for further discussion.

4.2.4 Dedicated intelligence and investigations team

The budget has significantly strengthened the intelligence and enforcement team through funding an additional eight staff. The team provide a central operational support function. This includes an onshore intelligence team in Newcastle supported by intelligence officers around the coast made-up of IFCA representatives as well as MEOs. The team was established to assess enforcement tools and datasets for areas of non-compliance, provide quality assessment and identify risks.

The investment in the central team means that **more extensive use of intelligence analysis to assess patterns and trends in data is being made**, the results of which can then be shared with the wider MMO. Both the volume and the methodology for receiving and processing intelligence is reported by MMO interviewees to have changed, as greater emphasis has been put on intelligence in light of EU Exit risks.

[30] Particularly in the event of a no deal EU Exit

[31] In early 2020 (after the evaluation research) Ocean Dee was swapped for Ocean Don

[32] MMO data source: Patrol_area_searched

In addition, there have been **more frequent communications with partner agencies** including IFCAs and the RN to keep abreast of local activity.

4.3 What worked well in delivering the MMO's operational outcomes

This section examines what has worked well and how it has contributed to delivering improvements in the MMO's operational performance – as was indicated in the MMO's business case for the additional funding. It considers performance against the following operational outcomes[33]:

- Stronger, multi-location physical presence, and increased proportion of fleet inspected more frequently.
- More informed, responsive and co-ordinated tasking.
- Improved capability of inspectors.
- Increased volume and speed of investigations.
- Improved infringement detection.

4.3.1 Stronger, multi-location physical presence and increased proportion of fleet inspected more frequently

The increase in resources has enabled more inspections of fishing vessels in port and at sea, as well as more inspections of transport and premises inspections.

4.3.1.1 Inspections of vessels

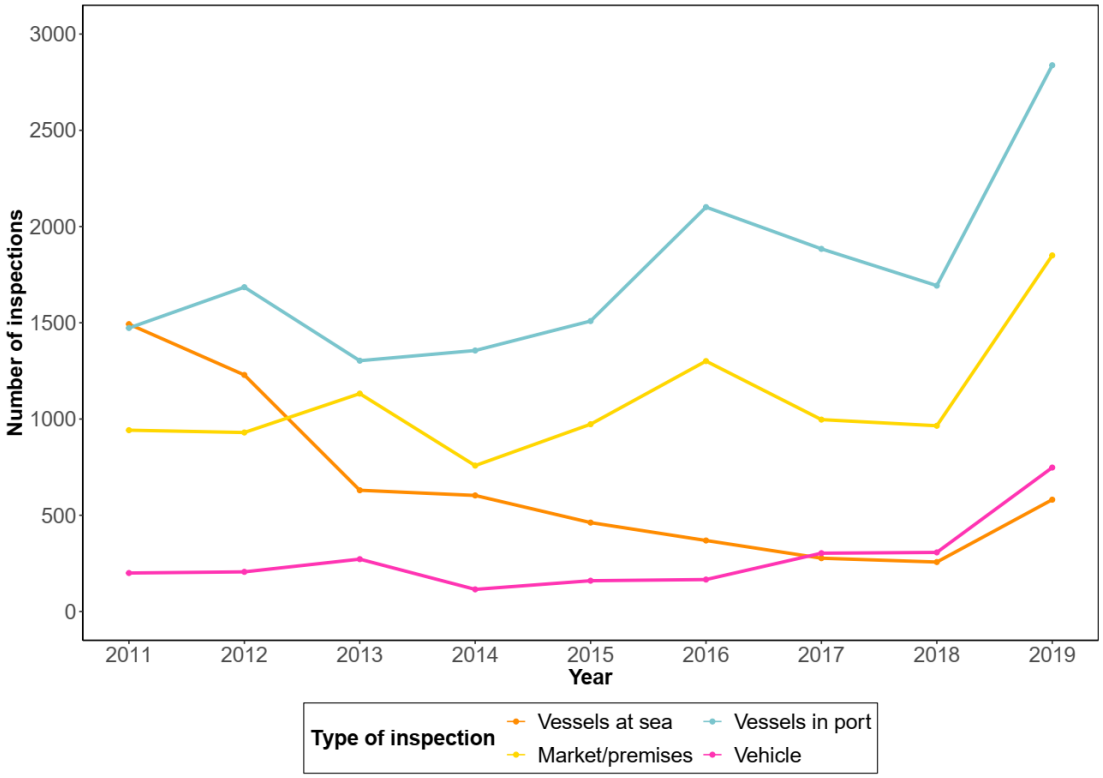
The number of MEO inspections of vessels in port increased by 68%, from 1,693 in 2018 to 2,840 in 2019 (Figure 4.1). When looking at the year from April – when a fuller complement of new MEOs were operational – the increase is more marked, up by 79% in 2019 compared to 2018[34] (Table 4.2).

Ports based in the East of England saw the greatest percentage increase in number of inspections of vessels in port between 2018 and 2019 (485%; from 47 in 2018 to 275 in 2019), whilst those in the South West saw the largest absolute increase (from 467 to 909) (Table A3.3). The South West also saw the largest increase in MEOs (Table A3.2), which may account for the scale of the increase in such inspections compared to other areas. Ports in the South of England saw the smallest increase, in both percentage and absolute terms (up by 20 inspections, or 4%, on 2018), and also recruited the fewest new MEOs.

[33] As identified in the evaluation intervention logic see Figure 2.1 and Figure 2.2

[34] Annual comparisons made for the 9-month period April to December.

Figure 4.1 Number of MMO inspections by type (2011-2019)



Source: MMO Statistical data, Portsum (inspections in port/ashore); Inrep (inspections at sea)

Table 4.2 Number of MMO inspections by type (Apr-Dec 2018 – Apr-Dec 2019)

	Apr - Dec 2018	Apr - Dec 2019	% change
Vessels (at sea)	192	521	171%
Vessels (in port)	1,346	2,413	79%
Markets	714	1,566	119%
Vehicles	255	680	167%

Source: MMO Statistical data, Portsum (inspections in port/ashore); Inrep (inspections at sea)

The two new FPVs appear to have had a significant effect on at-sea surveillance and inspection capabilities compared to recent years. The number of at sea inspections more than doubled between 2018 and 2019. However, some interviewees noted that this does not necessarily compare to historic levels. One interviewee recalled that in the 1990s there were nine RN fishery patrol vessels compared to only one or two now, and indicated that overall, in their view, at-sea surveillance capability remains below that available during the 1990s and 2000s. However, the MMO now has a number of other surveillance tools at its disposal, such as VMS, and other processes such as catch reporting.

There has been a reduction in the number of joint IFCA-MMO patrols. One interviewee indicated that this is because MEOs are now busy crewing their own FPVs. The number of inspections carried out jointly by IFCAs and the MMO declined

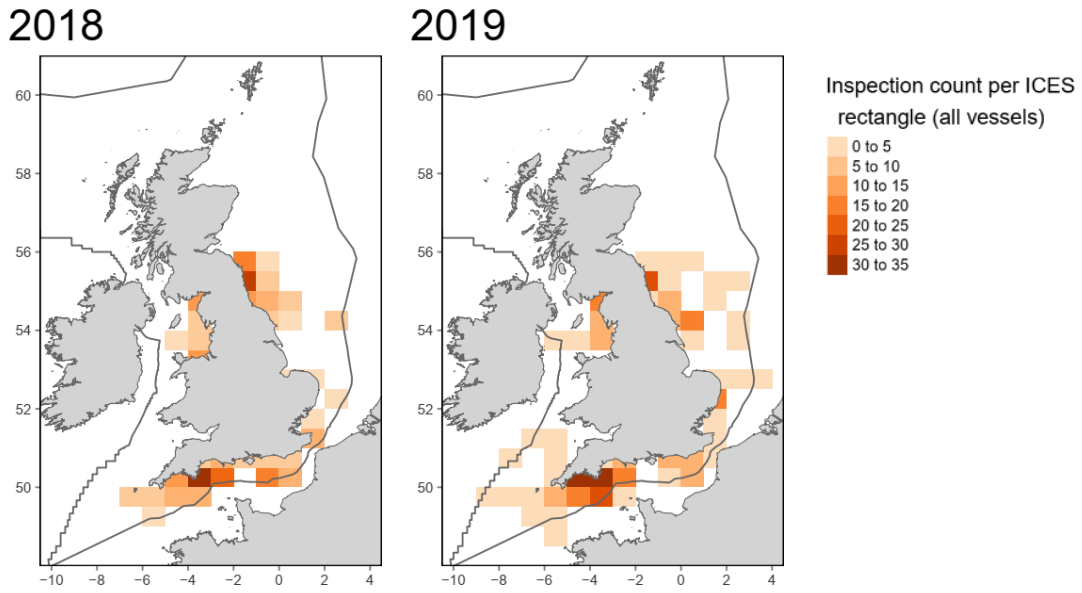
by 54% between 2018 and 2019 (from 67 to 31 inspections per year)[35]. According to one of the IFCA interviewees, this was not considered to have had a significant impact on the quality of the patrols since there were already existing challenges in co-ordinating joint patrols with the MMO (working to different timeframes and targets).

The increase in MEOs and the new FPVs have enabled the MMO to expand its physical presence, in terms of spatial extent and intensity. MMO interviewees indicated that the increase in MEOs has enabled local MEOs to visit ports further from their home base, and those considered of lower priority, more often than previously.

At sea, there was a 38%[36] increase between 2018 and 2019 in the total number of ICES rectangles where an inspection occurred (Figure 4.2). When looking only at the 9-month period Apr-Dec for 2018 and 2019, there was a 58% increase.

Subarea 7hj saw the largest percentage increase in at-sea patrols (up 575%, from just 4 patrols in 2018 to 27 patrols in 2019). Subarea 7de had the smallest percentage change (up 55%, but from a high base of 124 in 2018)[37].

Figure 4.2 Distribution of inspections by fisheries patrol vessels per ICES rectangle and year (2018 and 2019; RN, MMO and IFCA + SR combined)



Source: MMO Statistical data, Inrep (inspections at sea)

The MMO have been able to inspect more vessels more often. This pattern is seen in the data for both at sea and in port vessels inspections (see Table A3.8 and Table A3.9). In **Brixham,** a senior MEO noted that they have been able to conduct inspections across both small and large fishing vessels, with in port inspections of individual vessels taking place more frequently.

The increased budget has also enabled the MMO to increase the number of vessel inspections that take place outside of standard 9-5 working hours (see Figure A3.3).

[35] MMO data source: Inrep (inspections at sea)

[36] This percentage increase refers to inspections of UK vessels only

[37] This data does not account for time spent in each ICES area or the number of times one vessel may enter an ICES in a given period

4.3.1.2 Markets and premises

A total of 1,850 MMO inspections took place at markets/premises in 2019 an increase of 92% on 2018; and 748 inspections of vehicles in 2019, up 144% (see Table A3.7).

The increased budget has enabled the MMO to **increase the number of inspections that take place outside of standard 9-5 working hours** (Figure A3.3). In 2019, 585 inspections took place at markets/premises out of hours compared to just 389 in 2018 (a 150% increase). Out of hours inspections address an important potential detection avoidance action (i.e. undertaking non-compliant activity when inspectors are not at work). Being able to increase out of hours inspections was reported in MMO Interviews as being important for markets as these need to be done early in the day.

4.3.1.3 Activity in local offices

At a local area level, **the increased budget has enabled local offices to do more of their existing activities**. MMO interviewees indicated that surveillance activity (see Section 4.3.1.1) and fisher engagement have increased, which contributes to the MMO's operational outcomes of a stronger, multi-location physical presence as well as improved capability of inspectors to interact with fishers and to detect offences (see Section 4.3.3). MMO interviewees indicated that local offices have not used the increase in resources to take on new activities or to radically change how they do existing activities.

In the North East, according to one senior MMO interviewee, there has been a much **greater presence of, and interactions with, the FPVs**. The increased presence and ability to call on the FPV resource is reported to have been beneficial in the North East, particularly in relation to seasonal fishery pressures that arise.

In Poole, the increase in resource was considered to have been **particularly effective at supporting a strong multi-location presence**. Poole covers a large area of the South / South West coast where there are a lot of small vessels. Having an extra MEO (four up from three) meant that the team can work in pairs and cover more coastal areas, addressing some of the larger issues in Poole such as bass fishing.

4.3.2 More informed, responsive and coordinated tasking

4.3.2.1 At sea resourcing and tasking

Whilst the overall approach to tasking has not changed, the scope and flexibility with which vessels can be tasked has improved and is considered by MMO interviewees to have resulted in more effective at sea patrols (described in Section 4.3.1 above).

When the MMO relied on the RN, planning and flexibility was considered difficult. RN patrol days had to be planned well in advance, but there was no guarantee that these patrol days would be delivered as other RN non-fisheries activities may take priority.

As a result of the new FPVs, MMO aims to be more strategic in how it tasks at sea assets - working with intelligence and local teams to "*get the right people in the right place at the right time*". The increase in at sea assets has also **allowed the MMO to be more reactive to intelligence as it is received.** For example, when intelligence was received that English Channel fishing vessels may be turning off their AIS, the MMO was able to immediately redeploy a FPV to investigate and confirm whether there was a potential issue. It is unlikely that this would have been possible prior to the MMO commanding its own FPVs.

Furthermore, MMO interviewees note the advantage of having a crew manned by their own staff, giving better awareness of activity happening at sea and consequently, improved intelligence. One MMO interviewee also noted that they are exploring how the tasking objectives of different assets can be better co-ordinated. For example, delivering targeted campaigns on specific fisheries at differing times.

4.3.2.2 Use of centralised intelligence

The dedicated intelligence unit is reported to have added value as it enables intelligence to be collated centrally and then cascaded to relevant officers. The introduction of a dedicated intelligence team has directly contributed to the MMO's operational outcomes around tasking and enforcement by improving tasking of MEOs.

MMO interviewees reported that there has been more informed tasking and use of intelligence. This allows the MMO to conduct a triage intelligence and deploy assets to areas where there is known non-compliance as well as conducting standard patrols.

It was suggested that **MEO dialogue with, and hence intelligence from, fishers has improved** as a result of the increase in MEOs. One senior MMO interviewee emphasised the importance of talking to fishers to gather information which can then be input into the intelligence system and, subsequently, the intelligence gathered tends to be "*richer and fuller*".

Implementation of a central investigations team was noted as having **reduced the burden on MEOs**, who can now focus more on monitoring and inspections.

4.3.3 Improved inspections and infringement detection

The infringement detection rate improved for at sea vessel inspections but remained broadly unchanged for vessel inspections ashore. Total infringements detected during vessel inspections in port and at sea increased between 2018 and 2019 (see Table A3.10), as would be expected given the increase in inspection effort. The proportion of inspections detecting infringements increased for inspections of vessels at sea (up from 20% to 31%[38]) but remained similar for inspection of vessels in port (down from 7% to 5%[39]), for the same period.

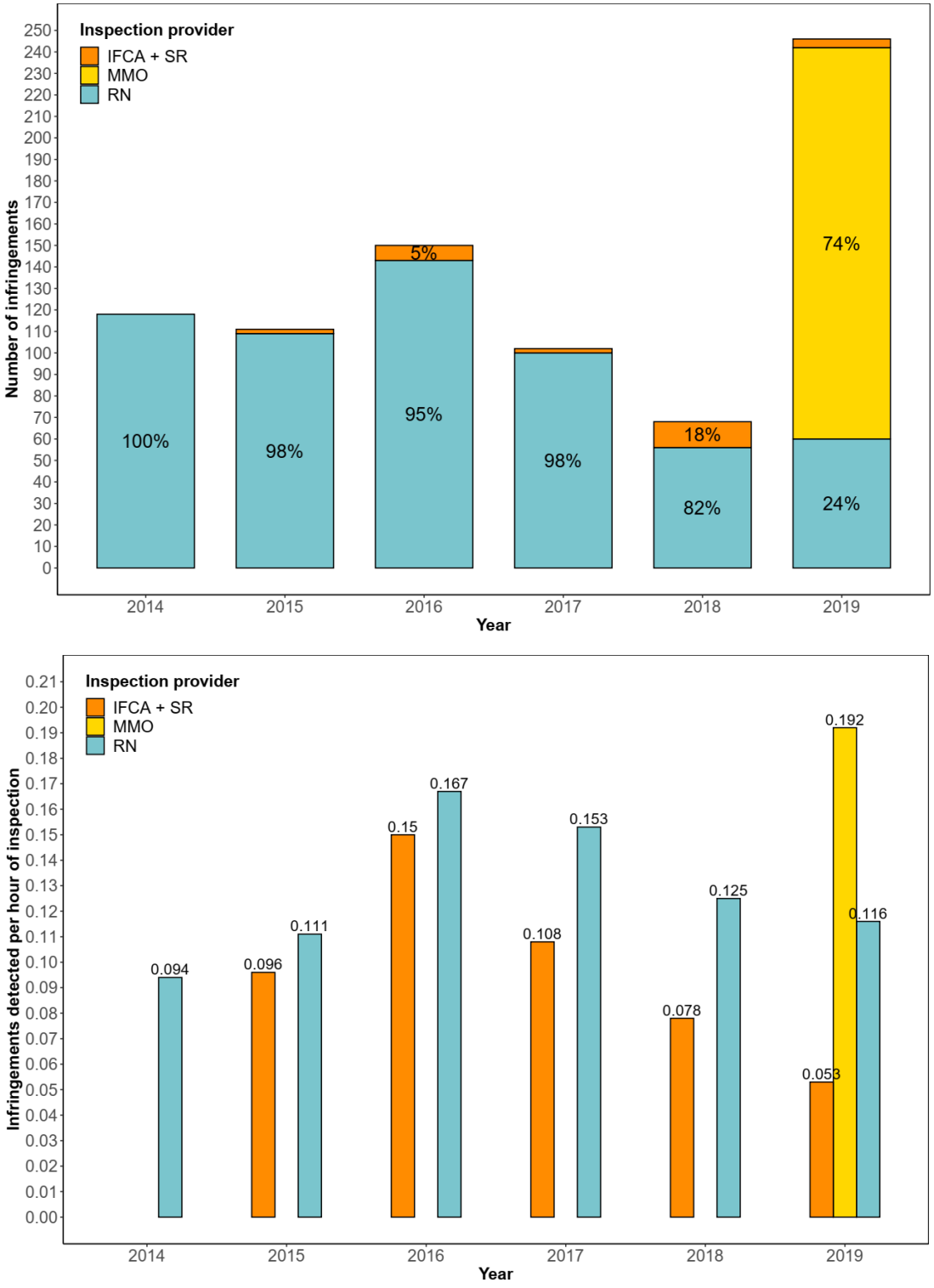
The quality and speed of conducting inspections at sea improved, according to some MMO interviewees. This has been supported by new inspection processes which mean that two of the three basic parts of an inspection can be done at the same time, thus speeding up the process.

The introduction of **the FPVs and the MMO's MEOs at sea, may have had a positive effect on the quality of inspections and at sea infringement detection**. The infringements detected per hour of inspection time is notably higher for MMO FPV inspections – 58% greater than RN and 275% greater than joint IFCA-MMO patrols (based on 2019 data – Figure 4.3). This may be due to MMO staff being better trained at fisheries inspections compared to RN staff or the improved ability of FPVs to react to tasking, compared to that of the RN or joint IFCA patrols, and of tasking itself. Of total infringements detected at sea, 74% were detected by the MMO FPV inspections compared to just 24% by the RN and 2% by joint IFCAs-MMO patrols (Figure 4.3).

[38] MMO data source: Inrep (inspections at sea)

[39] MMO data source: Portsum (inspections in port/ashore)

Figure 4.3 Infringements detected at sea by provider (MMO, RN and IFCA+MMO) (2014-2019). At sea infringements detected (top = count; bottom = number detected per hour of inspection).



Source: MMO Statistical data, Inrep (inspections at sea); Data in bottom panel has been standardised by inspection effort.

4.3.4 Increased volume and speed of investigations

Investigation cases are now conducted centrally rather than through coastal teams. MMO interviewees considered this to have resulted in a more consistent and efficient approach. In part, this was because much investigation activity focuses on fishing vessel licensing, which relies on central data analysis of fishing activity.

The MMO was able to conduct more investigations and close cases in shorter time periods than previously as a result of the increase in intelligence and investigations staff**,** according to MMO interviewees. The available data indicates that average investigation length reduced from 253 days in 2014, and 190 days in 2018, to 62 days in 2019. Whilst these data are incomplete and of variable quality[40], the general trend does corroborate the interview findings. The MMO is detecting and having to process a lot of cases because of the increase in MEOs and inspections supported by the increased budget - at the time of writing there were reportedly 90 investigation cases pending. One senior interviewee noted that more people are still needed.

The **central investigations team** is reported to have reduced the workload of the coastal offices as MEOs no longer have responsibility for conducting investigations. One MMO interviewee noted that investigations previously took up around 10-20% of an MEO's time, and the creation of a central investigations team freed this time up for other coastal activities.

4.4 What worked less well in delivering the MMO's operational outcomes

Six delivery areas were identified as areas with potential for further improvement: resourcing and tasking, staff retention, training practices, inspection targets, central intelligence and investigation.

4.4.1 Resourcing and tasking

4.4.1.1 At sea

Resourcing constraints may present a real risk to maintaining the level of at-sea presence the FPVs are expected to deliver. Finding MEO crew for FPVs is challenging as it is done on a voluntary basis. MEO employment contracts do not require them to go to sea. There are concerns that the number of MEOs willing to 'volunteer' for at sea patrols will diminish as the novelty of going to sea for extended periods (approximately 10 days at sea are required for each patrol) wears off. This is exacerbated by staff turnover. It was indicated this may be happening already. An example was provided of a patrol that had to be cancelled as it could not be adequately staffed.

The planning of MEOs to staff the FPVs has reportedly improved over the year, with better communication between area office managers and the central MMO team organising the FPV staffing plans. However, given the relatively small pool of available staff for at-sea patrols[41], there are **logistical challenges of getting MEOs to the**

[40] For example, a number of cases did not have a case closed date despite being recorded as closed, and a number of cases had an end date but were not recorded as closed.

[41] There are now 25 Marine Enforcement Officers boarding officers – see Section 4.2.1.1

right part of the country to join a FPV patrol, and MEOs may have to join patrols in marine areas they are not familiar with and do not have local fishery knowledge of.

It was noted that the **MMO as an organisation does not have significant sea-going experience**. Senior MEOs acting as leads on the FPVs are still inexperienced, particularly regarding patrol planning which requires them not only to have a good command of the tasking requirements, but to balance these against the opportunities and constraints presented by conditions at sea; decisions which have attendant considerations for patrol effectiveness, efficiency and safety at sea. Experience and supporting systems have reportedly improved over the last year but will take a number of years to fully come to fruition.

MMO-IFCA relationships differ around the coast at the local level. This can affect the degree of coordinated at sea patrol planning. Poor coordination has the potential to bring inefficiencies – an example was provided of the MMO investigating an issue that the IFCA had already been investigating. The increase in MMO capacity means there is both the scope and need for more co-ordination of patrols between IFCAs and the MMO.

Where relationships are good, MMO interviewees reported that IFCAs have been very helpful and provided patrol plans and shared reports, thereby reducing duplication of activity. However, others indicate more resistance to working with the MMO and a lack of willingness to share information.

It was indicated that due to the new MEO training regime, and the resourcing needs of the MMO FPVs, the attendance of the MMO on IFCA patrol vessels has reduced. This provides less opportunity for IFCA and MMO staff to build relationships. It also exacerbates existing challenges in co-ordinating joint MMO-IFCA patrols (where the MMO are perceived as having limited flexibility in cases where planned joined patrols are changed (e.g. due to adverse weather) or where joint patrols need to be arranged at short notice).

4.4.1.2 Coastal

There has been a loss of experienced MEO capacity from coastal teams. Additional resources have led to promotional opportunities for many existing teams in coastal offices. While this was good on an individual level and ensured a greater at sea presence, it meant a reduction in **experienced MEOs capacity in coastal teams**. New MEO recruits, funded by the increased budget increased, were inexperienced and hence not like-for-like replacements. Multiple senior MMO interviewees reported that they had gained replacements for lost staff and were given additional staff posts, but that all of these were new, inexperienced staff and therefore needed time to be brought up to speed. One senior MMO interviewee indicated that this has put a lot of pressure on their Senior Marine Officers (SMO).

An example of the above is in Brixham, where interviewees indicated there has been little net increase in staff[42]. Despite receiving several new recruits, three of the five existing experienced staff members moved to other teams (e.g. the training team). The team has also, therefore, become less experienced.

There **needs to be greater coordination** to resourcing and tasking across local areas. One senior MMO interviewee highlighted that there is a lack of co-ordination;

[42] As at the time of interview, in January 2020.

for example, each local area has its own SharePoint system. This restricts the ability to work consistently and collaboratively.

4.4.2 Staff retention

Staff have been brought in on short-term contracts due to the time-limited nature of the available funding. **Short-term contracts create challenges retaining staff for the planned duration and the longer-term which can result in the loss of intellectual capital and the investment put into training new recruits**. One experienced officer noted that some new recruits have already left due to dissatisfaction with their wages and the uncertainty over whether one-year contract would be renewed[43]. Another stated that they had struggled to recruit for a post because it was only a contract of 12 months. There was also concern new MEOs might only be fully trained for a few months before their contracts end.

4.4.3 Training practices

The **new training regime has received mixed reviews from new recruits.** One recent recruit reported that it had provided the perfect amount of time and quality of training. The opportunity to spend time in other MMO offices, working on different fisheries and with different teams was thought to be beneficial. Other recruits felt that the training was not sufficient. For example, that aspects of their training were conducted in too short a time period, which did not allow for messages and training to be properly conveyed; and that the new training had not prepared them adequately for conducting their activities. For example, it was suggested that there is a gap in emotional intelligence training and new that recruits **do not feel equipped to handle situations with high levels of conflict with fishers**.

It was reported that MMO staff were stretched and there have been challenges in providing training in specific areas due to a lack of experienced officers. This was particularly the case when high volumes of new recruits were joining the MMO, although this pressure is now reportedly easing.

The importance of the training programme 'mentors' was highlighted by one interviewee, who noted that it helped to learn from mentors how to interact with fishers and be professional. However, the **accessibility of mentors was an issue**. One interviewee indicated that their mentor had 11 trainees and had to split their time while still maintaining their own responsibilities. Another indicated that they did not receive sufficient support from their mentor.

MEOs have limited experience before going out to sea. Concerns were raised by one senior MMO interviewee regarding the short training schedule. It was also flagged that there is **a lack of general seamanship training for MEOs**, many of whom have no experience of working at sea, prior to going on sea patrols. New recruits were being trained at sea but were not provided with any seamanship courses. This was perceived to have had a knock-on effect on industry perceptions of the MMO as fishers knew MEOs conducting patrols and inspections were less experienced.

[43] A number of one-year contracts have been extended for another year since the interview took place with MMO staff.

4.4.3.1 Experience of MEOs

Both MMO interviewees and fishers[44] highlighted the **lack of fishing background of newer MEOs, and the negative effect on the quality of inspections**. Comments made by fishers in the Fisher Survey about what MMO could do to improve compliance included reference to these points:

> *"More knowledgeable staff, especially about fishing, need sea time."*
>
> *"MMO staff who are better informed as they don't know their own legislation and can't give simple answers"*
>
> *"Make sure regulators have a good basic knowledge of the fish in their area. Too many MMO and IFCA have very little experience of fisheries and fishing"*
>
> *"Stop sending out MMO officers who have little or no experience of fishing and the problems we encounter on a daily basis."*
>
> *"It's not their attitude – it's their knowledge. A lot of them are new. If you want any real information you have to go to the office. And it [what they tell you in the office] isn't always true – and they won't give you anything in writing"*

Given the significant level of MEO recruitment, this issue is not unexpected. It highlights the importance of staff retention over the medium-to-long term, and the need to try to insulate against cyclical losses in experiences as budgets increase and decrease over time.

4.4.4 Inspection targets

Along with the increase in MEOs, inspection targets for coastal teams were introduced. The inspection targets were reported to have encouraged a broader range of vessels to be inspected, as MEOs may have more randomly selected vessels to inspect (to ensure that met their targets) rather than focussing only on intelligence / high risk vessels. This was thought to have supported an increase in MMO visibility and widening of their extent of engagement with fishers. Although some MMO interviewees did not consider the increased use of random inspections to be a good thing, given it conflicts with the standard risk-based inspection approach. Some local areas have **struggled to reach new inspection targets,** considering them to have been set unrealistically high.

A few interviewees expressed **concern that, because of the targets, success may be measured by the number of inspections completed**, rather than the level of compliance and quality of inspections. It was suggested that, within a day, the MMO may intend to conduct 10 inspections, but if the first inspection shows non-compliance, this may take the whole day to follow through. One interviewee questioned why, given the important role of MEO 'presence' and general information gathering – outside of formal inspections – such activity is not reflected in performance indicators.

4.4.5 Intelligence and investigation

The dedicated intelligence unit does not necessarily account for 'informal' intelligence information particularly well. One MEO noted that much intelligence is only communicated through informal routes (e.g. via telephone to the coastal officer), rather than being formally entered into the intelligence system. Thus, intelligence is

[44] Respondents to the Fisher Survey and Sanctioned Fisher Interviews

not logged and may get lost. The processes and systems in place do not appear well set up to deal with informal intelligence. There may also be cultural barriers, as MEOs (from senior to junior staff) are more used to passing on informal intelligence via internal briefing calls and do not regularly formally log such information. Some Sanctioned Fisher interviewees indicated that there is no suitable channel for informing the MMO of suspected instances of non-compliance.

More could be done to support fishers proactively providing intelligence to the MMO. The MMO receive intelligence from fishers on potential non-compliance. However, there is no promoted system in place for fishers to report such intelligence. Some Fisher Survey and Sanctioned Fisher respondents indicated that more could be done to encourage fishers to report suspected non-compliance. One Sanctioned Fisher interviewee indicated they were concerned about reporting suspected illegal activity of other fishers due to potential reprisals from those fishermen. The interviewee suggested that a formal channel for the submission of such information which guarantees informants' anonymity should be available. Some Fisher Survey comments around this included:

"Fisherman could be more active at policing e.g. anonymous reporting line"

"No central contact point to report compliance issues"

Communication between the new investigations unit and the on-the-ground local teams was reported to be sometimes lacking, which may jeopardise case success. Concerns were also raised about the lack of field experience of some MMO investigators, noting that it takes a long time to train somebody to conduct investigations to a good standard. The lack of communication combined with limited experience of investigators means that new staff lack insight of the local context or of what may constitute good intelligence. As a result, some MMO interviewees suggested there is a risk of losing evidence and cases because of the new model.

Inadequate IT systems mean that full value may not be extracted from intelligence. Despite the new centralised intelligence and investigations unit**,** several MMO interviewees noted that the IT system is "*poor*" and "*clunky*". This presents challenges to processing intelligence data. However, a senior MMO interviewee indicated that there are plans to invest in digitising the intelligence system, which will support enhanced analysis.

4.5 Interaction of surface and aerial surveillance

This section investigates how aerial and surface surveillance are being used together to improve the effectiveness and efficiency of control and enforcement, and whether such improvements have materialised as a result of the increased budget. Specifically, this section seeks to answer the evaluation questions:

- What is the interaction between at-sea and aerial surveillance?
- What is the impact of the interaction in terms of effectiveness and efficiency?
- Has the increased budget delivered such effectiveness and efficiency gains?

4.5.1 Operational changes delivered by the increased budget

Aerial surveillance was secured but has not been used frequently, or at its full capacity – during 2019 there was up to one aerial surveillance flight a week, on average (see Section 4.2.3). The increase in aerial capacity delivered by the increased budget is available on a flexible basis – it can be increased as and when

needed. The primary purpose for securing this capacity was to address potential issues that may result from a no-deal EU Exit. As no such an event has occurred, the available aerial capacity has not been fully utilised.

The potential effectiveness and efficiency gains are not being fully captured, but the potential for them has been tested. Given that the aerial surveillance capacity is not been fully utilised, the level of interaction between aerial and at-sea assets is only limited and hence the scope for effectiveness and efficiency benefits is also limited.

Where there has been interaction, the tasking of at-sea assets in response to air surveillance is reported to work well. This is partly because they are both administered via a central operations team and so can be co-ordinated effectively. Aerial and at-sea surveillance assets are tasked through the UK Fisheries Monitoring Centre (FMC), principally through the central team in Newcastle and liaison officers in JMOCC/NMIC.

4.5.2 Interactions and the impact on effectiveness and efficiency

Aerial and at sea surface surveillance complement each other. The different surveillance platforms have different characteristics which support this complementarity and can positively impact on the effectiveness and efficiency of control and enforcement.

4.5.2.1 Intelligence gathering

Aerial surveillance offers the opportunity to gather extensive intelligence, faster and over a wider area that can at-sea surveillance.

Aerial surveillance can cover greater areas, provide a **wider scope of surveillance information** and react quickly. Aerial surveillance has a 250-mile radar and can be used to gather intelligence. Surface surveillance tends to be more in-depth and focussed on physical inspections.

Aerial surveillance provides a snapshot of fishing activity in a specific area, which **complements VMS data** which only reports a location every two hours. Aerial surveillance can also provide a validation mechanism to ensure that VMS and AIS have not been switched off.

4.5.2.2 Intelligence sharing to improve at-sea asset tasking

Aerial surveillance intelligence can be used to enhance the effectiveness and efficiency of at-sea assets.

Intelligence sharing can occur in real-time, enabling rapid tasking decisions. This capability has been trialled but not rolled out to its full capacity. Information can be passed from the aircraft very quickly to support rapid analysis by at-sea asset tasking decisions the central team in Newcastle and. MMO interviewees reported that this process works well. Aerial intelligence can be passed directly to at-sea assets, to provide for real-time tasking, but this has not facility has not been used.

The intelligence information can be provided in real time via satellite communication. There is an option for aerial surveillance to provide live video and downlinks, accessed via a web portal which would provide a step up in the speed and level of surveillance intelligence. This has been tested and works but is not currently deemed necessary.

Aerial surveillance has been successfully used to investigate suspected illegal and gather intelligence then be used to make at-sea asset tasking decisions. This has most commonly been associated with investing suspected illegal activity that would have prohibitively time consuming to investigate directly via at-sea assets. For example, aerial surveillance has been tasked to locations at the edge of the EEZ, such as the South West Approaches, which would take significant time (and hence cost) for an at-sea asset to reach.

4.5.2.3 Enhancing visible presence

Aerial surveillance can enhance the MMO's visible presence, getting to areas where at-sea vessels are not present. The greater speed and range of aircraft compared to at-sea assets is considered an important asset for enhancing MMO visibility around the EEZ, given that the MMO has only two FPVs under their direct control. Aerial surveillance is also typically tasked to areas where it may not be possible to deploy at-sea assets, typically either due to cost or weather.

Aerial surveillance is recognised as **not providing a full deterrence effect**, as inspections are not possible. It is possible to do a visual aerial inspection, for example the aircraft can ask a fisher to haul their gear so the number of dredges being used on each side can be check. However, a full physical inspection, as is done with at-sea assets, is not possible.

5 Drivers of compliance

The effectiveness of regulatory responses that seek to improve compliance can be improved through tailoring those responses to fishers' motivations for being compliant or non-compliant[45]. This section examines the extent to which different drivers motivate compliance and non-compliance, with consideration of the relative importance of 'deterrence drivers' and 'voluntary drivers' (see logic models in Section 2.1 for lists of specific deterrence and voluntary drivers) and responds to the evaluation questions:

- To what extent do different factors drive compliance and non-compliance?
- What is the relative contribution of deterrence and voluntary factors in influencing compliance?
- To what extent do different 'deterrence' factors influence compliance?
- Which factors are the most influential in supporting voluntary compliance?

The section draws primarily on evidence from the Fisher Survey, as well as information from the Sanctioned Fisher Interviews. Supplementary information is provided from the 2019 Baseline Survey and MMO Interviews where relevant and available.

This section presents three sets of analyses of drivers of compliance:

- The drivers that fishers say are most important when making compliance decisions: A descriptive analysis of the drivers that fishers directly stated to be of importance to them when making decisions about complying with fisheries regulations (source: Fisher Survey).
- The drivers that best explain variation in compliance: A regression analysis using fisher opinion about factors relevant to the different compliance drivers, to determine which best explain variation in self-reported compliance (source: Fisher Survey). The regression analysis identifies the main drivers that explain the variation in compliance across the Fisher Survey sample – it creates a model that can be used to predict the compliance of fishers with the regulations enforced by the MMO
- Reasons given for non-compliance: Analysis of reasons given by fishers as to why they have infringed fisheries regulations in the past (source: Fisher Survey, Sanctioned Fisher Interviews).

5.1 Summary

Both voluntary and deterrence drivers are important determinants of compliance. The three drivers considered to be of most importance by fishers were all voluntary drivers (Figure 5.1). All the variables that were found to best explain variation in compliance levels between fishers were also voluntary drivers.

The severity of sanctions was considered by fishers to be of greater importance than the likelihood of inspection / detection. Deterrence drivers were not found to explain variation in compliance amongst respondents – they were equally relevant to fishers regardless of their level of compliance.

[45] This idea is encapsulated in the responsive 'regulatory pyramid' proposed by Ayres, I. and Braithwaite, J. (1992) Responsive Regulation: Transcending the Deregulation Debate. Oxford University Press, New York

The potential for financial benefit was found to explain variation in compliance with Access restrictions. It was not a commonly identified reason given by fishers for instances of non-compliance (in general), however many research participants did mention the wider economic context as justification.

Awareness of regulations and potential disapproval by other fishers were found to be important drivers explaining variation in self-reported compliance for three of the four regulation categories[46] – with more compliant fishers more likely to think that other fishers would disapprove of compliance and more likely to consider themselves aware of the regulations. A lack of awareness of the regulations was the reason given most by fishers who had committed an infringement in the last 12 months.

Fisher perception of the likelihood that others comply with or break regulations was a significant explanatory driver for variation in compliance for Licence conditions. However other fishers not complying was the least cited driver that fishers who had been non-compliant with Licence conditions (or the other regulation categories) gave as the reason for their infringement.

5.2 The drivers that fishers say are most important when making compliance decisions

Respondents to the Fisher Survey were asked to rate how important different drivers were to them when making decisions about whether to comply with fisheries regulations. Eleven drivers were presented to fishers: two deterrence drivers, nine voluntary drivers.

The three drivers considered to be of most importance by fishers were all voluntary drivers (see Figure 5.1). Around four fifths of fishers rated as 'very important' or 'important' 'your reputation as a fisher' (85%), 'your awareness and understanding of the regulations (83%), and 'sense of moral duty / do the right thing' (77%).

The two deterrence drivers were ranked fourth and sixth: 69% reported the 'potential severity of sanctions'[47] to be 'very important' or 'important, and 65% considered the 'likelihood of inspection or infringement detection' as important.

The 2019 Baseline Survey similarly found the voluntary drivers were in general ranked more highly than deterrence drivers.

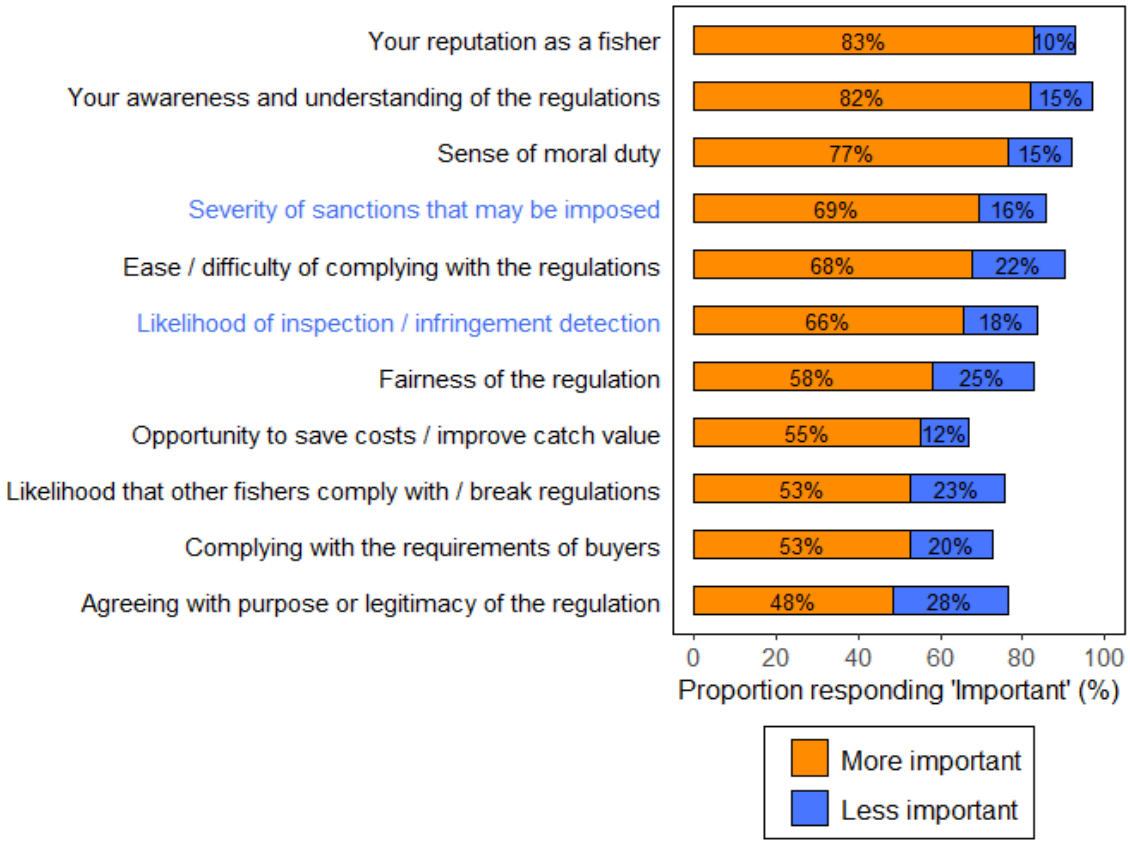
Responses were very similar across subgroups of fishers[48]. The stated importance of 'your awareness and understanding of the regulations' differed statistically between 10m and under and Over 10m vessel fishers (85% compared to 80% respectively), although the driver was still ranked second for both subgroups. There were no other significant differences in responses by vessel length, and no statistically significant differences across any driver by gear type.

[46] All except Access restrictions

[47] Further discussion on the severity of sanctions is provided in Section 6.3.4

[48] See tables in Section A3.2

Figure 5.1 Fishers own rating of the importance of compliance drivers to their decision making



Source: Fisher Survey.

Note: 'More important' includes responses: 'very important' or 'important'. 'Less important' includes responses: 'moderately important' or 'slightly important'. The two deterrence drivers are highlighted by blue text.

There were several statistical differences in the stated importance of drivers across ICES area(s) fished, which were further investigated through post hoc tests to determine which area combinations this applied to[49]. There were differences for:

- 'ease/difficulty of complying with regulations', 'fairness of the regulation', 'opportunity to save costs/improve catch value' and 'likelihood of being inspected/having an infringement detected': in all cases, a higher proportion of respondents in Subarea 4 felt the driver was very important/important compared to those in Divisions 7d,e, those in Divisions 7f,g and those in Divisions 7h,j.
- 'opportunity to save costs/improve catch value': a higher proportion of respondents in Divisions 7d,e and 7f,g do not consider this driver to be important to them, compared to those in Subarea 4.
- 'agreeing with the purpose/legitimacy of the regulation': the majority of Subarea 4 fishers stated this driver was important to them whereas for Divisions 7h,j most stated this was not important.

[49] Inter-area differences reported below were all statistically significant, however the small sample size (n = 8) for Divisions 7,h,j should be considered when interpreting the results.

- 'your reputation as a fisher': respondents who fish in Divisions 7f,g rated this driver as more important than those in Subarea 4.

Opinion on the top voluntary drivers that fishers considered important varied more with fisher compliance than did opinion on the two deterrence drivers.

A correlation analysis[50] was conducted between the compliance drivers that fishers said were important and self-reported compliance (compliance overall and with the fisheries regulation categories).

Of the three voluntary drivers that fishers stated to be the most important (from Figure 5.1), the top two – reputation as a fisher, and awareness of regulations – were both correlated with overall self-reported compliance and with compliance with multiple fisheries regulation categories. The correlations indicate that the more important fishers consider these drivers to be, the higher their self-reported compliance levels are.

Fisher opinion on the importance of the sense of moral duty to comply was not correlated with compliance. However, a similar question asking about whether fishers felt morally bound to comply with fisheries regulation was correlated with compliance.

Of the two deterrence drivers – the extent to which fishers state that they consider the likelihood of inspection/detection, and the severity of sanctions – neither were correlated with overall self-reported compliance, but were correlated with one of the regulation categories (Catch reporting and control requirements). This indicates that the deterrence drivers are generally considered by fishers to be of similar importance, regardless of a fisher's level of compliance level.

A further analysis was[51] conducted to determine the existence of any significant differences in the reported importance of drivers between a more compliant group of fishers and a least compliant group. A significant difference was found for three drivers between the more and least compliant groups[52] [53]:

- Reputation was found to be of greater importance for the more compliant group, for all regulations as a whole, Access restrictions and Licence conditions.
- Concern about the severity of sanctions was found to be of more importance to the compliant group, with regards Catch reporting and control requirements.
- The opportunity to save costs and improve catch value was found to be of more importance for the least compliant group, with regards to their compliance with Access restrictions.

5.3 The drivers that best explain variation in compliance

5.3.1 Results of the regression analysis

A regression analysis was carried out to determine which drivers best explained variation in compliance (looking at compliance with all regulations, and compliance

[50] A correlation analysis identifies whether there is a relationship, or association, between two variables. See Annex A2.1.8 for full results

[51] The analysis looked at whether there were significant differences between more compliant fishers (those with self-reported compliance scores of 7 and over), and the least compliant fishers (scores of 6 or under), using t-tests.

[52] See Table A2.10 for results of the t-test

[53] The sample size of the least compliant group of fishers was very small (between 11 and 35), which may have influenced the results. See Annex A2.1.7 for further details.

with each of the four regulation categories). A regression analysis goes further than identifying whether there are relationships between variables – it identifies the main drivers that explain the variation in compliance, creating a model that can be used to predict the compliance of fishers with the regulations enforced by the MMO[54].

Approximately 40 variables were considered for inclusion in the regression models – these included the drivers that fishers directly indicated they consider in compliance decisions[55], as well as other indicators of fisher opinion on the full range of issues relevant to compliance drivers (which were sought without reference to respondents' decision making)[56].

A correlation analysis was conducted for all 40 variables (see Table A2.3 for correlation results) to determine which variables to include in the regression analysis – only variables that were significant (or very close to significant[57]) were included in the regression analysis.

Figure 5.2 presents the drivers that were found to be significant in the regression models i.e. that best explain variation in compliance. However, the models explain a relatively low level of the variation in compliance (see Section A2.1.8.2 for further details).

Voluntary drivers were found to best explain variation in compliance. Two specific drivers – 'awareness' and 'disapproval of other fishers' – were found to be significant for three of the four regulation categories. Compliance with Access restrictions had a notably different set of drivers to the other three regulation categories – it was the only category where the opportunity to save costs / improve catch value was significant and this was the only significant variable.

No deterrence drivers were found to hold significant explanatory power. This means that fishers' different opinions on the deterrence drivers (e.g. the likelihood of being inspected, where the severity of sanctions were a concern to them) were not good predictors of differences in compliance levels. This is not the same as saying that deterrence drivers do not have an impact on compliance.

[54] See Annex A2.1.7 for further details the regression analysis, the methodology employed and its limitations.

[55] Already discussed in Section 5.2

[56] For example: As well as asking fishers how important their reputation is to them when they are making compliance decisions, fishers were also asked whether other fishers would disapprove if they were not compliant with the regulations.

[57] See A2.1.7.3 for further explanation.

Figure 5.2 Drivers that best explain variation in self-reported compliance, by category of regulation

REGULATION CATEGORY	DRIVER TYPE	SPECIFIC DRIVER
Overall compliance	Behavioural control	**Ease of complying** with access restrictions
Access restrictions	Economic incentives	**Opportunity** to save costs / improve catch value
Technical conservation measures	Behavioural control	**Awareness** and understanding of the regulations
	Social norms	Whether other **fishers would disapprove** of non-compliance
		Complying with the **requirements of buyers**
Catch reporting and control requirements	Behavioural control	**Awareness** of catch reporting & control requirements
	Social norms	Whether other **fishers would disapprove** of non-compliance
	Personal morals	Feel **morally bound** to comply with fisheries regulations
Licence conditions	Behavioural control	**Awareness** of licence conditions
	Social norms	Whether other **fishers would disapprove** of non-compliance
		Likelihood that **other fishers comply** with/break the regulation

Source: Fisher Survey, regression analysis based on multiple questions

5.3.1.2 Further consideration of correlations with deterrence drivers

The relative importance respondents attached to both the likelihood of being inspected/having an infringement detected, and to the severity of sanctions, when making compliance decisions, were found to be positively correlated with compliance for catch recording and control requirements i.e. more compliant fishers state they attach greater importance to these deterrence drivers than do less compliant fishers. No correlation was found for the other regulation categories, or when considering all regulations as a whole.

Respondents' opinion on the actual likelihood that they will be inspected at sea on their next fishing trip (by any fisheries regulator) was negatively correlated with compliance for some regulation categories i.e. respondents who considered the likelihood of being inspected at sea to be higher had lower compliance levels. Although it was not found in the regression analysis to be a significant explanatory driver. There was no correlation between respondents' opinion on the likelihood of being inspected in port and their self-reported compliance.

Whilst less compliant fishers may think themselves more likely to be inspected at sea than more compliant fishers, they did not attach any higher importance to the likelihood of being inspected/having infringements detected than more compliant fishers.

5.4 Reasons given for non-compliance

Where fishers had committed an infringement in the last 12 months, the Fisher Survey asked respondents to select their reasons for doing so from a pre-defined list (see Figure 5.3). A similar, open question was asked of the Sanctioned Fishers.

Being unaware they were doing something wrong was the most common reason given by fishers responding to the Fisher Survey and Sanctioned Fisher interviews for their non-compliance. In the Fisher Survey, 'I didn't know' was the most frequently given reason for non-compliance for three of the regulation categories (Catch reporting and control requirements was the exception) (Figure 5.3). Many of the Sanctioned Fisher interviewees who said they were unaware they were committing an infringement also highlighted the insignificant financial gain resulting from their infringement as further proof that they had not intentionally infringed regulations.

I**n many cases, fishers who committed an offence in order to save time/costs or improve landings, consider the wider economic context justification for doing so**. Whilst relatively few Fisher Survey respondents identified an 'opportunity to save time/costs' as a specific reason for their non-compliance for three of the regulation categories, it was the second most important reason given for non-compliance with Access restrictions. Further, a number of respondents raised financial issues to justify their non-compliance as part of the additional open text responses. For example, Fisher Survey respondents stated that their non-compliance was due to the inability to earn sufficient money within the regulations: one indicated they were non-compliant with Access restrictions because they *"need to earn a living in the only grounds available"*, whilst another who had infringed Technical conservation measures stated *"I lose too many fish sticking to these measures, I have bills to pay*". Another stated that "*if I didn't break the rules I would be bankrupt - unable to make a living*". The few Sanctioned Fisher interviewees who identified financial gain as a driver of their non-compliance stated that they had to work outside of the regulations in order to make a living. In addition, self-reported compliance was found to be correlated with opinion on the extent to which regulations make it difficult to be profitable[58].

Not agreeing with the legislation was the joint most frequently given reason for infringement of the regulation categories except for Licence Conditions by Fisher Survey respondents. Some Sanctioned Fisher Interviewees also stated that they do not always comply with regulations if they do not believe them to be necessary or appropriate. Examples given by both sets of respondents on why they disagreed included that the regulation threatened fishers' livelihoods, disregarded the local realities and characteristics of the fishery or was technically unworkable (particularly with regards the catch app for under 10s).

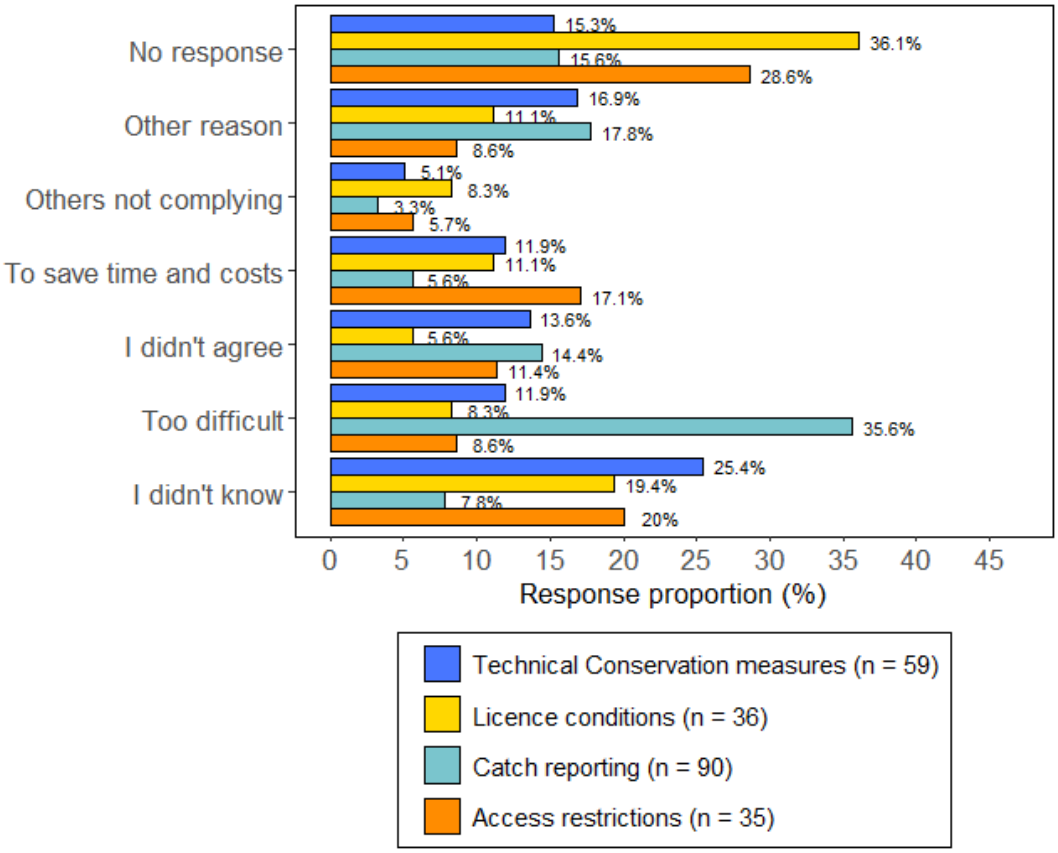
By far the most frequently cited reason for infringement of catch recording was that it was 'too difficult' to comply with. Many of the qualitative responses indicate that the new catch app for under 10s may have influenced responses, with catch app issues ranging from it being too complicated, not practical and challenges with

[58] Respondents with lower self-reported compliance were more likely to also think that fisheries regulations make it difficult for their business to be profitable (see Table A2.3, Q24b)

accurately estimating weights. Many respondents citing the technical difficulty of complying also indicated they disagreed with the need for the regulation.

Other fishers not complying was the least frequently identified reason[59] by Fisher Survey respondents who had committed an infringement. Half of Sanctioned Fisher interviewees reported being aware of repeated non-compliance from other fishers in their area[60], with a few indicating that *"bending the rules",* such as fishing in restricted areas or fishing above quotas, was common practice amongst fishers. A few interviewees revealed some frustration stating that non-compliant behaviour from other fishers was *"difficult to watch and accept"*, although did not state or imply that it impacted on their own compliance.

Figure 5.3 Reasons given for any non-compliance in the last 12 months



Source: Fisher Survey

Note: 'No response' refers to respondents who reported non-compliance but did not provide a reason.

[59] For all categories of regulation except Licence conditions, for which it was the second least frequent.

[60] This included references to European vessels fishing in UK territorial waters.

6 Inspection and detection deterrence drivers

This section examines the relationship between control and enforcement activities and the deterrence drivers of likelihood of inspection and likelihood of detection (as indicated in Figure 2.1), and investigates changes resulting from the increased budget. Specifically, this section addresses the evaluation questions on:

- Relative contribution of control and enforcement activities
  - What contribution does each strand of control and enforcement activity make to fishing behaviour?
  - How effective is each strand?
- Industry perceptions / attitudes
  - How have industry perceptions and attitudes of the factors that drive compliance changed and what contribution did the increased budget make to these changes?
- Evidence of specific and general deterrence
  - Has the increased budget resulted in an increase in the specific deterrence effect?
  - Has the increased budget resulted in an increase in the general deterrence effect?

Evidence was primarily drawn from the Fisher Survey. Supplementary evidence was drawn from MMO data, interviews with the MMO and other regulators, and Sanctioned Fisher Interviews.

This section is structured as follows:

- Section 6.1 summarises the findings from Sections 6.2 and 6.3.
- Section 6.2 explores the relationships between control and enforcement activities and perceptions about the likelihood of inspection and detection.
- Section 6.3 examines how perceptions of the inspection and detection deterrence drivers have changed in the last year and considers what contribution the increased budget made to the changes.

6.1 Summary

Contributions of control actions to deterrence drivers

Relationships between control actions and deterrence drivers were explored by investigating the effect of MMO visibility and inspections on the deterrence drivers of perceived likelihood of inspection and perceived likelihood of detection.

The visibility of the MMO was found to be linked to both deterrence drivers; respondents who reported a higher perceived likelihood of inspection and detection were more likely to think that the MMO has a visible presence. Sighting FPVs more frequently increased perceptions about the MMO being visible. This relationship was also identified by the 2019 Baseline Survey. Overall, however, most respondents reported not having seen the MMO FPV.

The perceived likelihood of being inspected or of infringements being detected were not clearly related to the experience of being inspected. An exception was for respondents who perceived a higher likelihood of detection ashore, who were more

likely to have been inspected recently. Also, those who perceived a higher likelihood of inspection were more likely to perceive a higher likelihood that infringements would be detected. However, most respondents felt that the likelihood of being inspected was low and having been inspected recently did not appear to alter this perception.

Additional factors were observed that relate to perceived likelihood of inspection and detection. Respondents who thought the MMO was effective, and who thought they were likely to hear about infringements detected on other vessels, perceived a higher likelihood of detection. Together with the finding on the role of MMO visibility, this suggests that perceptions matter more than the experience of being inspected in relation to the deterrence drivers considered in this section.

Changing perceptions and links to the increased budget

All evidence sources indicated a degree of positive change resulting from the increased control and enforcement effort in 2019. Compared to the 2019 Baseline Survey, the perceived likelihood of inspection and likelihood of detection have increased – the strength of change appears to be greater ashore than at sea. A number of the variables which may influence these deterrence drivers also increased – inspections at sea and ashore increased, opinion on MMO visibility ashore increased, and views of MMO effectiveness increased. A notable exception was MMO visibility at sea, which was found to be lower than the 2019 Baseline Survey despite the evident increased MMO presence at sea.

Given the increased control actions had been operational for less than 12 months at the time when the Fisher Survey was conducted, it is a positive sign that there are signals indicating that fishers perceive a higher risk of being inspected and of infringements being detected. Interviews also yielded some evidence of specific deterrence effects due to increased control actions.

The weight of evidence indicates that the strength of the deterrence drivers has increased and that this may be resulting in a stronger deterrence effect. This should however be tempered by the general finding that MMO visibility and the likelihood of inspection are reported to be low.

Challenges and opportunities

Interviews with the MMO flagged challenges with a small number of persistent offenders who actively avoid detection. Examples of these behaviours were offered in Sanctioned Fisher interviews. Knowledge about MMO movements ashore and at sea, information that can be readily shared, make detection avoidance easier. The role of regulatory strengthening was highlighted as an effective means of deterring noncompliant activity, and may be necessary to tackle persistent offenders alongside control and enforcement investment.

Regulator visibility positively influences deterrence drivers, but the effect can be temporary e.g. a FPV deterrence is most effective when it is visible or known to be in the vicinity of a fisher.

6.2 The contribution of control actions to deterrence drivers of the likelihood of inspection and likelihood of detection

This section examines the relationships between fishers' direct experience of control actions and their perception of the deterrence drivers of the likelihood of inspection and the likelihood of infringements being detected.

Specifically, it considers the influence of MMO visibility in port and at sea (which relates to the increased budget operational objective of a 'stronger, multi-location physical presence' - presented in the logic models in Section 2.1), and the influence of being inspected (which relates to the operational objective of 'increased proportion of fleet inspected more frequently').

6.2.1 The effect of MMO visibility on deterrence drivers

There is a positive relationship between the visibility of the MMO to fishers and fishers' perceptions of the likelihood of inspection and detection.

Fishers who consider the MMO to have a visible presence are also more likely to perceive the likelihood of inspection to be higher. This relationship holds for both at sea visibility - inspection likelihood, and for ashore visibility - inspection likelihood. Nearly 85% of Fisher Survey respondents who reported a >50% chance of being inspected ashore during or after their next fishing trip agreed that the MMO is visible ashore, compared to 60% of those who reported a <50% chance (Figure 6.1). Whilst lower proportions of respondents consider the MMO to be visible at sea compared to ashore, the relationship still holds: 55% of Fisher Survey respondents who reported a >50% chance of being inspected at sea during their next fishing trip agreed that the MMO is visible at sea, compared to 29% of those who reported a <50% chance.

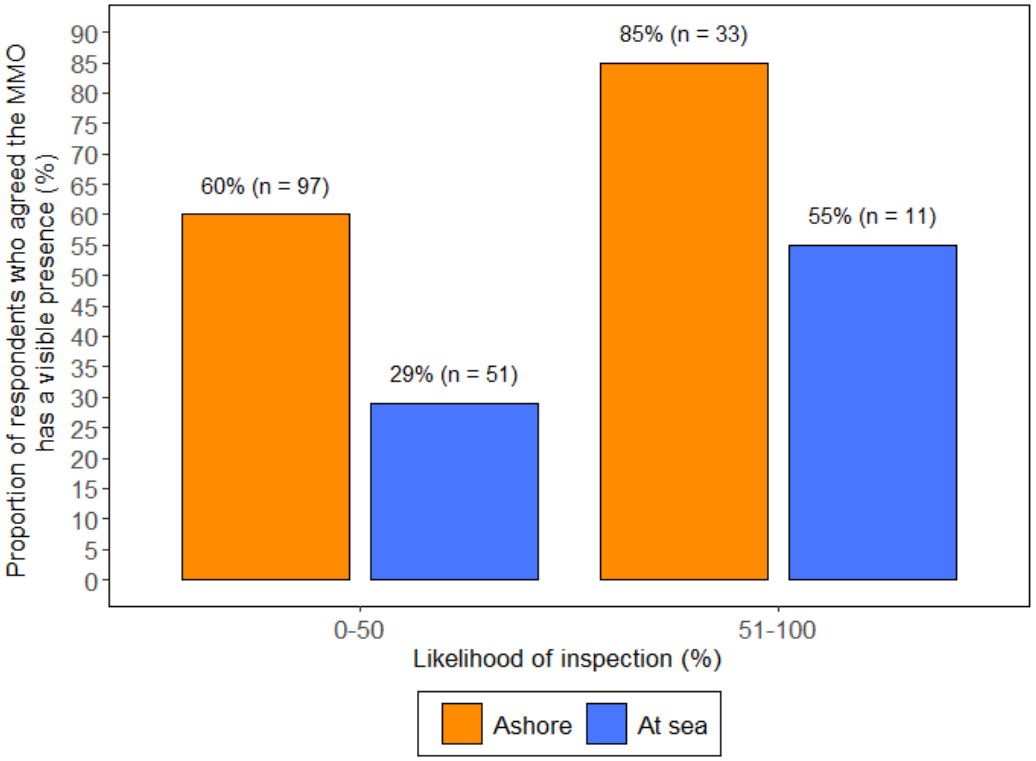
However, most Fisher Survey respondents did not perceive a high risk of being inspected on their next trip. The majority of respondents reported that the likelihood of being inspected at sea during their next fishing trip or being inspected ashore after their next trip was 50% or less (89% and 81%, respectively)[61].

Fishers who consider the MMO to have a visible presence are also more likely to perceive the likelihood of infringement detection to be higher. This relationship holds for both visibility at sea and ashore (Figure 6.2), although a lower proportion of respondents considered the MMO to be visible at sea compared to ashore. Overall, the same proportion (47%) of Fisher Survey respondents reported it to be likely that infringements would be detected by a fisheries regulator as reported it to be unlikely[62]. Some Fisher Survey respondents stated that increased MMO presence, particularly on the quayside but also at sea, could support greater compliance with the regulations. Some Sanctioned Fisher interviewees reported that the MMO was not visible in their area, and hence they felt there was low risk of any offences being detected.

[61] n = 182 and 165, respectively (excludes non-responses).

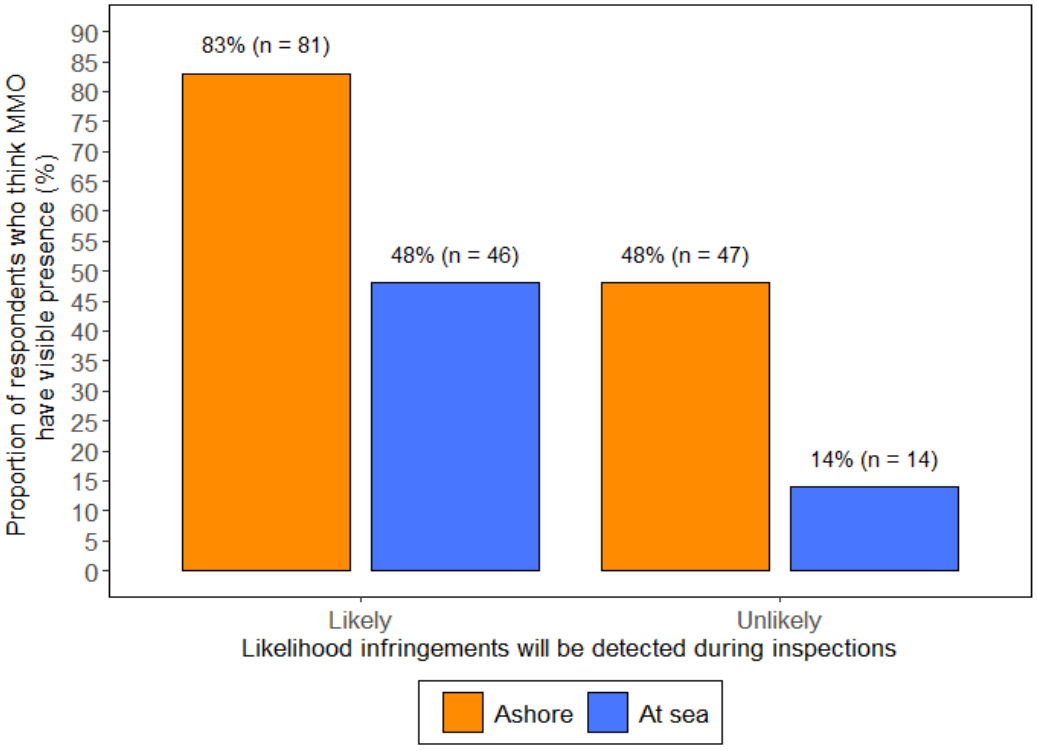
[62] The remaining 6% (n = 12) responded 'Don't know' to likelihood of infringement detection.

Figure 6.1 Opinion on MMO visibility ashore / at sea by perceived likelihood of being inspected ashore / at sea.



Source: Fisher Survey

Figure 6.2 Opinion on MMO visibility (ashore and at sea) by perceived likelihood that infringements will be detected during inspections



Source: Fisher survey

6.2.1.2 The influence of physical sightings of FPVs on perceived visibility of the MMO

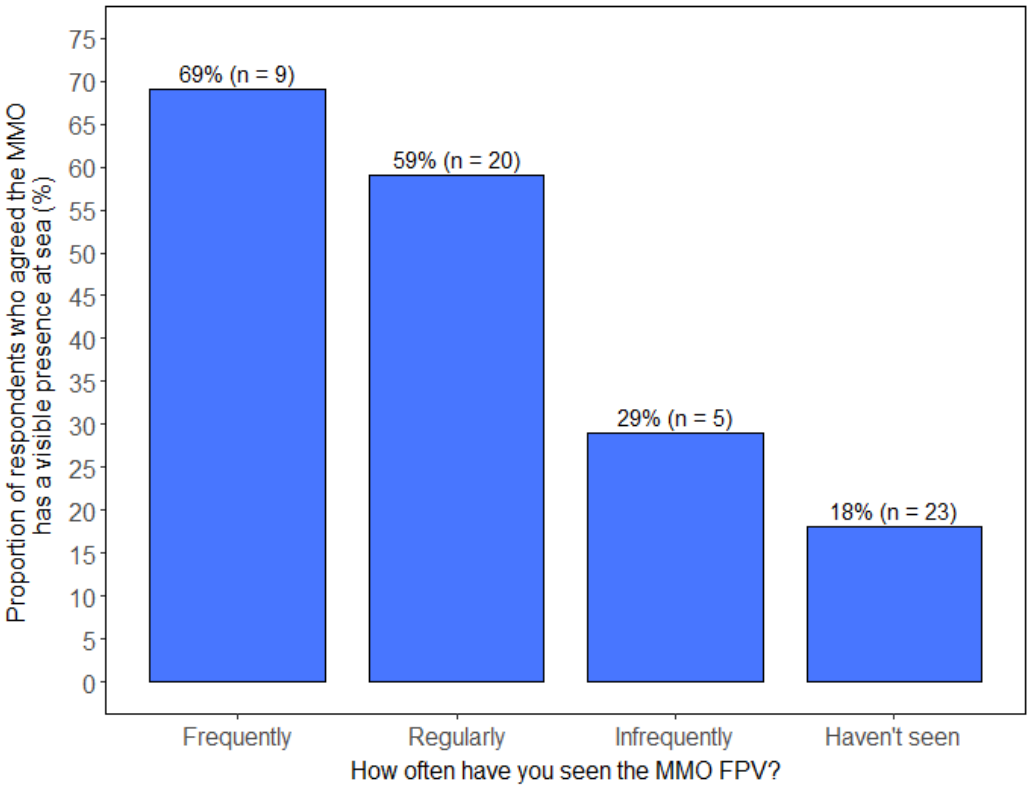
Fishers who see FPVs more often are more likely to think that the MMO has a visible presence[63]**.** Fisher Survey results (Figure 6.3) show this relationship for MMO FPVs. While unsurprising, this finding provides evidence that fishers' experience of control actions through sighting patrols influences the perceived visibility of the MMO and therefore may contribute to deterrence. The same relationship was also observed in the 2019 Baseline Survey.

The association between FPV sightings and MMO visibility is stronger for the MMO FPV than the RN. Of the 47 Fisher Survey respondents who had seen the MMO FPV more than once during the past year (categorised as 'frequently' or 'regularly' on Figure 6.3), 62% agreed that the MMO has a visible presence at sea, compared to 48% of the 63 respondents who had seen the RN.

However, **many respondents reported they had not seen a RN or MMO patrol vessel** (44% and 64% of the 209 respondents, respectively) and therefore the potential deterrence effect of seeing a FPV is likely to be limited in reality.

Significantly more Fisher Survey respondents of Over 10m than 10m and under vessels reported seeing the MMO (and RN) FPV regularly or frequently. This is in line with expectations, given that larger fishing vessels may be more likely to encounter the MMO and RN vessels as they generally operate further offshore.

Figure 6.3 Relationship between experience of sighting the MMO FPV and opinion that the MMO has a visible presence at sea.



Source: Fisher Survey
Sighting frequency response categories: Frequently = more than once a month or once a month, Regularly = every 2 to 3 or every 4 to 6 months, Infrequently = once a year

[63] This holds for the MMO FPV and RN but not other FPVs, as one would expect. Other FPVs include IFCA or Border Force vessels. The question on visibility was specifically asked regarding visibility of the MMO, not all fisheries regulators.

6.2.2 The effect of inspections on deterrence drivers

A fisher's experience of being inspected in the past is related to their opinion on the likelihood of being inspected in the future. The relationship between being inspected and opinion on the likelihood of infringements being detected is less clear.

Of the 209 Fisher Survey respondents, 57% had been previously inspected at sea (once for 21%, twice for 15%, ≥ three times for 21%) and 42% had not been inspected in the last year. More respondents had previously been inspected ashore or in port (77%, compared to 22% who had not) and the majority had been inspected three or more times (41%, compared to 20% inspected twice and 16% inspected once).

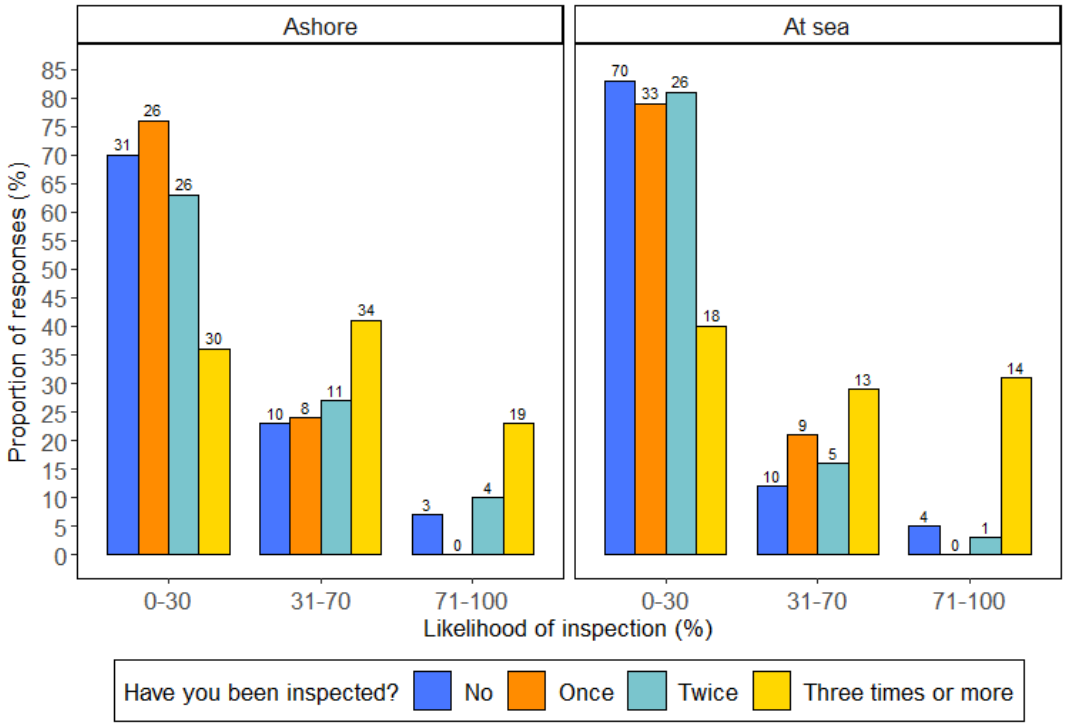
Figure 6.4[64] shows that Fishers Survey respondents who had not been inspected, or who had been inspected only once, were most likely to consider the likelihood of inspection to be low (≤30%). Less than 10% of such respondents considered the likelihood of inspection to be >70%. The pattern is similar for both inspections ashore and at sea. As experience of being inspected increases, particularly to being inspected three times or more, so do does the frequency of respondents' reporting a higher likelihood of inspection. The pattern is similar for both inspections ashore and at sea.

Figure 6.5 shows a positive relationship between Fisher Survey respondents who had been inspected ashore most frequently (three times or more) and the perception that infringements will be detected. For respondents who had been inspected twice or less in port, there is no clear relationship between inspection frequency and perceived likelihood of detection. There is also no clear relationship between the frequency of being inspected at sea and perceptions that infringements will be detected.

Respondents who report a higher chance of being inspected (greater than 30% chance of being inspected on their next trip) were more likely to report that infringement detection by a regulator is likely (Figure 6.6).

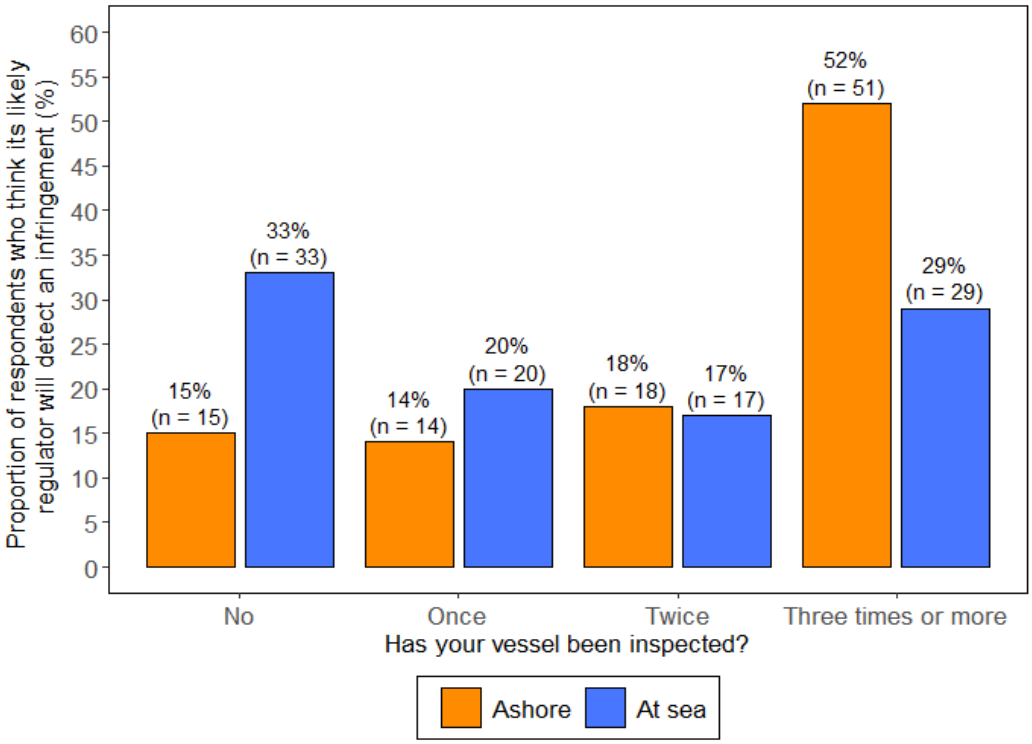
[64] Excludes the 7 (for ashore) and 6 (for at sea) respondents who stated 'don't know' for inspection history or likelihood of inspection.

Figure 6.4 Perceived likelihood of inspection during / after next fishing trip, by frequency of being inspected in the last 12 months (ashore and at sea). Corresponding sample sizes shown.



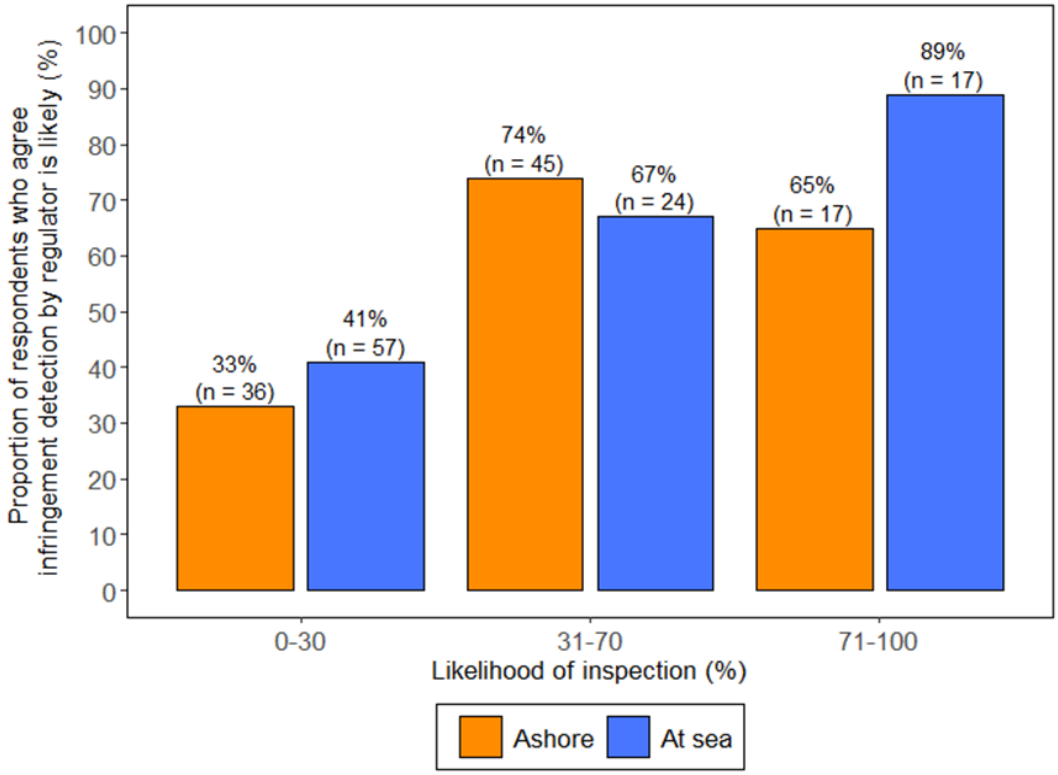
Source: Fisher Survey

Figure 6.5 Perceived likelihood of infringement detection by frequency of being inspected in the last 12 months (ashore and at sea)



Source: Fisher Survey

Figure 6.6 Fisher Survey opinion on likelihood of infringement detection by opinion on likelihood of inspection



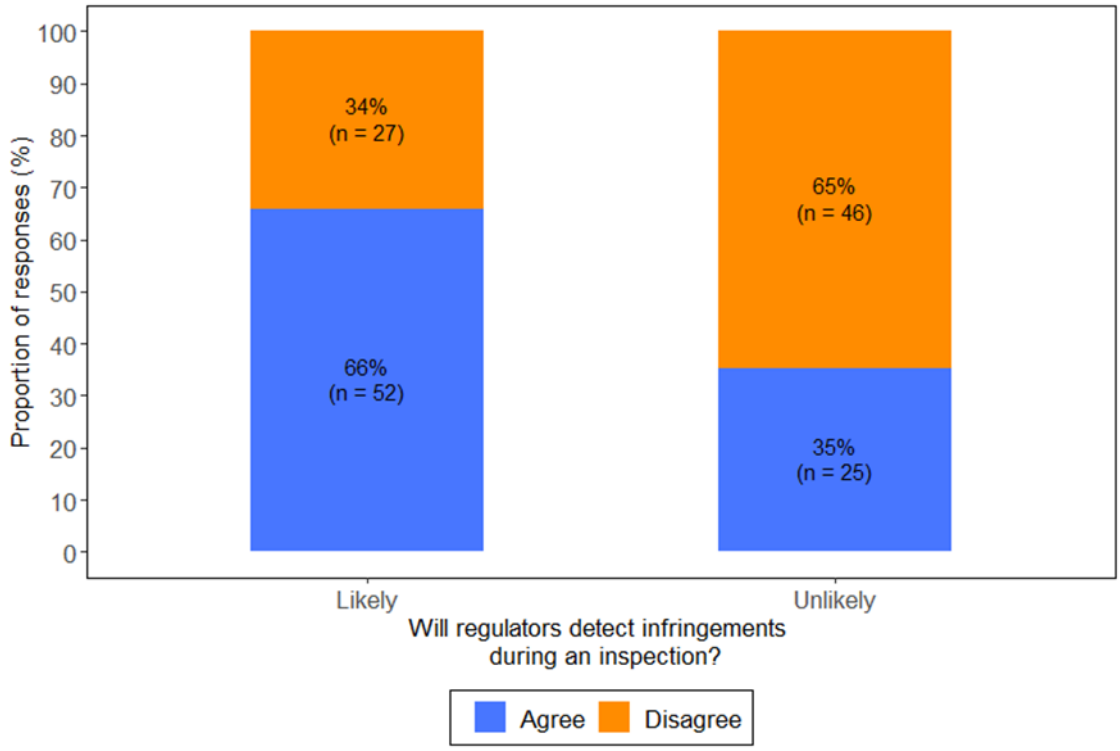
Source: Fisher Survey

6.2.3 Other factors influencing the likelihood of detection

The perceived effectiveness of the MMO influences the perceived likelihood that infringements will be detected during an inspection. Of respondents who agreed that the MMO is an effective regulator (n = 79, 38%), 66% thought it likely that infringements will be detected (compared to 34% of respondents who disagreed) (Figure 6.7)[65].

[65] Excludes the 2 respondents who agreed the MMO is an effective regulator but did not know the likelihood of infringement detection

Figure 6.7 Fisher Survey opinion on likelihood of infringement detection (likely/unlikely) by opinion on whether the MMO is an effective regulator (agree/disagree)

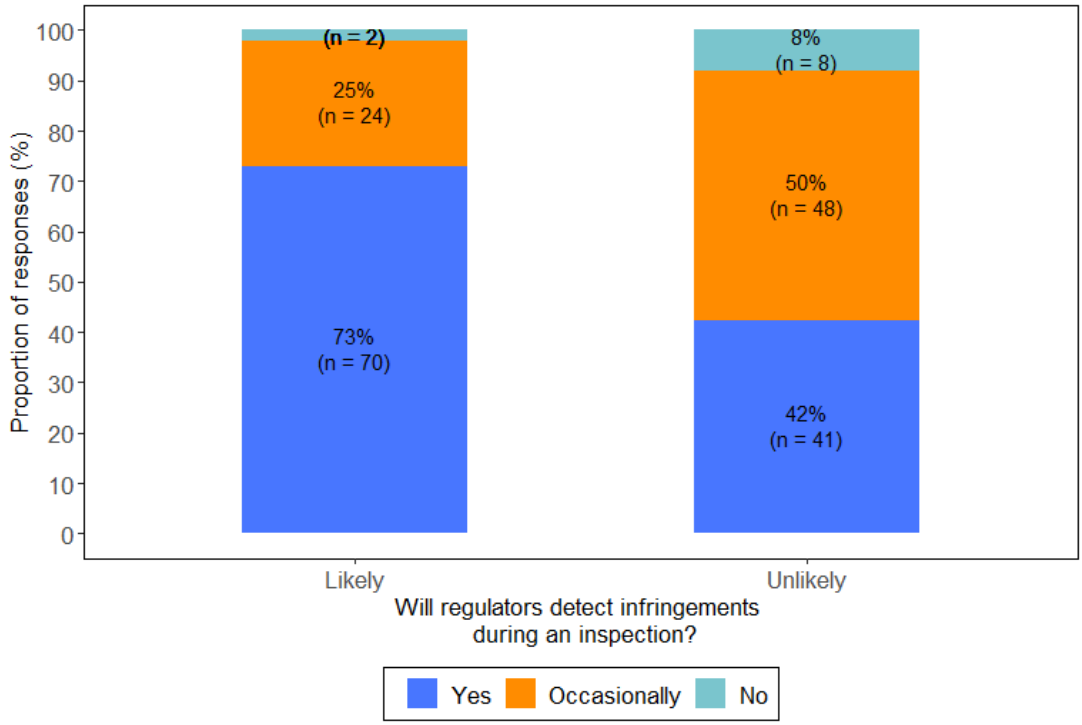


Source: Fisher Survey

Fishers who hear about infringements being detected on other vessels are more likely to think that infringements will be detected during an inspection. Of respondents who report that they often or always will hear about an infringement being detected aboard another vessel (overall, 56% of the 209 respondents), 63% thought it likely that infringements will be detected compared to 33% who reported they only occasionally hear about an infringement (Figure 6.8)[66]. The Sanctioned Fisher interviews also point to a potential general deterrence effect arising from knowing of other fishers who had been sanctioned for similar offences.

[66] Excludes the 16 respondents in total who stated 'don't know' for likelihood of infringement detection (n = 6) or whether they would hear about an infringement (n = 10)

Figure 6.8 Fisher Survey opinion on likelihood of infringement detection (likely/unlikely) by opinion on whether they will hear about infringements being detected by regulators (yes/occasionally/no)



Source: Fisher Survey

Fishers who change behaviour to avoid detection can reduce their perceived and actual likelihood of inspection and detection. Sanctioned Fisher and MMO Interviews provided examples of fishers taking active steps to avoid non-compliant behaviour being detected. Amongst Sanctioned Fisher interviewees who were aware their behaviour was non-compliant, the majority mentioned that they had taken steps to reduce the likelihood that an offence would be identified. Examples of detection avoidance behaviour reported by fishers and by MEOs included fishers moving catch transhipment rendezvouses to locations unobserved by Fisheries Officers when officers were known to be present, fishers not landing or landing to alternative/irregular harbours if MEOs were known to be present at the preferred port, and conducting non-compliant activity at night when there is less chance of surveillance or inspection activity.

Fishers may take corrective actions to avoid detection when they perceive a short-term increase in control and enforcement activities. Sanctioned Fisher and MMO Interviews both identified examples of fishers changing their behaviour when the risk of inspection or detection was increased. Examples included discarding illegally retained fish and correcting falsified logbook entries if fishers became aware of FPVs in the vicinity. This behavioural change was said to be facilitated using social media, radio and telephone, so that fishers could warn other fishers that an FPV was in the area or that MEOs were present ashore. This deterrence effect was noted to last only as long as the control activity (e.g. FPV) was present.

6.2.4 The role of regulatory enhancement

MMO interviewees recognised the positive influence that improved rules and regulations can have on control and enforcement effectiveness. Examples provided included:

- The new catch recording app requires fishers to record and submit catch data electronically and should improve reporting and identification of non-compliance.
- Electronic logbooks require catch data to be submitted electronically by vessels every 24 hours, which can then be verified at sea or on the quayside. It was suggested that this has helped to address the issue of black fish on larger vessels at sea for more than 24 hours, as it is less easy for fishers to 'correct' or 'smooth' logbook entries if they become aware that they are going to be inspected. This effect has been further enhanced by the increased at sea capacity the MMO FPVs provide.
- Prior notification of landing supports MEOs ability to identify potentially suspicious vessels (e.g. due to late submission on a notification) and improves their ability to ensure inspection (due to the forewarning provided) and verify catch.
- It was suspected that fishers active in ICES Division 7e would briefly enter ICES Division 7d, and falsely record a proportion of their catch as being from that ICES area. This was done to circumvent quota restrictions in 7e. This was a continual compliance issue that the MMO was not able to fully address through control and enforcement. New licence conditions were therefore imposed on Channel sole fishers so that they could not fish in two neighbouring ICES Divisions (7d and 7e) on the same fishing trip, making it more difficult to misreport the ICES area in which they caught their sole.

6.3 Effect of increased control and enforcement activities

This section examines whether the increased budget has contributed to an increased deterrent effect, reflecting on the relationships identified in the previous section.

6.3.1 Changes in MMO visibility

The MMO has become more visible. Increased visibility has been more pronounced on land than at sea.

MMO patrol and inspections data indicate a stronger presence both ashore and at sea in 2019 compared to previous years (see Section 4). Fisher Survey, Sanctioned Fisher and MMO interview evidence indicate that fishers are aware of this increase ashore, but are less aware of it at sea.

Most Fisher Survey respondents (64%) reported that the MMO has a visible presence ashore, a slight improvement on opinion in the 2019 Baseline Survey (61%). A larger improvement in opinion on the visible presence of the MMO ashore was recorded for respondents of Over 10m vessels (77% in Fisher Survey up from 66% in the 2019 Baseline Survey).

When asked explicitly whether they thought MMO visibility ashore had improved relative to the previous year, 48% of Fisher Survey respondents reported that the MMO was more visible ashore in the last year, 40% reported no change and 7% said the MMO was less visible ashore. However, despite the increased number of MEOs ashore, some Sanctioned Fishers reported that they rarely see MEOs, with a few interviewees noting they had not seen any in the last 2 to 4 years. In some cases, the

differing prevalence of IFCA and MMO officers in certain areas may account for such opinion.

At sea, the impact of increased resources is less clear. Of Fisher Survey respondents, 30% reported that the MMO has a visible presence at sea, whilst the majority (55%) reported that the MMO is not visible at sea. Significant differences were detected between opinions on MMO visibility at sea between 10m and under and Over 10m vessel operators, with a higher proportion of the former group disagreeing that the MMO has a visible presence at sea (61% compared to 43%).

Comparing fisher perceptions to the Baseline Survey, the proportion reporting that the MMO has a visible presence at sea decreased in 2020 (30%, down from 42% in 2019). In terms of perceived changes relative to the previous year, 11% reported that the MMO had become more visible in the last 12 months, but the majority (68%) perceived no change, and 15% said the MMO was less visible at sea. These patterns were recorded for both 10m and under and Over 10m vessel operators.

Similar divergences between ashore and at sea visibility were presented in the Sanctioned Fisher interviews, where there was greater recognition of an increased presence ashore than at sea.

Given the notable increase in MMO FPV activity and that RN patrol numbers were broadly similar in 2018 and 2019[67], it is surprising that **Fisher Survey participants did not feel there had been a positive change in MMO visibility at sea**. There was more MMO FPV activity than RN activity in 2019 – however more Fisher Survey respondents reported not having seen an MMO FPV (64%) than the RN (44%) in the last 12 months. This may reflect reality. However, it may also be influenced by how recognisable the MMO FPV is, both in comparison with RN vessels which are well known, and as an FPV in its own right, whether fishers are always aware if an RN vessel they see is on active fisheries patrol or not, the short timescale over which the MMO FPV has been active, or the tasking patterns of FPV activity compared to fishing patterns of Fisher Survey respondents.

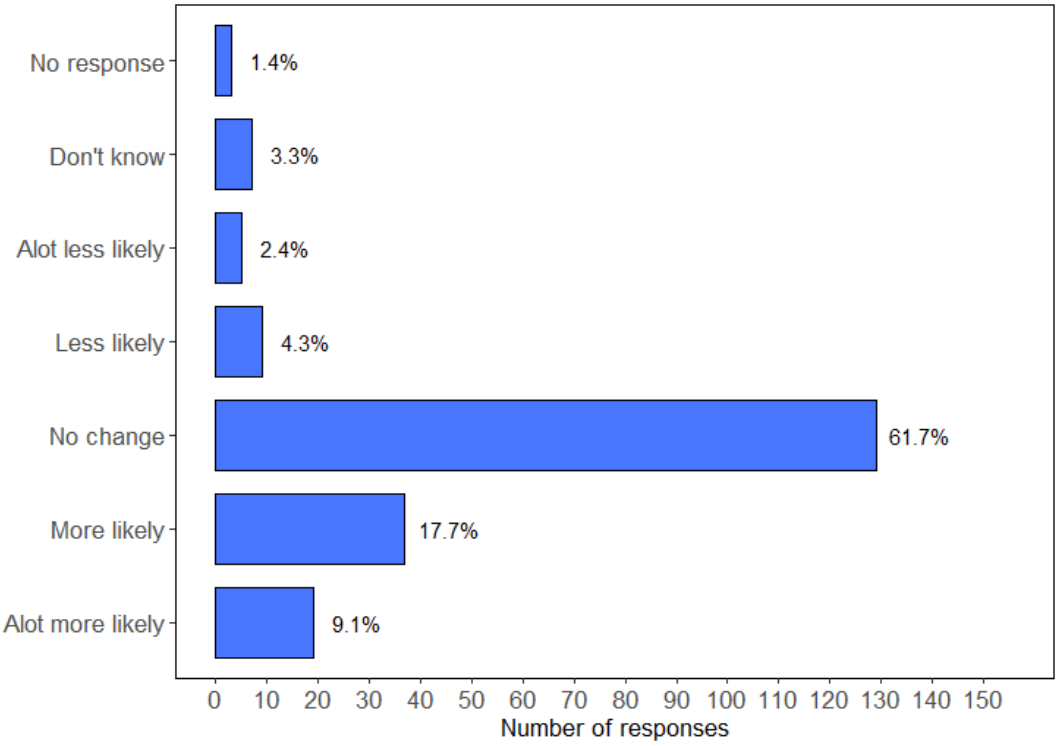
6.3.2 Changes in the likelihood of inspection

The perceived likelihood of being inspected has increased, although the change is relatively small and is more pronounced for inspections ashore than at sea. This change has not resulted in any change in the importance of the likelihood of inspection/detection in fishers' compliance decision making. Some examples of the increased likelihood of inspection having a deterrence effect were identified.

The MMO undertook more inspections and inspected more individual vessels more often in 2019 compared to 2018 (see Section 4.3.1). Interviews with MMO staff indicated a perception that fishers think there is now a greater likelihood of inspection. Of Fisher Survey respondents, while the majority of respondents felt there had been no change in the likelihood of being inspected, of the remainder, more reported that the likelihood of inspection had increased than decreased (27% vs 7% at sea, 37% vs 2% ashore – see Figure 6.9 and Figure 6.10).

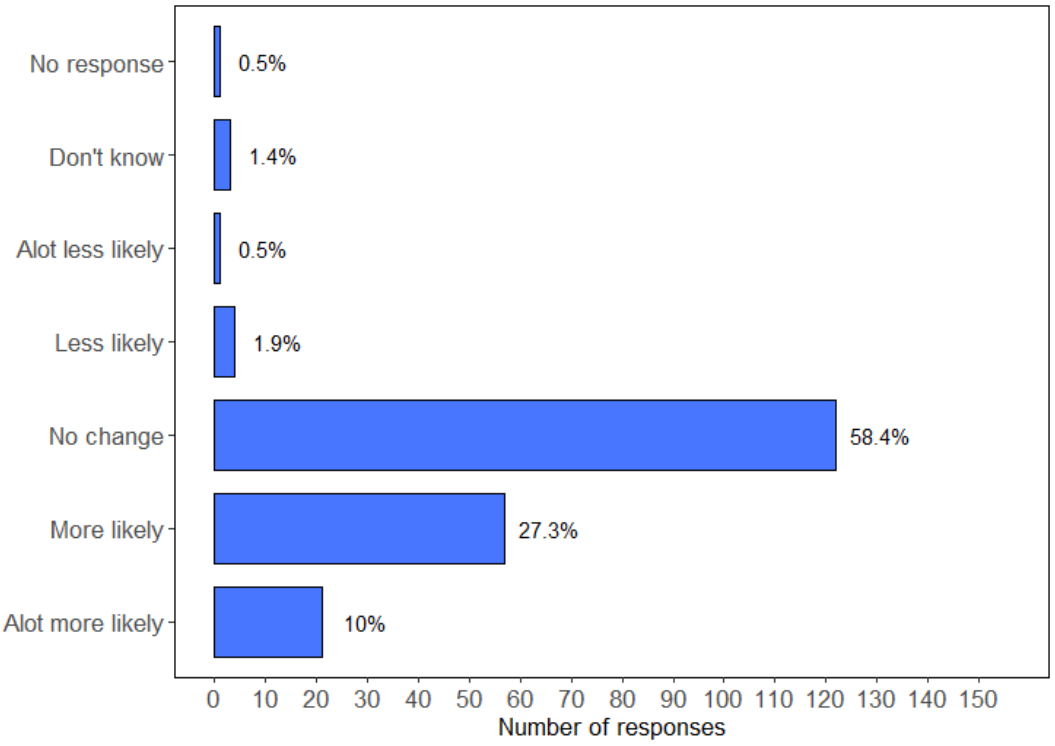
[67] 190 and 182 respectively

Figure 6.9 Fisher opinion on whether the likelihood of being inspected at sea during their next fishing trip has changed in the last 12 months



Source: Fisher Survey

Figure 6.10 Fisher opinion on whether the likelihood of being inspected ashore after their next fishing trip has changed in the last 12 months



Source: Fisher Survey

Relative to the 2019 Baseline Survey, respondents in 2020 reported a slightly higher chance of inspection compared with 2019: 50% of respondents felt the chance of being inspected in port or ashore was greater than 25% compared to 42% in the baseline. At sea, 31% of respondents felt the chance of being inspected at sea was greater than 25% compared with 23% in the baseline.

The proportion of survey respondents who had been inspected at sea at least once in the previous 12 months increased from 36% in the Baseline Survey to 57% in the Fisher Survey, and the proportion inspected more than once increased from 25% to 37%. The equivalent for ashore inspections saw an increase in those inspected at least once from 48% to 77%, and more than once from 32% to 61%.

The targeting of increased inspection effort across fleet segments is reflected in fisher opinion on changes in likelihood of inspection. MMO data indicates a greater percentage change in inspection effort directed at towed gear than static gear between 2018 and 2019 (134% vs. 72%, respectively). This pattern was reflected in the Fisher Survey. A greater proportion of towed gear respondents indicated an increased likelihood of inspection compared to static gear respondents.

Ashore, fishers using towed gear reported the greatest increase in likelihood of inspection relative to the Baseline Survey: 60% of Fisher Survey participants felt their chance of being inspected ashore was greater than 25%, compared to 42% in the baseline. A similar but less pronounced pattern was found for Over 10m vessels (66% compared to 54% in the baseline).

At sea, fixed gear fishers indicated the greatest increase in likelihood of inspection between the Baseline Survey and Fisher Survey: 28% of Fisher Survey respondents using fixed gear reported a >25% chance of inspection compared to 20% in the baseline. Respondents from the 10m and under length category reported an increase in inspection likelihood (>25%), from 20% in 2019 to 29% in 2020.

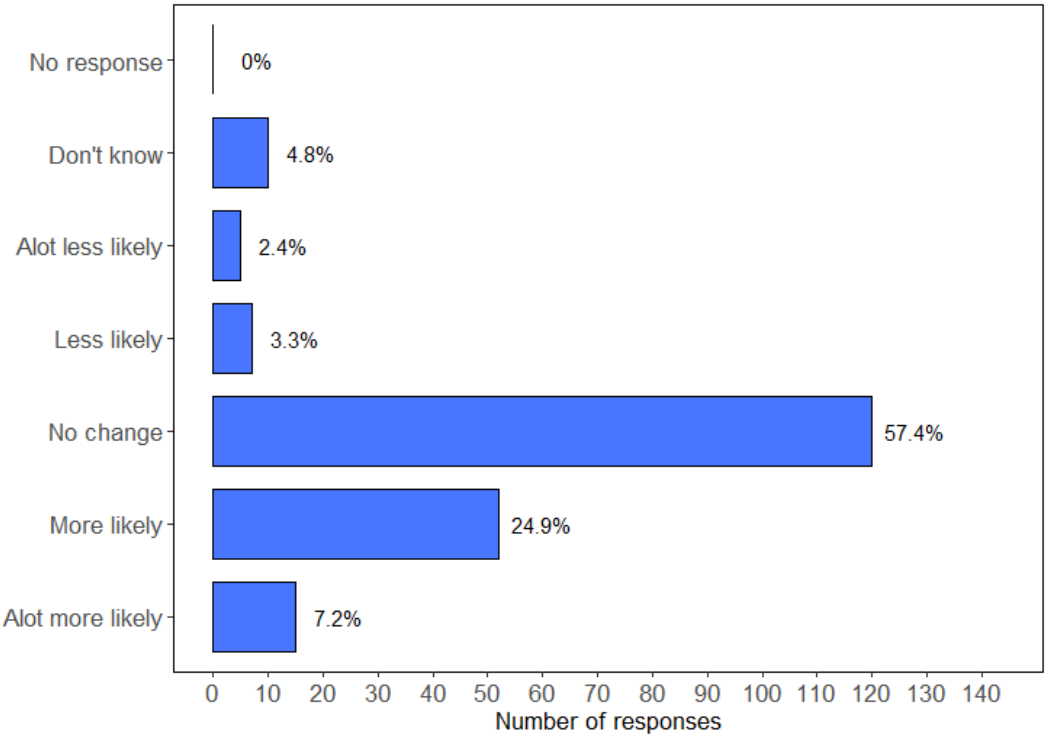
6.3.3 Changes in likelihood of infringements being detected

The perceived likelihood of regulators detecting infringements has increased. The effect is more pronounced for Over 10m than 10m and under vessels.

Of Fisher Survey respondents, 32% thought that the MMO is now more likely than before to detect infringements during inspections compared with just 6% who reported it has decreased. No similar question was asked in the 2019 Baseline Survey. The majority (57%) thought there had been no change (Figure 6.11). Whilst MMO capacity to detect infringements may have improved, notably at sea (see Section 4.3.3), these changes may take time to feed through to fisher perceptions.

A greater proportion of respondents now report that the MMO is effective compared with the baseline. Opinion on the effectiveness of the MMO is expected to influence, and was found to be positively correlated with, opinion on detection likelihood. The proportion who somewhat or strongly agreed the MMO is an effective regulator increased from a baseline of 34% in the Baseline Survey to 38% in the Fisher Survey.

Figure 6.11 Fisher opinion on whether the likelihood that regulators will detect infringements has changed over the last 12 months



Source: Fisher Survey

A significant difference in opinion on detection likelihood was found between vessel length groups and between gear type groups. Respondents operating Over 10m vessels and respondents using static gear, were more likely to think that there is now a greater chance that infringements will be detected than were respondents of 10m and under vessels and respondents of towed gear.

Some MMO interviewees noted the limitations of at sea patrols in actually detecting offences, and hence providing a specific deterrence effect, particularly for spatial incursions.

6.3.4 Evidence of deterrence effects caused by increased control actions

Given that survey respondents regard the likelihood of inspection and infringement detection important compliance drivers, and that many perceive there to be an increased chance of these happening over the last year, theory indicates that there should now be an enhanced deterrence effect.

However, no direct evidence is available to indicate whether the increased control actions and strengthening of the deterrence drivers have resulted in a specific or general deterrence effect i.e. whether there has been a positive impact on compliance.

Several MMO interviewees considered the increased control actions to have had a positive deterrence effect, though this was not a universally held view. Some interviewees thought the deterrence effect had most influenced more compliant fishers – those undertaking occasional, minor offences – implying limited or no effects on habitual offenders. Whilst some interviewees thought that fisher behaviour had

changed very quickly in response to the increased resources, others recognised that there was a time lag between the increase and any noticeable effect on compliance.

Some examples were offered by MMO interviewees of where an increased likelihood of inspection may be having a deterrence effect:

- In one location, it was reported that fishers have been asking the MMO to measure their nets (to ensure they are within legal limits) more frequently in response to an awareness that MMO FPVs are present more often than the RN used to be and hence they are more likely to be inspected at sea than in previous years. Previously fishers may have been more inclined to risk fishing with nets that they suspected were not within legal limits.
- One interviewee noted that with the MMO FPVs it is easier to verify the logbooks of fishers who work multi-day fishing trips, which has helped to combat issues of black fish.

Some MMO interviewees indicated that the increase in resources is not sufficient to have a deterrence effect on more habitual offenders. Some indicated that, despite the increase in at sea presence and ability to undertake more out of hours inspections ashore, those inclined to be noncompliant are still able to find ways to avoid detection and know that it remains difficult for the MMO to catch them.

7 Enforcement deterrence drivers

Fishers' perceptions of the likelihood of being sanctioned for detected offences and their concern about the severity of those sanctions may influence compliance. This is the sanction risk. Risk can occur through both specific and general deterrence of offenders. The logic model (see Section 2.1) indicates how enforcement-related actions may influence sanction risk.

This section explores enforcement activity and sanction risk. It responds to the following evaluation questions:

- What enforcement actions are available to the MMO?
- What is the pattern of enforcement activity, including offender characteristics, offence types, seasonality of offending and geographic spread?
- Which enforcement actions are the most effective and in what circumstances?
- Has the increased budget resulted in an increase in the specific deterrence effect?
- Has the increased budget resulted in an increase in the general deterrence effect?

Evidence on enforcement action and activity taken by the MMO is drawn from MMO secondary data. The analysis was performed utilising three primary MMO data sources, the Inrep and Portsum databases for at sea and ashore inspections, respectively, and the PFV dataset for investigations.

There are a number of limitations to the scope of the sanction analysis because of issues with linking MMO inspections data with MMO investigations data and also due to incomplete records relating to case closures. This means that:

- Separate analyses of sanctions stemming from inspections in port compared to inspections at sea was only possible for the least severe type of sanction – rebriefs
- Rebriefs issued from inspections at sea and ashore inspections were analysed separately to those sanctions resulting from an investigation[68]. It is understood that rebriefs are primarily issued at the time of inspection and do not warrant any further investigation, lending a higher confidence to such records.
- Sanctions following an investigation conducted by the MMO were also looked at separately. These are generally more severe than rebriefs. This includes sanctions ranging from an advisory letter to a court case.

Evidence on the influence of actions on deterrence drivers are drawn primarily from the Fisher Survey, but also the Sanctioned Fisher Interviews. Supplementary evidence is drawn from the MMO Interviews and the 2019 Baseline Survey[69].

The section presents analysis of the evidence, structured as follows:

- The enforcement actions taken by the MMO and the pattern of enforcement and sanction, including – to the extent possible – a breakdown of sanctions by regulation category, enforcement action and vessel length.

[68] Relating to the Inrep (inspections at sea), Portsum (inspections ashore) and PFV (investigations) MMO statistical datasets, respectively.

[69] Comparisons between the 2020 Fisher Survey and 2019 Baseline Survey are made with low confidence due to differences in survey methodology and population sample composition. See Annex A2.1 for further details

- The links between enforcement and deterrence drivers, exploring the effectiveness of enforcement actions on fishers' future compliance by influencing perceptions of risk of being sanctioned.
- The effectiveness of enforcement actions on specific and general deterrence and other considerations in the choice of enforcement actions that can impact on their effectiveness.
- Evidence on the effect of the increased control and enforcement budget.

7.1 Summary

Pattern of enforcement actions:

From 2014 onwards there has been a steady increase in the number of enforcement actions taken by the MMO, with the number of sanctions peaking in 2019. Most enforcement actions lead to minor sanctions such as rebriefs. The more severe sanctions resulting from investigations are primarily associated with Technical conservation measure offences, and Official Written Warnings make up the largest proportion of awarded sanctions.

Effects of enforcement on deterrence

The majority of Fisher Survey respondents felt that there was a high likelihood of a detected offence resulting in a sanction. Fishers using towed gear and those with vessels over 10m, were more concerned about the severity of sanctions than those using fixed gear or operating smaller vessels.

Fishers recently inspected by the MMO at sea were more likely to agree that detection of an offence would result in a sanction than those who had not been inspected. Perhaps surprisingly, neither receiving a sanction, opinion on the effectiveness of the MMO, nor likelihood of hearing about sanctions applied to other fishers were associated with differences in fishers' views on the likelihood that an offence would result in a sanction.

Sanctioned Fisher interviewees nearly all stated that the sanction they received was greater than they had expected. This may reflect a situation where fisher expectations of sanctions are not aligned with reality, or may be a natural view to hold upon being sanctioned for an offence. Only one of the Fisher Survey variables tested was found to be significantly associated with views on sanction severity: MMO visibility in port was positively associated with fishers' concern about the severity of sanctions.

Whilst the evidence indicates that fishers' awareness of control and enforcement actions may deter fishers from non-compliance if it is likely to result in a sanction, there is concern that the severity of sanctions may not be sufficient to deter persistent offenders, for whom potential rewards are often seen as greater than the risks.

There is some evidence indicating the increased budget has had an influence on sanction-related deterrence drivers. However, there is likely to be a lag before the effects of increased resources fully influence enforcement-related deterrence drivers.

7.2 Types and pattern of enforcement actions taken by the MMO

7.2.1 Enforcement actions available to the MMO

The MMO has a number of fisheries enforcement actions available to them, ranging from those that are less severe – a rebrief (written or verbal) – to more severe, such as a prosecution. In the analysis we consider the sanction outcomes in the relative order of severity presented in Box 7.1.

Box 7.1 Sanction outcomes in order of severity, from less to more severe

Verbal or written rebrief: Given for a minor offence at the time of inspection where a prosecution or further action is not thought to be appropriate, but advising the offender that the offence has been detected

Advisory letter: Given for minor offence where a case has been fully investigated but a prosecution or further action is not thought to be appropriate

Official (written) warning: A written notification by the fisheries authority to a master or person responsible for an infringement(s) where the offence has been fully investigated but it has not resulted in the offender being brought to court for infringement(s) committed.

Case forwarded to Other Member State (OMS) / third country: A case which has been passed on to another Member State or third country for investigation or sanction.

Admin penalty: Financial admin penalty issued.

Court case guilty: Successful prosecution of an individual infringement(s).

7.2.2 Total sanctions issued by the MMO

The total number of sanctions issued by the MMO reached its highest level in recent years in 2019, driven primarily by the issuance of rebrief sanctions, in particular those stemming from inspections in port, likely as a result of an increase in the number of inspections. However, the percentage increase in infringement detection and rebrief issuance at sea compared to ashore was not reflected by the proportional increase in inspection effort (Table 7.1)[70]. Sanctions stemming from investigation outcomes (i.e. more severe sanctions) did not show any increase in 2019, however. This may be the result of the time lag between the offence detection and an investigation being completed and closed and the sanction issued and recorded.

[70] See Section 4 for discussion on the influence of the increased budget on inspections.

Table 7.1 Total number of inspections, infringements and sanctions recorded in the three inspection and investigation datasets (2014-2019)

	Year						% change 2018-19
	2014	2015	2016	2017	2018	2019	
Inspections							
Inspections at sea[(a)]	603	462	369	277	257	581	9%
Inspections ashore[(b)]	2230	2645	3569	3184	2966	5438	83%
Infringements							
Infringements detected by inspections at sea[(a)]	118	111	150	102	68	246	262%
Infringements detected by inspections ashore[(b)]	125	130	177	204	196	304	55%
Sanctions[71]							
Rebriefs resulting from inspections at sea[(a)]	84	53	75	56	29	106	266%
Rebriefs resulting from inspections ashore[(b)]	95	97	157	187	179	236	32%
Other sanctions stemming from investigations[(c)]	56	95	99	99	66	61	-8%

Source: MMO statistical datasets, (a) Inrep (inspections at sea); (b) Portsum (inspections ashore); (c) PFV (investigations)

7.2.1 Investigation outcomes by regulation category

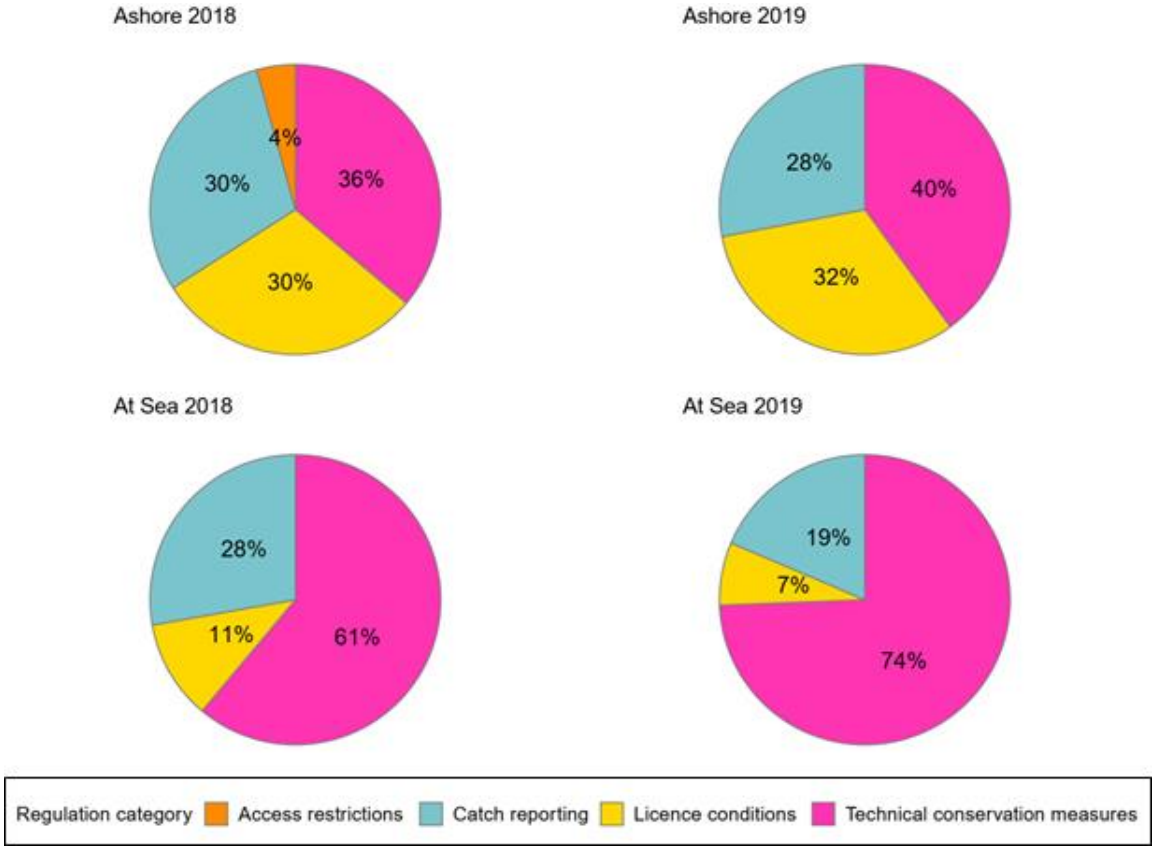
This section presents data on sanctions that result from investigations (which excludes rebriefs) by the category of regulation that the offence was associated with.

Offences related to Technical Conservation measures account for the largest proportion of sanctions issued by the MMO following investigations (Figure 7.1). This is particularly the case for sanctions resulting from at sea inspections. There was a marked increase in the proportion of such sanctions between 2018 and 2019. There was little change in the distribution of sanctions resulting from investigations across regulation categories for ashore inspections between 2018 and 2019.

Very few sanctions are issued for Access Restriction offences – these represented just 4% of the total sanctions resulting from shore-side inspections which lead onto MMO investigations in 2018. No sanctions for Access Restriction offences resulted from investigations following ashore inspections in 2019 or following at sea inspections in either years (Figure 7.1).

[71] Rebriefs relate to those sanctions given at the time of inspection but did not warrant further investigation through the opening of a PFV. “Other” sanctions refer only to those cases where an infringement was detected which led to an investigation.

Figure 7.1 Breakdown of sanctions resulting from investigations, from ashore and at sea inspections in 2018 and 2019, by regulation category



Source: MMO statistical data, PFV investigation data

7.2.2 Investigation outcomes by enforcement action

This section presents data on sanctions that result from investigations (which excludes rebriefs) by the types of sanction applied.

The outcomes of the MMO's case investigations resulting from inspections at sea and ashore (from the PFV dataset) are presented in Figure 7.2. Official written warnings were the most frequently applied category of sanctions across all regulation categories[72].

In 2019, official written warnings were the most commonly applied sanction following investigations. The dominance of this sanction type is particularly strong (accounting for 78% of the total) in relation to offences that are detected through at sea inspections (Figure 7.2). The number of official written warnings stemming from at sea inspections increased markedly in 2019, up 625% compared to 2018, from 4 to 29 (Table 7.2). Hence the proportion of total sanctions they account for also increased significantly.

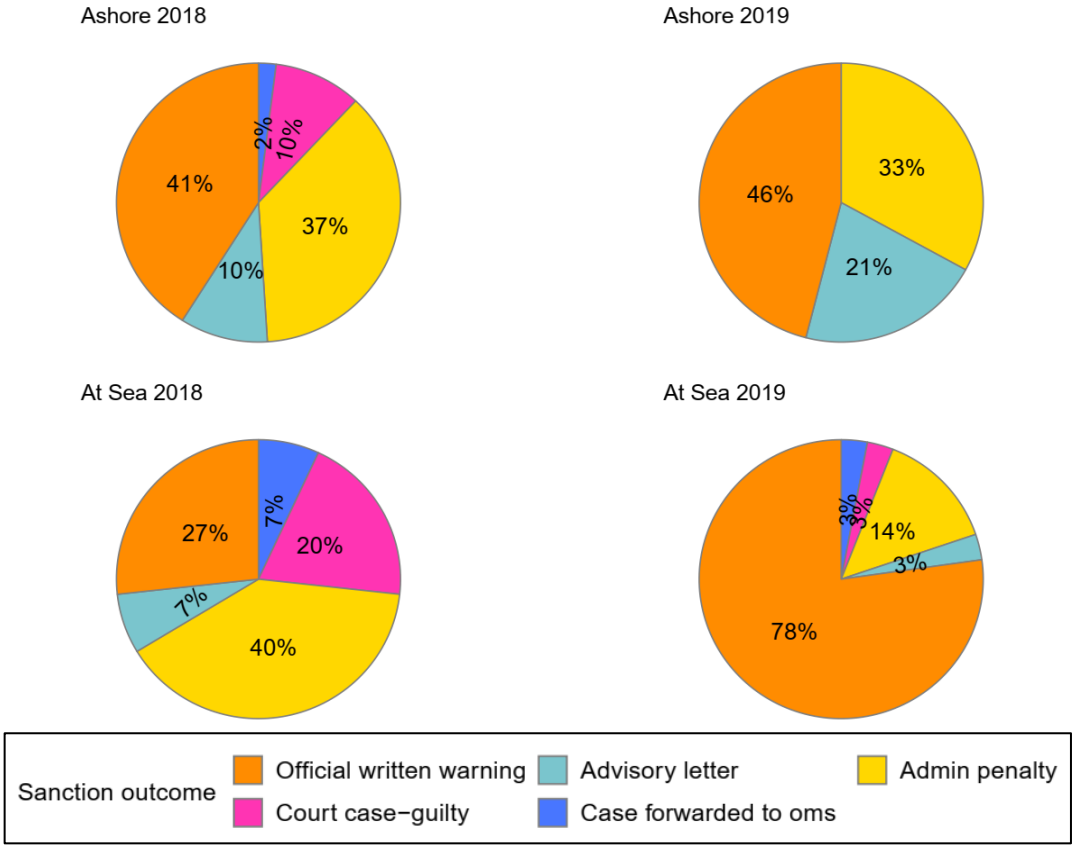
Whilst the relative proportion of other types of sanction issued reduced, there was little change in the number of such sanctions issued. The exception was guilty court case verdicts, which saw a decline in the number of such sanctions. A time lag is expected from prosecution until these cases are resolved in court, which may limit the

[72] i.e. offences related to the four regulation categories: Access Restrictions, Catch Reporting and Control requirements, Licence conditions and Technical Conservation measures

extent to which any increased activity resulting from the increased budget has influenced the 2019 data.

In 2019, sanctions arising from investigations into infringements detected ashore were primarily official written warnings and administrative penalties. Numbers of all sanction types except advisory letters declined between 2019 and 2018. No court case-guilty or case forwarded to OMS sanctions were issued following inspections of markets/vehicles in either 2018 or 2019 (Figure A3.4)[73].

Figure 7.2 Proportional distribution of investigation (sanction) outcomes in 2018 and 2019 resulting from MMO ashore (all types) and vessel at sea inspections



Source: MMO statistical data – PFV investigation data

Table 7.2 Number of investigation outcomes (sanctions) in 2018 and 2019 resulting from MMO ashore (all types) and vessel at sea inspections

	Official written warning		Advisory letter		Admin penalty		Court case – guilt		Case forwarded to OMS/3rd party	
	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Ashore	21	11	5	5	19	8	5	0	1	0
Sea	4	29	1	1	6	5	3	1	1	1

Source: MMO statistical data, PFV investigation data

[73] In the analysis time period (2018-2019), only 1 sanction was observed for vehicles and was awarded an official written warning, hence that inspection category does not feature in Figure A3.4.

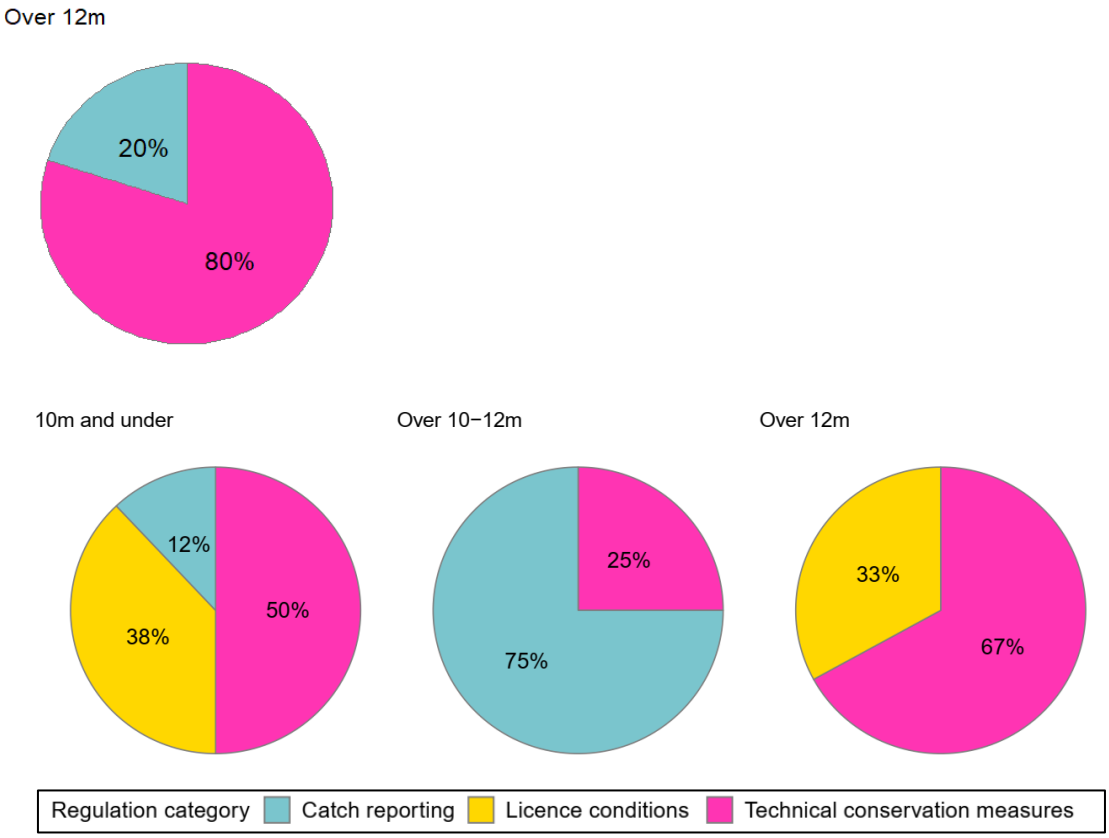
7.2.3 Investigation outcomes by vessel length groups

This section presents data on sanctions that result from investigations (which excludes rebriefs) by vessel length group and regulation category that the sanctioned offence relates to. There are limitations in the scope of analysis that was possible[74], hence analysis relating to at sea inspections is only presented for Over 12m vessels.

More Catch Reporting related sanctions were issued for vessels of Over 10m in length than 10m and under in length. This may be explained to some extent by the latter vessel length category having fewer reporting requirements, but also by the lower interaction between the MMO and smaller vessels (which are instead more often subject to inspections by the IFCAs).

Sanctions for Technical Conservation measure offences were more common in the 10m and under category and the Over 12m category (Figure 7.3, Table A3.12).

Figure 7.3 Breakdown of offence regulation categories resulting from investigations following inspections of vessels at sea (top) and in port (bottom) by vessel length group (2019)[74]



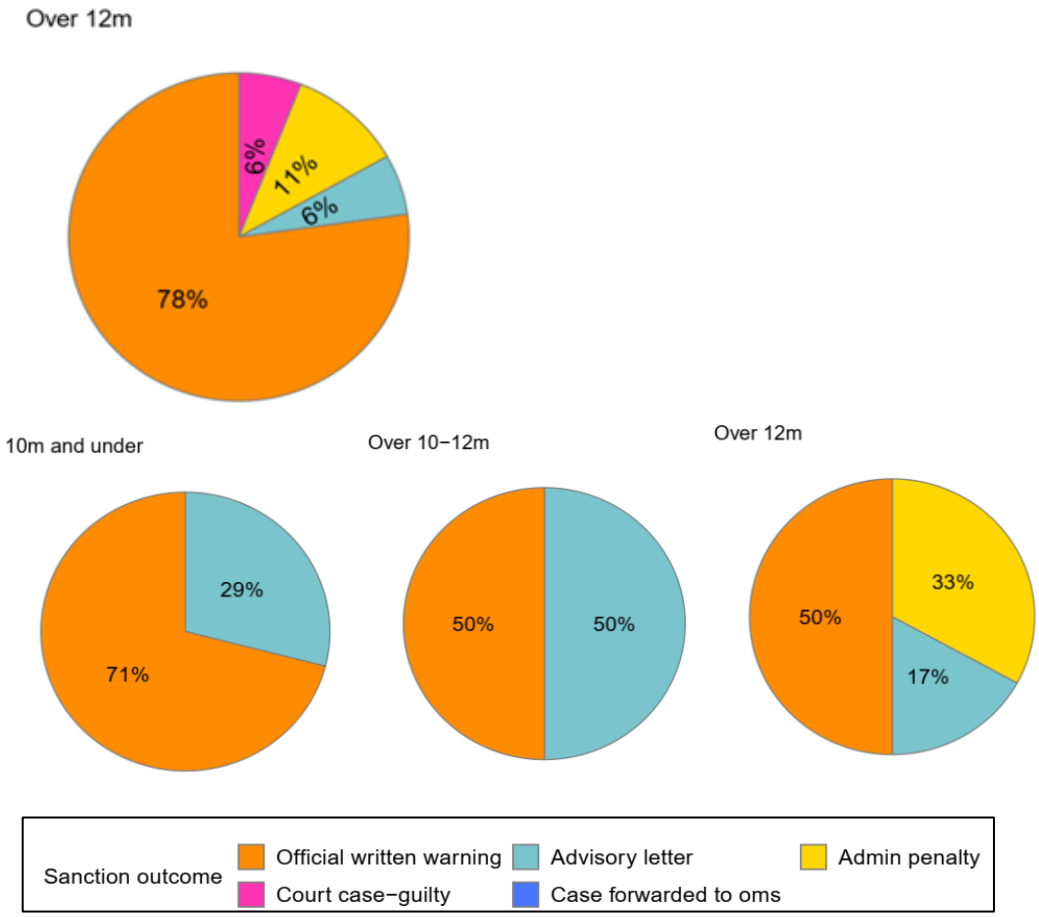
Source: MMO statistical data, PFV investigation data

Vessels of 10m and under commonly receive a higher proportion of less severe sanctions resulting from investigations (i.e. official written warnings) compared to

[74]The number of vessels in each length category receiving sanctions in 2019 following an investigation needs to be considered when interpreting these results: for investigations resulting from in port vessel inspections, these analyses are based on 58 records of vessels Over 12m in length, 8 vessels of 10m-12m and 20 vessels of 10m and under. For vessels at sea, only 2 sanction records in 2019 are associated with 10m and under vessels and 0 records exist for the 10m-12m category. The results are further caveated by the large number of offence records (n = 64) where the vessel length is NA or unknown.

other vessel categories, as illustrated in the outcomes of inspections in port in 2019 (Figure 7.4, Table A3.13). Administrative penalties were more common for Over 12m vessels.

Figure 7.4 Breakdown of sanction outcomes from investigations following inspections of vessels at sea (top) and in port (bottom) by vessel length group (2019)[74]



Source: MMO statistical data, PFV investigation data

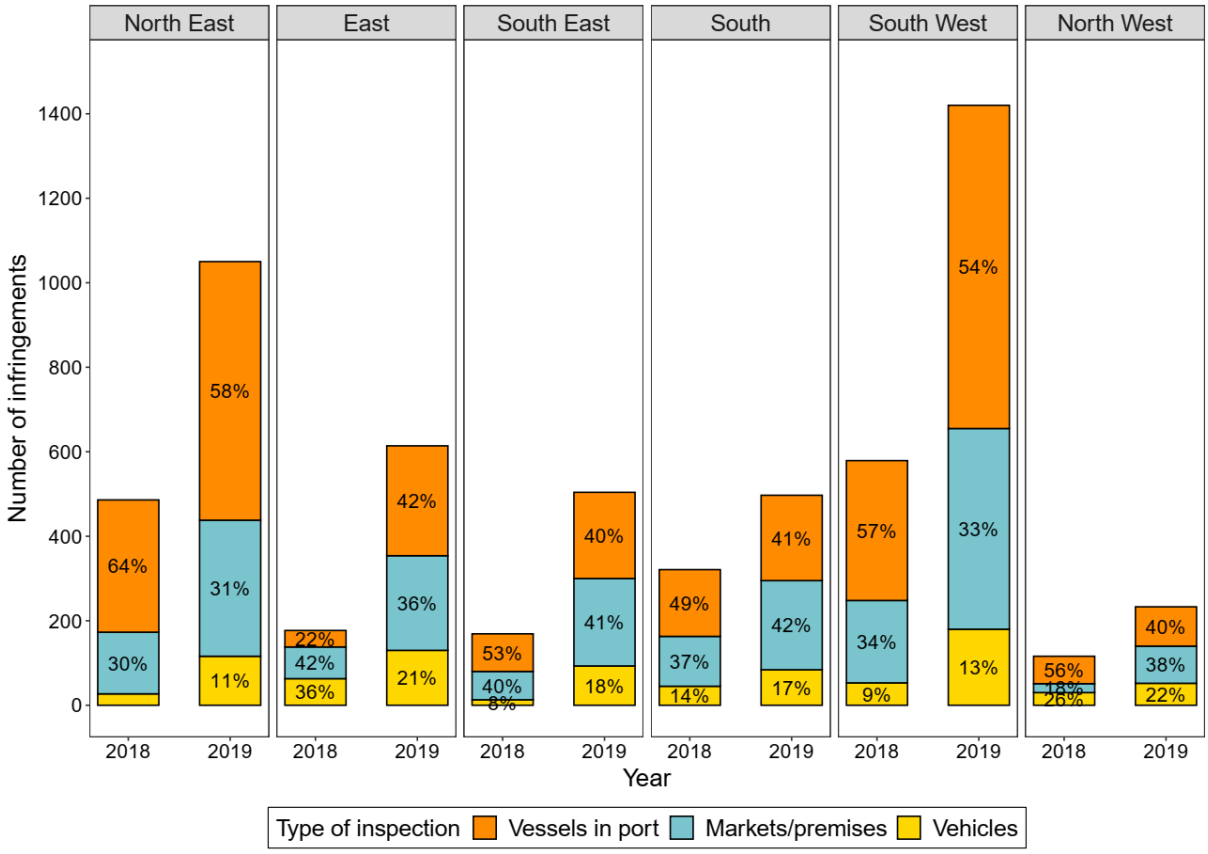
7.2.4 Geographic distribution of offences detected by ashore inspections

This section describes geographical patterns of infringements as a proxy for sanctions, due to a lack of spatial information associated with the investigations dataset[75].

There are some notable differences in the distribution of offences across inspection sources between regions. In 2019, the majority of infringements from inspections of markets/premises were found in the South West, but the North West had the highest percentage point increase in infringements detected from such inspections (see Figure 7.5). This is the same pattern as is seen in the distribution of inspection activity across the regions. The exception is the South, within which vessel in port inspections were relatively high in terms of their proportional representation of infringement detection, but the actual number of detected infringements was relatively low.

[75] MMO PFV dataset

Figure 7.5 The Proportion of infringements detected by region and type of ashore inspection (2018-2019)



Source: MMO Statistical data, Portsum (inspections in port)

7.3 Links between enforcement and fisher deterrence drivers

7.3.1 Likelihood of being sanctioned and opinions on severity of sanctions

The majority of Fisher Survey respondents agreed that the detection of an infringement will result in a sanction being applied (62% agreed, 11% disagreed), and 47% of respondents felt it was likely that regulators would detect an infringement. Interviews with fishers suggested that some do not necessarily view verbal rebriefs as a sanction, which may at least in part explain the percentage of those disagreeing with the above statement. There were no significant differences in respondent opinions based on type of gear, vessel length or ICES area(s) fished, and no significant correlation between compliance and opinion on sanction likelihood (see Tables in Section A3.2).

Of Fisher Survey respondents, 77% agreed that the severity of sanctions for non-compliance is high enough to pose a concern (7% disagreed). There was no correlation between fisher compliance and their opinion on whether the severity of sanctions was a concern to them. There were no significant differences in opinion of fishers by gear type, vessel length or main ICES area fished.

When making decisions about complying with fisheries regulations, 69% of Fisher Survey respondents said that the severity of sanctions was very important / important,

and a further 16% said they were moderately / slightly important. Responses did not vary across fisher subgroups.

7.3.2 Influencing the likelihood of being sanctioned

This section examines whether there is a relationship between fishers' perceived likelihood that a detected offence will result in a sanction, and the following variables that reflect fishers' own experiences and opinions of control and enforcement[76]:

- Being inspected in port
- Being inspected at sea
- MMO visibility in port
- MMO visibility at sea
- Receiving a sanction
- Opinion on the effectiveness of the MMO
- Likelihood of hearing about sanctions applied to other fishers

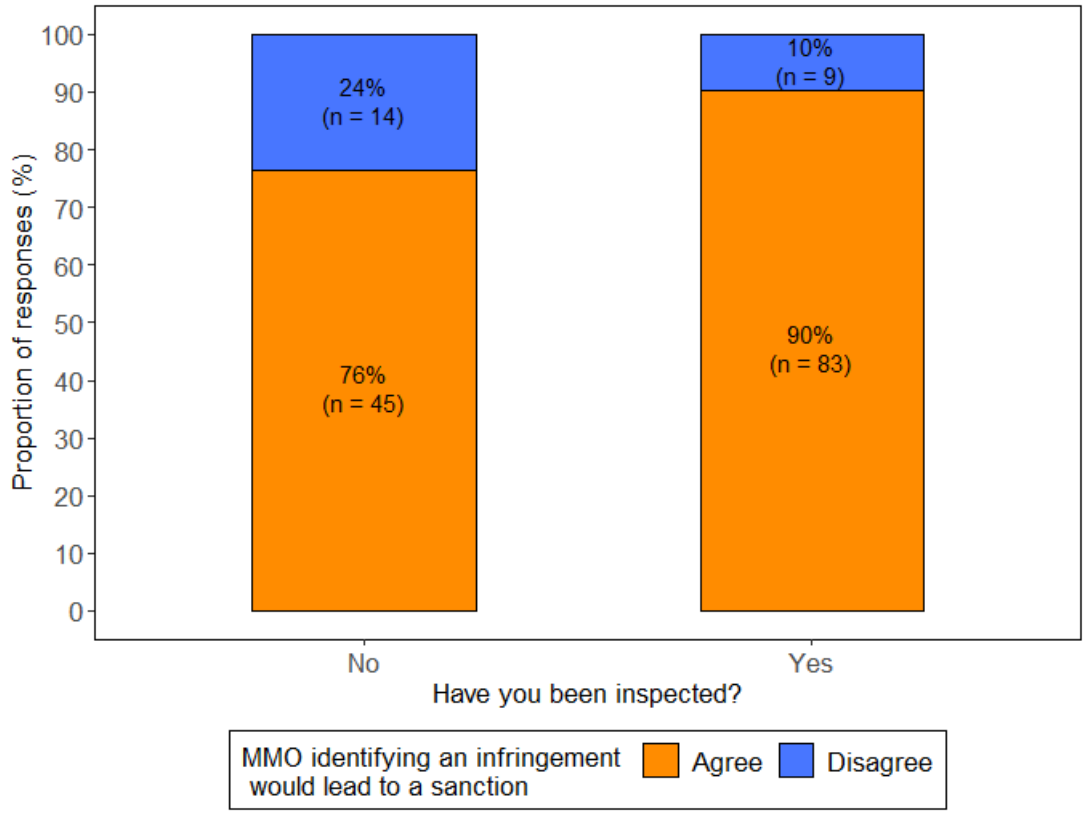
Only fisher experience of being inspected at sea was found to be related to respondent opinions of the likelihood that a detected offence will result in a sanction. Fishers inspected by the MMO at sea in the last 12 months were more likely to agree that detection of an offence will result in a sanction than those who had not been inspected (Figure 7.6).

Those who had been sanctioned[77] were no more likely to think that a detected infringement will result in a sanction. Hearing about sanctions issued to other fishers did not have an impact on fishers' views on the likelihood of an infringement resulting in a sanction either.

[76] See Section A2.1.6

[77] Whether the respondent had received a sanction in the last 12 months

Figure 7.6 Perceived likelihood of a detected offence resulting in a sanction, by whether a fisher had been inspected at sea or not



Source: Fisher Survey

7.3.3 Influencing perceptions of the severity of sanctions

For most variables indicating control and enforcement actions, no significant relationship with fisher opinion on the severity of sanctions was found.

The relationships between fishers' concern about the severity of sanctions and the following variables, that reflect fishers' own experiences and opinions of control and enforcement, were analysed:

- Being inspected in port
- Being inspected at sea
- MMO visibility in port
- MMO visibility at sea
- Receiving a sanction
- Likelihood of hearing about sanctions applied to other fishers
- Perceived likelihood that if an offence is identified by the MMO it will result in a sanction

In relation to this list, few significant differences in responses of fishers grouped by their experiences and opinions were detected. Only MMO visibility in port was found to be significant with regards to fishers concern about the severity of sanctions – respondents who agreed that MMO was visible in port were more likely to agree that sanctions were severe enough to be of concern to them (of those respondents who

agreed the MMO was visible (n = 116), 95% agreed sanctions were a concern compared to the 5% (n = 6) who disagreed[78]).

The relationships between the extent to which fishers say they consider the severity of sanctions in their compliance decision making and the following variables, that reflect fishers' own experiences and opinions of control and enforcement, were analysed:

- Perceived likelihood that if an offence is identified by the MMO it will result in a sanction
- Concern about the severity of sanctions
- Likelihood of hearing about sanctions applied to other fishers

There were no significant differences with regards to the importance that fishers place on severity of sanctions in their compliance decision making and any of these variables.

It was not possible to test fishers' expectations of sanction severity with the severity of sanctions in reality. However, nearly all of the Sanctioned Fisher interviewees commented that the sanction they received was greater than they had expected - regardless of the severity of sanction received. Whilst this may be a natural response of any individual when receiving a punishment, it may also indicate that fisher expectations are not aligned with reality.

7.4 The effectiveness of enforcement actions

7.4.1 Specific and general deterrence

The specific deterrence effect

There is a small degree of evidence[79] indicating that reoffending - committing the same offence more than once, after being sanctioned - may be relatively low. In most cases, Sanctioned Fisher interviewees indicated that they did not reoffend following the enforcement action taken against them[80]. However, concern was raised by a few MMO interviewees on the longevity of specific deterrence effects.

For the majority of Sanctioned Fisher interviewees who had received minor sanctions the experience of the enforcement process and act of being sanctioned was enough to deter them from repeating the offence. Education and improved awareness offered through the sanctioning process also played a role in enabling fishers to avoid reoffending. In many cases fishers took actions to reduce their chances of committing the same offence in the future. The magnitude of self-reported changes appeared to be linked to the severity of the sanction. For most fishers, these were small changes in fishing practices to avoid unintentional negligence, such as, catching moderately below their quota to ensure compliance, referring to online quota allowances, changing net size/escape gaps to ensure minimum size, checking catch more thoroughly and/or conservatively (including making changes to the measuring equipment), and improving communication with

[78] Overall, 64% (n = 133) of Fisher Survey respondents agreed the MMO was visible in port. For this analysis, only those respondents who agreed or disagreed with either question were included, resulting in 57 responses being excluded due to neutral, don't know or null responses. Of the 152 responses considered, 116 (76%) agreed the MMO was visible in port.

[79] It was not possible to undertake any reoffence analysis using MMO data

[80] Low confidence in this evidence, primarily due to potential biases in the sample (see A2.2 for further details)

colleagues and peers to ensure they are notified of regulatory changes. There was little evidence to indicate that fishers take actions or change behaviours more broadly i.e. beyond correcting the action that led to their sanction.

MMO interviewees held mixed opinions on the effectiveness of enforcement actions. Some interviewees recognised that effectiveness varied depending on the fisher. **The ineffectiveness of sanctions against persistent offenders was highlighted**. This situation was also apparent in the Sanctioned Fisher interviews. Some of the Sanctioned Fisher interviewees who received more severe sanctions appeared to see the financial penalty as a cost of doing business. One respondent noted they had repeated the same offence as the reward still outweighed the risk, particularly as they felt confident of avoiding detection. This may imply that the sanctions are not severe enough, and/or that the likelihood of having an infringement detected and receiving a sanction is not high enough.

The general deterrence effect

The Fisher Survey analysis presented in Section 7.3 principally examined the specific deterrence effect of enforcement – that is, the way in which a fisher's personal experience of control and enforcement influences their attention to enforcement-related deterrence drivers.

Several MMO interviewees highlighted the general deterrence effect, which is the effect that enforcement against one fisher can have on a wider fishing community, as news of such action spreads. **Examples provided indicate the effectiveness of general deterrence within specific fleet segments or for specific offences**. The examples provided were:

- A series of prosecutions in a period of a few months against a few scallopers was thought to have resulted in a permanent reduction in offences within this fleet segment in the port area.
- One fisher was fined for an offence, which reportedly resulted in other local fishers all addressing their compliance on the same issue.
- A high volume of illegal fishing in a closed area was occurring. Successful court prosecutions of some of these fishers reportedly resulted in a cessation of such illegal fishing across all fishers in this area.

7.4.2 Other issues

Challenges to the consistent application of sanctions

Several interviewees highlighted the importance of a consistent approach, for enforcement effectiveness. Some MMO interviewees indicated there was a strict process to determine what type (i.e. severity) of enforcement action to take - ensuring that the action was proportionate to the offence and compliance record of the non-compliant fisher. Interviewees highlighted the responsibility on MEOs to come to the right judgement, and that guidance and support is available to help MEOs come to appropriate decisions. However, some interviewees indicated that **consistency is not always achieved.** One interviewee felt that MEOs do not always show good judgement (e.g. can become overly zealous in their approach to sanctioning) and that improvement is needed to ensure enforcement actions are proportionate considering both the severity of the offence but also the fisher's behaviour. It was highlighted that experience is an important determinant of appropriateness of MEO judgement. The

number of newly recruited MEOs is likely to have exacerbated challenges in the consistent application of sanctions.

The appropriateness of the level of fines imposed

The importance of Financial Administrative Penalties (FAPs) was recognised by some MMO interviewees. Some interviewees indicated that FAPs provide a middle ground for imposing financial penalties for offences that do not warrant court cases, and also a way to impose meaningful sanctions without 'criminalising' fishers.

However, some MMO interviewees highlighted that FAPs may not always be set at levels that are high enough to pose a sufficient deterrent. There was a perception amongst some MMO interviewees that fisher income was insufficiently taken into consideration when imposing a financial penalty, which may limit the effectiveness of financial penalties, particularly for larger vessels.

Overly conservative 'public interest test' decisions

Several MMO and other agency interviewees considered that an insufficient proportion of non-compliance cases were taken to court by the MMO, primarily because the cases failed the public interest test. Some interviewees suggested that the relatively 'conservative' approach adopted by the MMO when deciding whether to prosecute, is known to the fishing industry and undermines the deterrence effect of sanctions. Interviewees emphasised that reluctance to prosecute cases in court can damage the credibility of the MMO (and enforcement authorities in general) and compromise their ability to play an effective enforcement role. Examples were provided of the positive influence of cases taken to court on general compliance and deterrence. Only one interviewee noted that other sanctions (such as FAPs) may be preferable as they are less punitive and seek to work with the industry to avoid more severe sanctions.

7.5 Effect of increased control and enforcement resources

There is a small degree of evidence that indicates the increased resources have had an influence on the enforcement-related deterrence drivers.

The previous section identified an association between fishers' perceived likelihood of being inspected and their expectation that detections result in sanctions, and concern about the severity of sanctions. Given that both MMO inspections have increased and fishers' perceptions of being inspected have also increased[81] ,it may be expected that the relationship between enforcement-and deterrence drivers is strengthened .However, at this time there is insufficient evidence against which to assess if improvements in MMO's case investigations may have fed through and impacted on fisher compliance drivers and compliance. It is likely that any such effect would be expected to lag the improvement in enforcement (and other MMO activities). MMO interviewees pointed out that as increased inspections lead to further detections, investigations and eventually feed through to more meaningful sanctions, then this might start to have an effect on compliance over time.

[81] See Sections 4 and 6 respectively

8 Voluntary compliance drivers

This section explores drivers of voluntary compliance and how these may be influenced. It responds to the evaluation questions:

- How can good compliance be incentivised?
- Which factors are the most influential in supporting voluntary compliance?
- How have perceptions / attitudes towards the regulations and regulator changed?

Evidence is primarily from the Fisher Survey, the 2019 Baseline Survey and interview programmes with the MMO and Sanctioned Fishers. Comparisons between the Fisher Survey and 2019 Baseline Survey can only be made for a few variables, and the change indicated should be considered to have low confidence[82].

The section examines three of the four compliance driver groups in turn – awareness, attitudes towards the regulations and regulator, and social norms[83]. For each compliance group, fisher opinion on each voluntary compliance driver is first presented, followed by discussion of the role of the MMO and how fisher opinion may be enhanced.

8.1 Summary

Awareness of the regulations

Fishers' awareness of the regulations is one of the most important drivers of compliance. Less compliant fishers tend to have lower levels of awareness of the regulations.

The role of MEOs to educate and raise awareness of regulations is recognised. However, other fishers, social media (for 10m and under fishers) and Producer Organisations (for Over 10m fishers) are considered more important sources of information. There are issues with the volume and complexity of information and inconsistency of advice provided by the MMO. This can undermine fishers' engagement with, and trust of, MMO communications and advice.

Attitudes towards the regulations/regulator

From the regulator's perspective, the increase in resources have enabled them to engage more with fishers, which is expected to improve fisher attitudes towards the regulator. However, the extent to which this has impacted on fisher attitudes is not clear.

Fishers generally agree with the principle of regulation but disagree with actual regulations. This can impact on compliance. Such disagreement may occur when fishers deem the regulations unfit for purpose - due to issues of fairness, impacts on profitability or suitability and flexibility of the regulatory solutions.

Fishers with poor MMO relations, and who feel like they have less of a say in fisheries management, are more likely to have negative views on the regulations. Positive targeting of disenfranchised fishers may encourage voluntary compliance – by taking opportunities to adopt more participatory approaches to fisheries management, building a more empathetic, trusting and collaborative relationship. Particular

[82] Due to differences in survey methodology and population sample composition. See A2.1for further details.

[83] It does not examine the compliance driver group of personal morals. Personal morals are assumed to be outside of the MMO's ability to influence and hence are not considered relevant for examination.

attention should be focussed on interaction with fishers during the enforcement process and on building the skills and experience of MMO staff to interact with fishers positively at the local level and making greater use of earned recognition (such as through the MMO's 'trusted customer model').

Social norms

Lower compliance is associated with lower concern about reputation, and lower expectation that other fishers would disapprove. The evidence available is insufficient to determine why less compliant fishers care less about their reputation and why they are less likely to think that other fishers would disapprove.

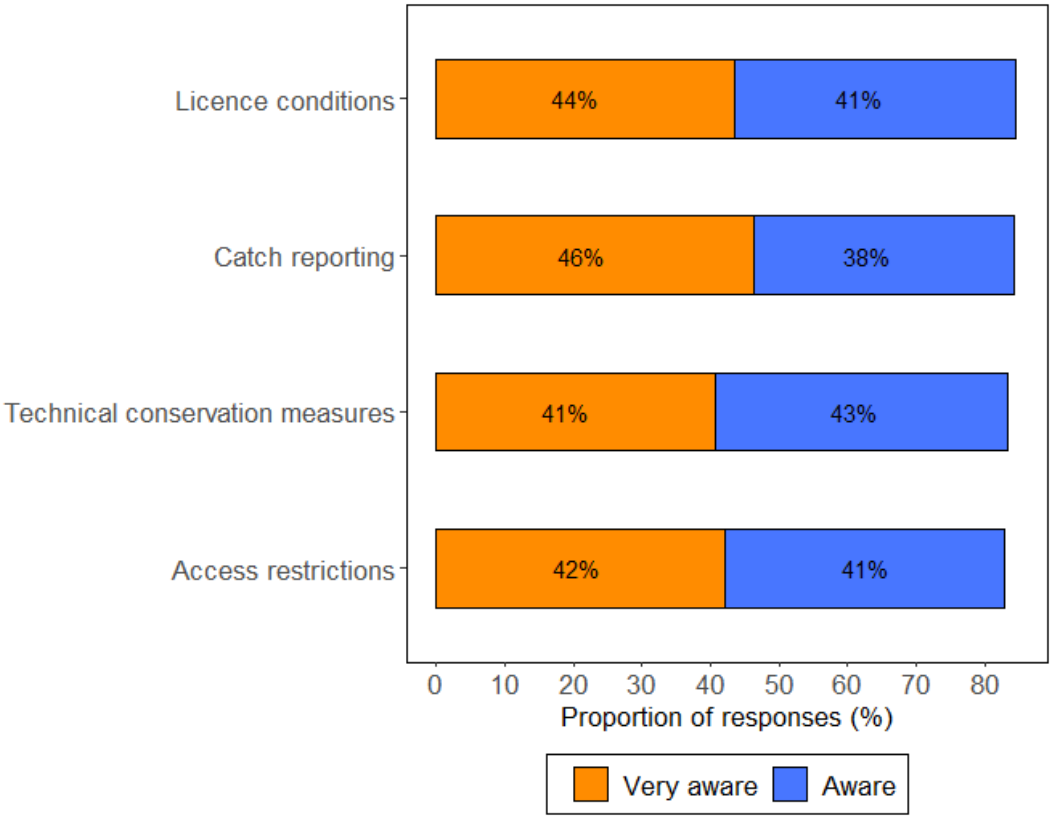
The compliance of others is important to fishers, although evidence of the impact on fishers' own compliance is mixed. Respondents who thought that other local fishers were mostly compliant were no more likely to consider other fishers' compliance to be important to their own decision-making than were those who thought other local fishers were less compliant.

8.2 Awareness of fisheries regulations

8.2.1 The level of awareness amongst fishers

Fishers generally consider themselves aware of regulations, but varying awareness amongst fishers is an important driver of compliance. Over 80% of Fisher Survey respondents consider themselves 'aware' or 'very aware' across all four regulation categories (see Figure 8.1). However, lower levels of awareness are associated with lower levels of compliance (see Table A2.3, Q27). Fishers' levels of awareness was a significant explanatory variable for the variation in compliance levels, and was the most frequently cited reason why fishers had been non-compliant (see Section 5). This indicates that **improving the awareness of less compliant fishers may support improved compliance**.

Figure 8.1 Fisher self-reported awareness of regulations, by category



Source: Fisher Survey

It was recognised by both fishers[84] and MMO interviewees that there are a lot of regulations that fishers must abide by, and that many regulations are complex and subject to frequent change. The majority of Sanctioned Fisher interviewees stated they were not aware that their action was non-compliant, with almost all noting that there is a lack of clarity in the fishing regulations making it difficult to discern what is and isn't compliant behaviour. Comments provided by Fisher Survey respondents indicating awareness as a key barrier to being compliant included:

"Don't know the rules, don't know the changes".

"MMO keep changing things then the IFCA do".

"So many regulations changing suddenly."

"Making the job more difficult, we work long hours and sometimes make mistakes, that should not make us criminals. There are too many rules and bylaws".

8.2.2 The role of the MMO

There are **important channels through which information on regulations flows to fishers**, which should be reflected in how the MMO communicates. The majority of MMO interviewees identified education and information provision as a key role of MEOs, and the MMO more widely, to improve fishers' awareness of existing regulations, and any changes or new regulations. However, **'other fishers' is the most identified main source of information** on changes to regulations by fishers

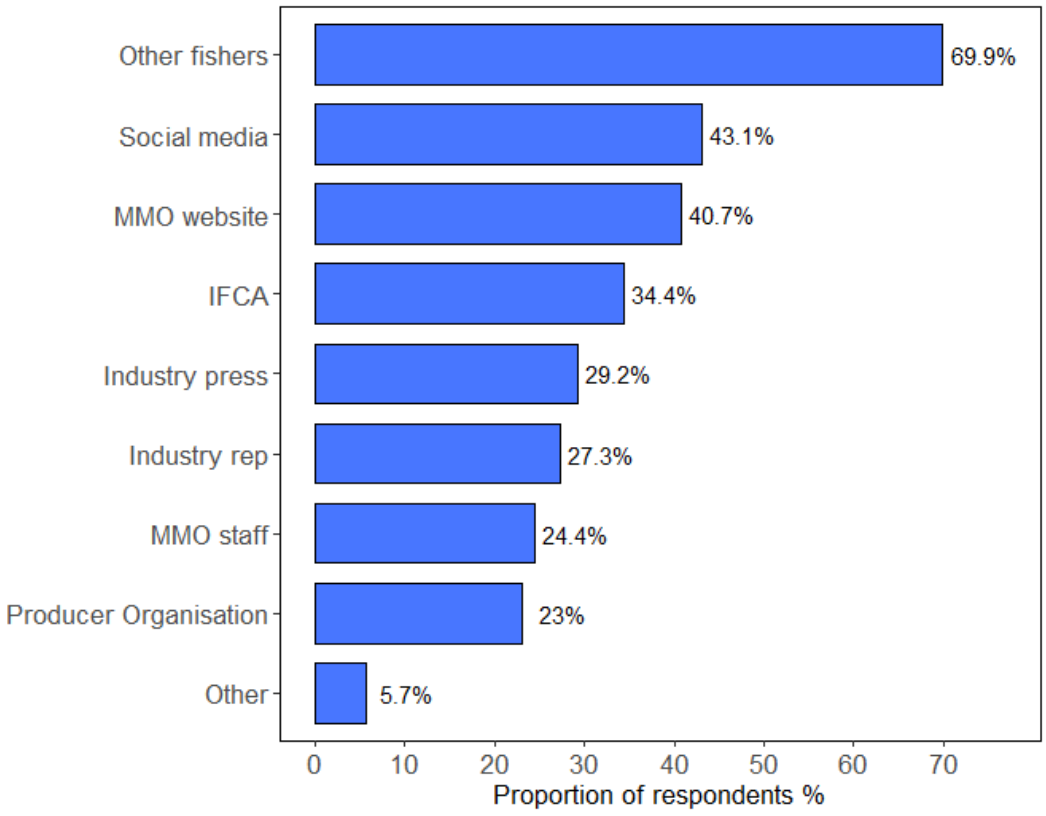
[84] Fisher Survey respondents and Sanctioned Fisher interviewees

(by 70%[85], see Figure 8.2). This finding applied regardless of gear type or vessel length group.

The second most frequently identified form of communication was 'social media'[86] (43% of respondents) – although this wasn't the case for fishers operating Over 10m vessels[87], for whom Producer Organisations were the second most frequently identified source of information, and social media was the 8th most frequently identified (identified as a main source by 55% and 35% of participants, respectively).

The MMO website is also important. It was the 3rd most frequently identified main source of information (identified by 41% of Fisher Survey respondents) and was more frequently identified than MMO staff[88] (ranked 7th, 24%). This pattern is similar across subgroups (gear type, vessel length). The importance of MMO staff providing information 'face-to-face' was noted by some MMO interviewees, given the relatively old age profile of fishers and the low level of IT literacy within parts of the fishing community.

Figure 8.2 Fishers' main sources of information about changes in regulations



Source: Fisher Survey

[85] Of Fisher Survey respondents: identified as 'a main source of information on changes in fisheries regulations'

[86] Which may be MMO generated content of that of others

[87] For 10m and under vessel respondents, the sources of information match those provided for the sample overall. The notable exception is Producer Organisations: whilst still ranked 8th, it was only selected by 8% of respondents.

[88] Which may encompass information being provided by MEOs during inspections, liaison with fishers on the quayside or in the office, or via surgeries/drop-ins.

8.2.3 Awareness before and after the increased in MMO resources

There is no direct evidence on how the increased MMO resources have impacted fisher awareness of regulations. The increased resources have allowed for greater MEO-fisher interaction and hence provision of advice and guidance, which can improve fisher awareness. However, given that MEOs are not one of the more important sources of information for fishers, and that issues with the quality of advice (see Section 8.2.4) will not have been improved through the recruitment of new, inexperienced MEOs, the impact of greater MEO-fisher interaction on awareness is unlikely to have been significantly positive. Awareness levels reported in the Fisher Survey across the four regulation categories (80%-85%).

8.2.4 Improving awareness

Addressing the volume and complexity of information provided: evidence suggests that improvements could be made in the way in which amendments and updates are communicated. Some Sanctioned Fisher Interview respondents reported feeling overwhelmed with the extent of information they receive from the MMO regarding amendments to regulations. Issues with the complexity of the information and language used were raised by both Sanctioned Fisher and MMO interviewees. It was suggested that there is insufficient translation of technical information / legalese into more comprehensible lay terms, and in particular that references to sections from legislation is unhelpful.

Improving the consistency and quality of advice: The receipt of inconsistent advice from different MMO staff (and between MMO and IFCA staff) was raised repeatedly by fishers[89]. This may undermine the long-term ability of MMO staff to communicate effectively as fishers may no longer seek or trust what they say. Examples of inconsistent advice included fishers receiving different interpretations on techniques for measuring fish, receiving incorrect advice on quota, and receiving advice from one MEO that was then contradicted by the MEO who inspected them (and detected an associated infringement). Examples of insufficient advice included the advising MEO not being willing to put their advice in writing, and not being willing to support the fisher in interpreting the regulations. Concerns about the knowledge of MEOs, particularly newer MEOs, which may inhibit the MMO's ability to provide consistent and accurate advice. Statements made in the Fisher Survey included:

> *"Often issues raised not properly answered by the right person"*
>
> *"Local office is a bit sparse on info when you ask about any rules. Need more staff who know what they are talking about"*
>
> *"More consistent staffing and better knowledge amongst officers [would improve compliance]"*
>
> *"MMO staff who are better informed [would improve compliance] as they don't know their own legislations and can't give simple answers".*

Recognising the importance of good relationships: Fisher Survey respondents with a good relationship with MMO staff were more likely to also consider MMO staff an important source of information[90] (32% of respondents with a 'good' relationship

[89] Fisher Survey respondents and Sanctioned Fisher interviewees

[90] No such relationship was found with respondents' opinion of the visibility of MMO staff in port – the importance of MMO staff as a source of information was no more important for those who consider the MMO to be visible in port, then for those who consider the MMO not to be visible. This may imply that having 'access' to MMO staff is not a relevant consideration.

with the MMO selected MMO staff, compared to 7% of those with a 'poor' relationship). The Fisher Survey indicated that Over 10m vessel respondents had a stronger relationship with the MMO than respondents of 10m and under vessels[91] – which may be expected given the greater focus (and hence interaction) that the MMO has on over 10m fishers relative to that of IFCAs[92] – and consider themselves more aware of regulations[93].

Providing timely information on infringements: A number of Sanctioned Fisher Interviewees, who stated they had been unaware that they had been infringing regulations, highlighted that they would prefer the MMO to make them aware of their non-compliance earlier, and provide greater information on the nature of it. This would enable them to take corrective steps early, thereby improving their compliance.

8.3 Attitudes towards the regulations and regulator

8.3.1 Opinion on regulations and the regulator

Fishers generally agree with the principle of regulation, but do not always agree with the actual regulations. This can have a material effect on compliance. A high proportion of Fisher Survey respondents agreed that fisheries regulations are necessary (87% agreed, 3% disagreed)[94] and more than half agreed that regulations benefit fish stocks (55% agreed, 23% disagreed) (see Figure 8.3). However, 'not agreeing with the regulation' was a commonly given reason by Fisher Survey respondents for their infringements – and the most frequently given reason for access restriction infringements (see Figure 5.3).

Fishers may deem the regulatory solution unfit for a variety of reasons, including: impact on profitability / threat to livelihoods, perceived fairness, appropriateness for the issue being addressed, appropriateness for local conditions and local fishery characteristics, and responsiveness/flexibility of the regulations and underpinning scientific data to changing conditions[95]. The majority of Fisher Survey respondents (see Figure 8.3) reported that fisheries regulations make it difficult to be profitable (63% agreed, 22% disagree), and a majority thought that regulations are unfair (26% agreed regulations are fair, 56% disagreed[96]). Respondents who thought regulations were unfair were also more likely to think that regulations make it difficult to be profitable[97].

[91] 65% of Over 10m vessel respondents rated their relationship with MMO staff as excellent or good, compared to 46% of 10m and under vessel respondents.

[92] Given the difference in the regulatory remits of MMO and IFCAs

[93] The Fisher Survey found that Over 10m vessel respondents considered themselves more aware than those of 10m and under vessels, across all regulation categories (see Table A3.17).

[94] There were no significant differences across fisher subgroups (gear type used, vessel length, ICES area(s) fished)

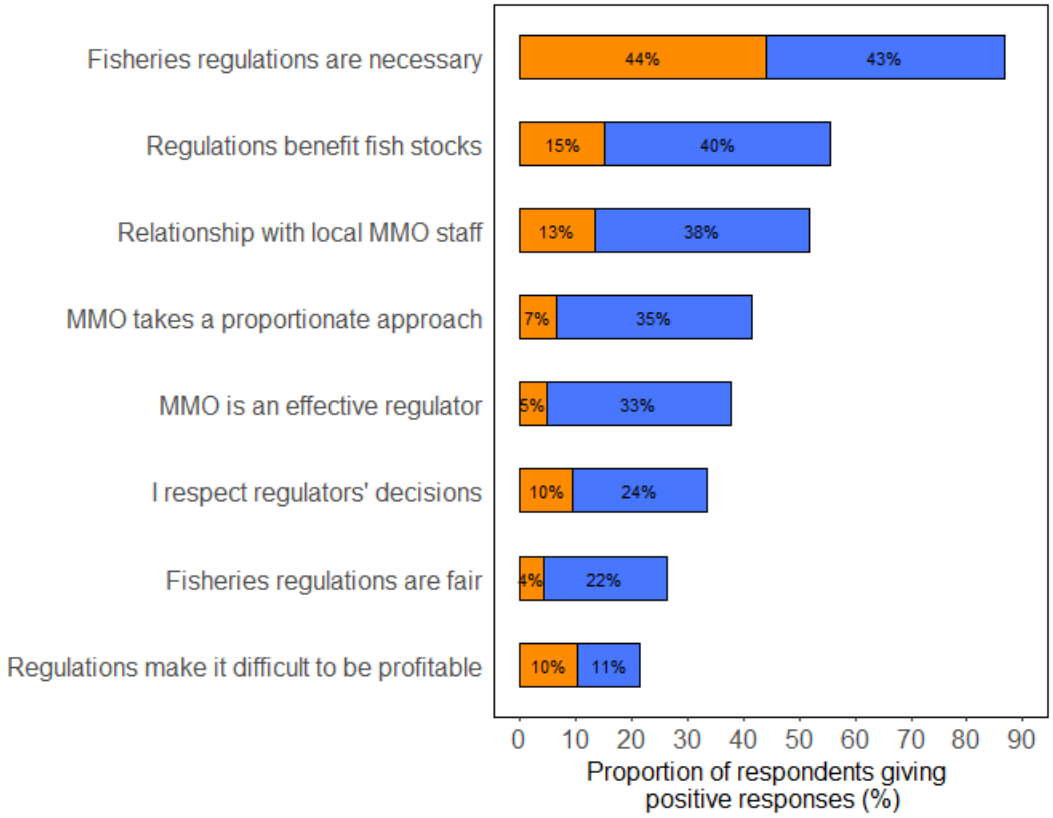
[95] Drawn from Fisher Survey comments and Sanctioned Fisher interviews

[96] Similar to the 2019 Baseline Survey: 29% agreed and 54% disagreed

[97] 90% of respondents who thought regulations were unfair thought that regulations make it difficult to be profitable, whereas 35% of respondents who thought regulations were fair thought regulations make it difficult to be profitable.

Figure 8.3 indicates the attitudes of Fisher Survey respondents towards different aspects of the regulations and the regulator.

Figure 8.3 Fisher attitudes towards regulations and the regulator



Source: Fisher Survey

Note: For most statements, responses shown are 'Strongly agree' (orange bars) or 'Somewhat agree' (blue bars). For relationship with MMO staff, respondents rating their relationship as 'Excellent' (orange) or 'Good' (blue) are shown (other response options were Average, Poor, Very Poor). For 'fisheries regulations make it difficult to be profitable, responses shown are 'strongly disagree' (orange) or 'somewhat disagree' (blue).

Negative attitudes to the regulations and regulator are nearly always associated with negative opinions on relationships with the MMO and extent of involvement in fisheries management.

Respondents who felt that they had a poor relationship with the MMO were more likely to think that regulations make it difficult to be profitable, and less likely to think that regulations are fair[98], that MMO is an effective regulator and to respect decisions made by the regulator. The same was true for respondents who thought felt that they do not have a say in how fisheries are managed[99] (see Table A3.15). Respondents who have a poor relationship with the MMO were also more likely to think feel that they did not have a say in how fisheries were managed.

[98] The 2019 Baseline Survey also explored the relationship between fairness and MMO relationship, with similar results: 39% of those with a good relationship considered regulations to be fair, compared to 14% of those with a poor relationship.

[99] With one exception: there was no significant variation in respondents' opinion on 'having a say' in fisheries management between those who agreed that regulations make it difficult to be profitable and those who disagreed.

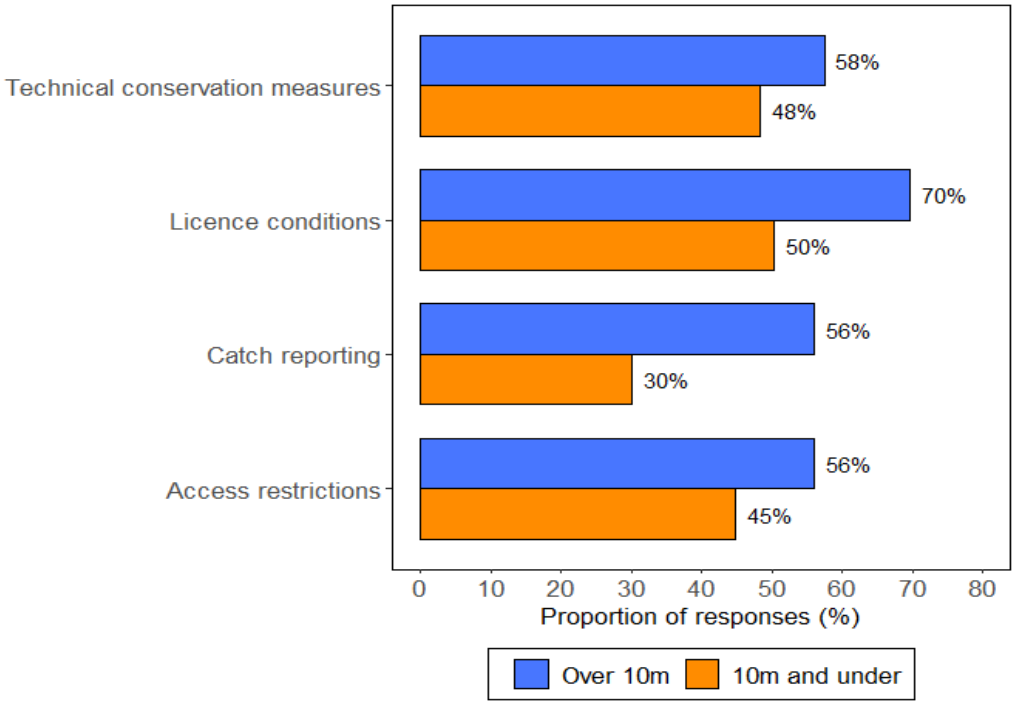
Framed more positively: Fishers with a good relationship with the MMO, and fishers who feel they have a say in how fisheries are managed, are more likely to respect decisions made by the regulator, to think that the MMO is effective, that regulations are fair, and that regulations do not make it difficult to be profitable.

Notably, 10m and **under vessel operators tended to have poorer opinions of regulations and regulators than those of Over 10m vessels**. 10m and under vessel Fisher Survey respondents were more likely than Over 10m respondents to have a poor view of regulations in terms of fairness and inhibiting profitability, of the MMO's effectiveness and their respect for decisions made by the regulator, and of their relationship with the MMO and their involvement in fisheries management (see Table A3.17). Specific issues raised by respondents included: 10m and under vessels being subject to a disproportionate level of regulation compared to Over 10m vessels, and being overly targeted for inspections.

10m and under vessel respondents also appear to find it harder to comply with regulations than do respondents of over 10m vessels (see Figure 8.4) – this was found in the Fisher Survey for all regulation categories except Access restrictions. The difference was largest for Catch reporting and control requirements, which again is likely to reflect the introduction of the catch app for the under 10m fleet. A large volume of comments received in the Fisher Survey, and opinion offered in the Sanctioned Fisher interviews, identified the catch recording app as a major barrier to their compliance.

Some Fisher Survey respondents raised the problem of ever-changing regulations making new gear redundant, or undermining their ability to make new gear investments, indicating a trade-off in their technical capacity to comply and the costs of fishing. One respondent identified this as a key barrier: *"[Receiving] never ending texts with new regs, using gear that is suddenly illegal – not knowing whether to invest in new gear to be told it's an offence if we use it a few months later*".

Figure 8.4 Fishers who feel it is very easy or quite easy to comply with fisheries regulations (by vessel length)



Source: Fisher Survey

8.3.2 Fisher attitudes before and after the increase in MMO resources

8.3.2.1 Attitudes towards the regulator

From the regulators' perspective, the increase in resources have enabled them to undertake activities expected to improve fisher attitudes towards the regulator. However, the extent to which this has impacted on fisher attitudes is not clear.

Survey data[100] indicates that change in fisher attitudes towards the regulator has been mixed. Opinion of the MMO as a proportionate regulator and an effective regulator both improved, whilst fishers' relationships with the MMO remain similar (see Figure 8.5).

MMO interviewees suggested fishers had initially felt unfairly '*picked on'* as a result of the increased MEO presence supported by the increased budget, particularly if they were not used to seeing MEOs frequently or being inspected. One interviewee reported that fishers still feel '*overpoliced*' as a result of the increased resources, although another thought fishers were now used to the increased MEO presence.

Several MMO interviewees indicated that the increased interaction with fishers, enabled by having more officers, was improving MEO-fisher relations, and that this was appreciated by fishers. This included being able to have more one-to-one dialogue, rather than group events that can be difficult to manage. However, fishers raised issues around the experience and attitudes of MEOs, particularly new MEOs[101] (see Section 4.4.3.1 for further discussion), which may have limited any positive effect of increased MEO-fisher interaction. Survey responses indicate little change in MMO-fisher relationships (Figure 8.5).

Some MMO interviewees suggested that there are different attitudes between compliant and non-compliant fishers – with the former feeling assured and welcoming the increased MMO activity and opportunity to '*ask more questions'* of MEOs; and the latter complaining and consider the increase *'invasive'*. However, the Fisher Survey found no correlation between fisher compliance and fishers' opinions of their relationship with MEOs, nor with their respect for MMO decisions. There was, however, a correlation between compliance and views on the MMO as an effective regulator for two of the four regulation categories (see Table A2.3, Q23b).

Other contextual factors may also have influenced fisher attitudes. For example, a high volume of negative comments received in the Fisher Survey focussed on the catch app. Negative opinion on the apps usability and relevance may have negatively impacted on fishers' attitudes towards the regulator.

8.3.2.2 Attitudes towards the regulations

Survey data[102] indicates that fisher opinion on whether regulations benefit fish stocks has improved markedly, but that there has been little change in opinion on the fairness of regulations (see Figure 8.5). MMO interviewees recognised the role that MEOs play in educating fishers on the purpose of regulations, for which an increase may have positively impacted fisher opinion on whether regulations benefit fish stocks. However

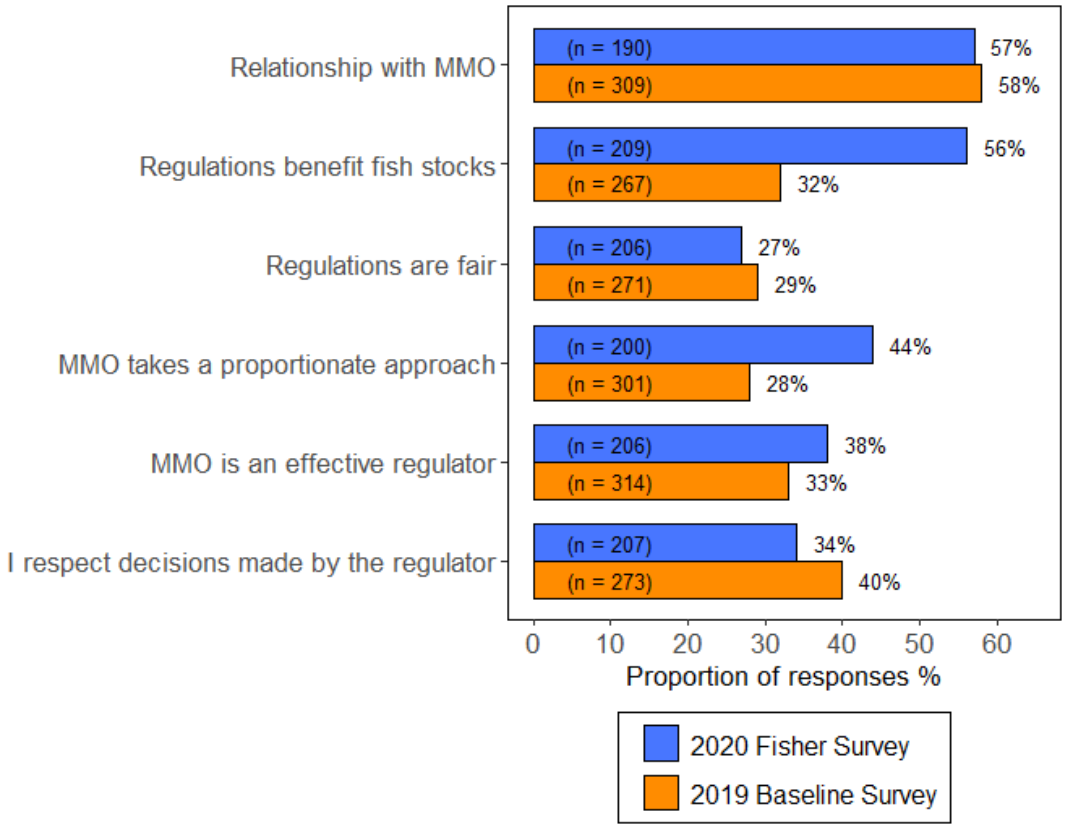
[100] A comparison of the 2020 Fisher Survey and 2019 Baseline Survey. Indicated changes should be treated with low confidence due to differences in survey designs. See A2.1 for further details.

[101] See Section 4 for further discussion.

[102] A comparison of the 2020 Fisher Survey and 2019 Baseline Survey. Indicated changes should be treated with low confidence due to difference in survey designs. See A2.1 for further details.

insufficient evidence was collected to examine, or draw conclusions on, why attitudes towards the regulations have/have not changed.

Figure 8.5 Positive opinions on regulations and the regulator from the Fisher Survey, compared to the Baseline Survey



Source: 2020 Fisher Survey, 2019 Baseline Survey

Notes: Proportions shown are for 'strongly agree' plus 'somewhat agree' responses to each question. For 'Relationship with MMO' the selected responses were 'excellent' and 'good'.

Fisher Survey analysis was adjusted to exclude 'don't know' responses, as this response option was not available in the 2019 Baseline Survey

8.3.3 Improving attitudes

The analysis presented in Section 8.3.1 indicates that there is a group of fishers whose negative opinion on regulations may be associated with feeling disenfranchised from fisheries management. Re-empowering fishers in order to enhance their attitudes towards the regulations and regulator may be supported through:

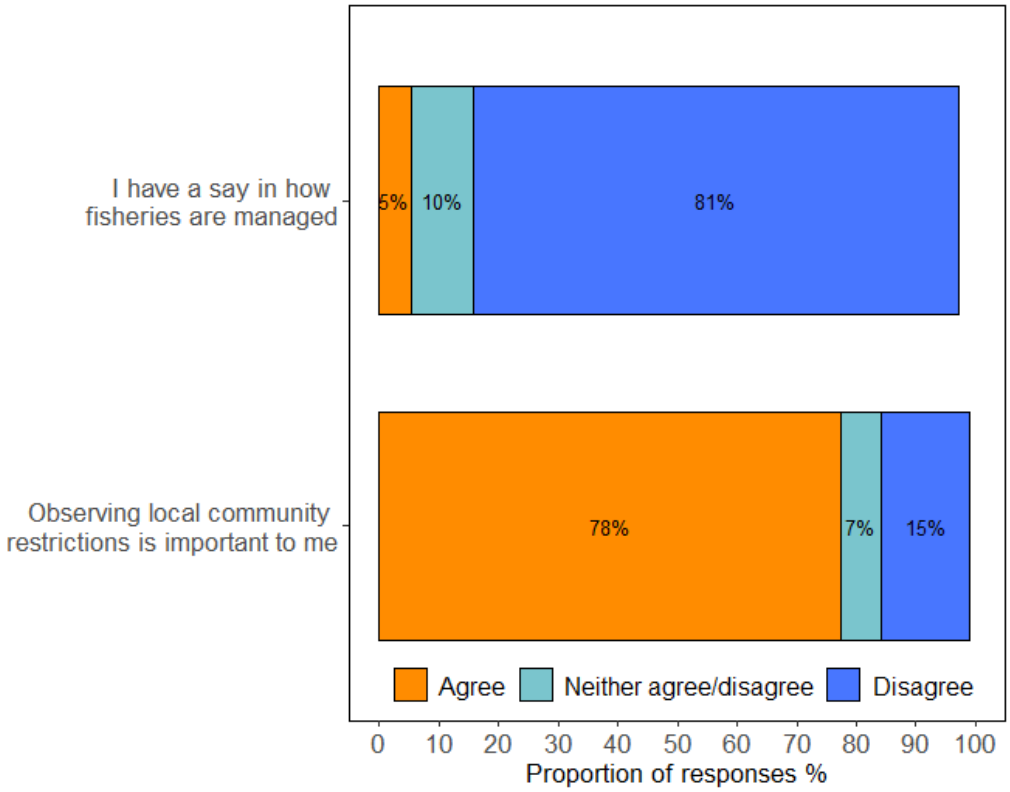
- Increased use of participatory management approaches.
- Building a more empathetic, trusting and collaborative relationship with Fishers.
- Greater application of the MMO's 'trusted customer model' to ensure that more compliant fishers feel the benefit of their compliance more directly.

Participatory management

The lack of fisher involvement in fisheries management was raised by all stakeholder groups: MMO interviewees, Sanctioned Fisher Interviewees and Fisher Survey respondents.

Only 15% of Fisher Survey respondents agreed that they have a say in how fisheries are managed (78% disagreed) (see Figure 8.6). This was particularly the case for respondents operating 10m and under vessels (10% agreed, compared to 25% for Over 10m vessels). Fisher Survey and Sanctioned Fisher Interview participations felt that their views and local/fishery knowledge are not adequately represented and/or considered in fisheries regulations, even when they are consulted. A number of MMO interviewees indicated that, in general, the fishing industry tend to be resistant to a top-down regulatory approach, but this approach of 'imposing' regulation on the industry was considered the status quo.

Figure 8.6 The role of fishers in fisheries management



Source: Fisher Survey

MMO interviewees highlighted the importance of getting industry to 'buy-in' to regulations, particularly for new/revised regulations if the industry is not sufficiently engaged in the design/revision process. Some interviewees suggested that the MMO needs to go beyond informing and consulting industry about upcoming new or revised regulation and develop a genuine two-way relationship**,** drawing on ideas of co-management and co-development of regulations. As well as fostering 'buy-in' it was suggested that other compliance drivers (e.g. awareness, technical capacity) would also be improved if fishers were more involved in the design of regulation.

The potential benefit of greater fisher involvement is highlighted by the Fisher Survey: **80% of respondents indicate it is important to them to observe fishing restrictions agreed by the local fishing community** (only 5% disagreed) (see Figure 8.6). Both more and less compliant fishers tended to agree, but it was more likely for the 10m and under group compared to Over 10m group to agree (86% agreed compared to 79%, respectively). In the 2019 Baseline Survey observing local

restrictions agreed by the local community was the most highly rated driver that fishers consider when making compliance decisions[103].

A high number of both Fisher Survey respondents and Sanctioned Fisher interviewees felt that **if the MMO worked more closely with fishers across different locations and represented their views in the regulations, it would encourage voluntary compliance and discourage non-compliance**. A high volume of Fisher Survey respondents raised the issues of fisher involvement in management decisions as a key action the MMO could take to improve compliance – statements included:

"Greater co-management needed. Greater involvement by fisherman in decision making. Working together more important as if rules are right in the first place they don't need enforcing."

"Greater information sharing and cooperation"

"Increase interaction with fisherman on decision making"

"More input from fishermen but MMO never go enough with any ideas given to them. We've been trying for many years"

"Listen to fishermen when deciding new measures - consult more widely"

"Greater co-management approach is greater discussion before bringing in new measures"

"More industry input into the way fisheries are managed at a local level"

"Listen to fishermen's views. Involve fishermen in decision making. Fishers should be rule-makers not rule targets"

"MMO could learn from us what's happening at sea. Would like to work with them to manage stocks but we're scared if they use info against us"

"Work with fishermen more to ensure they are collecting relevant information that can assess stocks and conservation measures"

"MMO do make the job so hard with changing regulations that we don't have a say in. Every area is so different. [The MMO] need to be more localised and understand local issues"

"*Listen more to fishermen about the practicalities of developing new rules as often these are not fully understood by regulators*".

Improving MEO-fisher relations

The MMO could build a more empathetic, trusting and collaborative relationship between MEOs and fishers. To support this, greater emphasis could be placed on equipping MEOs, particularly new MEOs, with the skills and knowledge to better engage with fishers as well as the time required to better embed within fishing communities.

Many Sanctioned Fisher and Fisher Survey respondents reported that MEO-fisher relations suffered from an *"us versus them"* mentality. Both fisher and MMO research participants suggested that re-establishing a good relationship would require building trust and respect, including an improved understanding amongst MEOs of the fishing industry and the challenges they face, and vice-versa for the fishers of the MMO/MEOs.

[103] This question was not repeated in the Fisher Survey.

MEOs with a lack of knowledge potentially annoy fishers and undermine MEO-fisher relations and respect. Just under half Sanctioned Fisher interviewees and a number of comments made in the Fisher Survey highlighted that attitudes amongst MEOs vary, with some being more understanding, friendly, approachable and courteous than others.

MMO interviewees raised concerns, as did fishers[104], about the quality and experience of new inspectors – many of whom have no fisheries or seagoing background. Some new MEO recruits felt that their training did not fully equip them to engage with fishers, particularly in potentially confrontational situations[105]. Comments from the Fisher Survey about fisher relations with MEOs include:

"Remove us/them mentality"

"Friendliness, not a presumption of guilt"

"Trust fishermen"

"Be more friendly, less aggressive not always looking to catch you out"

"Not treat us like common criminals more friendly interaction"

"Work with us understand more, some MMO couldn't ID certain fish, how can we respect their decisions"

Particular focus may be given to how MEOs, and the MMO more generally, interact with fishers during the enforcement processes. Several Sanctioned Fisher interviewees complained about aspects of the enforcement process[106]. Issues included not receiving full information regarding their offence, delays between notification and enforcement proceedings, and being interviewed under caution for minor offences. Some interviewees highlighted the stress that being sanctioned, even receiving minor sanctions such as a written warning, can cause, particularly given the criminal nature of many fisheries infringements.

Models of earned recognition

There is **scope for the MMO to make greater use of the concept of earned recognition in several ways**. It could frame a more positive relationship for fishers with the regulatory regime, providing a positive feedback loop and tangible benefit to fishers of improving compliance.

Earned recognition is a concept whereby businesses that can demonstrate a level of compliance, performance or quality, such that a regulator can appraise the level of risk the business poses, have this recognised through tailored regulatory interaction – such as reduced inspections for better performing (lower risk) fishing vessels.

The concept is reflected in MMO's risk-based approach to inspections, stepped approach to sanctioning and the trusted customer model put forward in the MMO's Compliance and Enforcement Strategy[107]. But it is not clear that MMO have formal systems that support the systematic implementation of each of these – as indicated through the lack of integration and gaps in databases on inspection and sanctions.

[104] In both the Fisher Survey and Sanctioned Fisher Interviews

[105] See Section 4.4 for further discussion

[106] Although perhaps unsurprising, Fisher Survey respondents who had received a sanction from the MMO in the last 12 months reported a worse relationship with MMO staff than those who had not received a sanction. The same association was not apparent between relationship with MMO staff and whether a fisher had been inspected or not.

[107] MMO (2020). Statutory guidance. Compliance and Enforcement Strategy https://www.gov.uk/government/publications/compliance-and-enforcement-strategy/compliance-and-enforcement-strategy

The stepped approach to sanctioning was referred to by several Sanctioned Fishers and appears to be appreciated. The lack of meaningful implementation of the trusted customer model was also raised.

Financial incentives targeted at investments which aid compliance

Some MMO interviewees recognised that more could be done to help fishers to comply, rather than solely making them aware of their responsibilities. Better targeting of financial support packages could help fishers make investments in gear and technology that could aid their compliance.

8.4 Social norms

8.4.1 Reputation and approval

Lower compliance is associated with lower concern about reputation, and lower expectation that other fishers would disapprove (see Table A2.3, Q26c, Q32k) – fishers who are less concerned about their reputation are also less likely to think that other fishers would disapprove if they were non-compliant (see Figure 8.7).

Concern for their reputation was the top ranked driver that fishers stated to be of importance when making decisions about compliance (85% said it was very important/important). The variable was positively correlated with compliance for three of the four categories of regulation[108] (see Table A2.3).

Of Fisher Survey respondents, 76% agreed that other fishers would disapprove if they were non-compliant (9% disagreed) (see Figure 8.7). Opinion on whether other fishers would disapprove of non-compliance was found to be a significant explanatory variable of levels of compliance with three of the four categories of regulations[109] (see Section 5.3).

There may be potential to influence the compliance of less compliant fishers by seeking to enhance the extent to which they are concerned about possible impacts on their reputation, and the extent to which they think other fishers would disapprove of their non-compliance.

A simple intervention that seeks to increase public awareness of fishers' non-compliance[110] (e.g. publishing a register of sanctions) may increase the chances of reputational damage. However, it is not clear whether this would have an impact on less compliant fishers i.e. whether it would increase the extent to which they are concerned for their reputation (and hence their compliance), or have no effect because they are not concerned about their reputation. Further, such an approach may have unintended consequences (e.g. on MMO-fisher relations), particularly if it impacts on the reputations of predominantly compliant fishers.

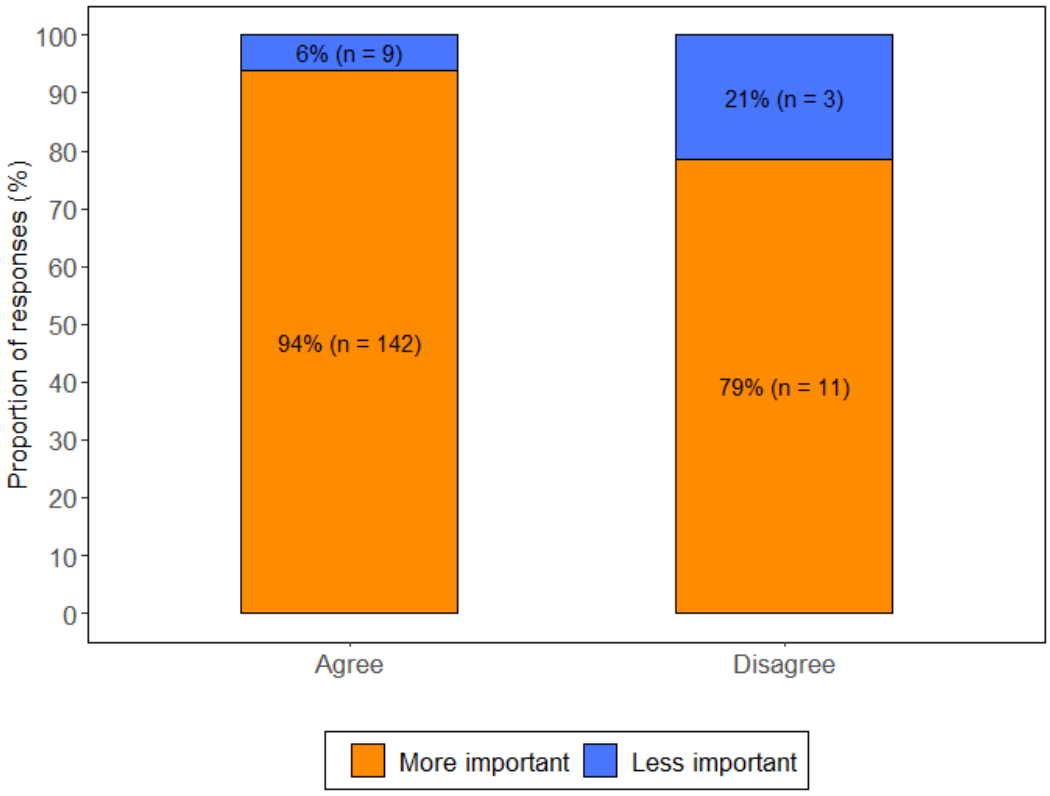
In order to design suitable interventions, further evidence is needed to understand why less compliant fishers care less about their reputation and why they are less likely to think that other fishers would disapprove.

[108] All except Access restrictions

[109] All except Access restrictions

[110] Only 56% of Fisher Survey respondents think they would always or often hear about others' non-compliance; 57% of Fisher Survey respondents agreed that compliance with fisheries regulations is important to their buyers.

Figure 8.7 Ratings of importance of reputation in compliance decisions by agreement/disagreement that other fishers would disapprove of non-compliance



Source: Fisher Survey

8.4.2 The compliance of others

A few MMO interviewees suggested that the deterrence effect created by increased control and enforcement could increase fishers' expectations that other fishers would be compliant. Positive messaging regarding compliance levels is one route to influence fisher perceptions about the compliance of others. The MMO does not calculate, or publish data on, compliance levels and does not systematically publish information on instances of non-compliance. Only one Fisher Survey respondent suggested this as a route to improve voluntary compliance: *"[To improve voluntary compliance] improve perception of constant enforcement and compliance - what others are doing".*

The Fisher Survey offers mixed evidence on the extent to which interventions to influence fisher expectations of others' compliance might impact compliance.

Fisher Survey respondents indicated that the compliance of others was important to them (91% agreed), and compliance of others was found to be a significant explanatory variable for compliance with Licence conditions (see Section 5).

However, the likelihood that other fishers comply or not was one of the lower ranked drivers that fishers said they considered when making compliance decisions[111]. Further, respondents who thought that other local fishers were mostly compliant were

[111] it ranked 9th out of 11 drivers – see Section 5.2.

no more likely to consider other fishers' compliance to be important to their own decision-making than were those who thought other local fishers were less compliant[112]. In addition, other fishers not complying was the least frequently reported reason for why fishers had been non-compliant (see Section 5.4).

[112] Although the 2019 Baseline Survey did find a significant relationship: 84% of Baseline Survey respondents who perceived that there were high levels of compliance within their local area felt that it was important that other fishers complied, compared to 61% of respondents who felt that there were low levels of local compliance.

9 Conclusions

The evaluation has examined compliance with fisheries regulations, the role of control and enforcement in influencing this compliance, as well as the implementation and effects of additional MMO control and enforcement funding of £16.5m over the period 2018/2019 to 2019/2020. Headline conclusions are:

- The increased budget has considerably strengthened MMO control and enforcement activities and has had a positive effect on its operational performance.
- The relationships in the logic model developed to frame this evaluation are broadly supported by the research outputs from the evaluation itself, notably the links between control and enforcement activities and deterrence drivers.
- The deterrence drivers linked to increased control and enforcement activity are likely to have increased the perceived risk of being non-complaint. The visibility of fisheries control and enforcement and hearing about non-compliance being detected appear to be at least as important as the experience of being inspected.
- Most fishers appear to be largely compliant with fisheries regulations. The extent to which increased control and enforcement will influence deterrence drivers and further reduce non-compliance is not clear. Compliance may alter to some degree in response to changes in control activities but influencing voluntary drivers of compliance offers a complementary opportunity to deliver improvements without the need for further regulatory control. The evaluation provides evidence that compliance by individuals is dynamic, for example in response to changing regulations, or in response to the presence of a patrol vessel.
- Using voluntary drivers more effectively would benefit from further study. There are indications from the Fisher Survey that the preconditions required to support innovative 'soft' measures exist, such as market pressure, increased fisher agency in management, increased publication of good and bad behaviour.
- Accidental or opportunistic non-compliance may be improved through better communication from the MMO, simplifying regulations and strengthening regulations where loopholes or obvious gaps exist.
- For the minority of determined, persistent offenders, alternative models are necessary to reduce non-compliance.

9.1 Compliance with fisheries regulations

Most fishers consider themselves to be largely compliant. The introduction of the catch app for under 10m vessels negatively impacted compliance with Catch Reporting and Control Regulations.

Two-thirds of survey respondents rated themselves as fully compliant with fisheries regulations overall (score of 10 out of 10), increasing to 80% including those rating themselves as nine out of 10. This is in line with the views of MMO interviewees, who also thought that most fishers are largely compliant. Survey evidence indicates that, overall, perceptions of fleet compliance in 2019 was broadly in line with that of 2018.

The highest compliance levels were reported for Access restrictions and Licence conditions. The lowest were reported for Catch reporting, which was negatively impacted by the launch of the under 10m vessel catch app in 2019. More generally, fixed gear fishers reported higher compliance levels than towed gear fishers. This

mirrors the distribution of MMO sanctions across areas of regulation and vessel gear types.

In the process of this study, it was found that in general the MMO data collection system and datasets were not set up for monitoring or assessing compliance performance indicators or to feed into operational management on the ground. There is no coherent data collection fisher behaviour that could be used to better monitor performance against compliance indicators. This is particularly important given the challenges of obtaining data on compliance.

Self-reported compliance rates imply that the MMO's risk-based approach to control and enforcement is appropriate.

MMO data collection is extensive but does not support analysis of defined (non)compliance metrics. Improved data collection and management could be used to demonstrate performance against regulatory objectives, better target and design interventions that address the range of drivers as well as supporting live decision making by officers on the ground by providing them with valuable background information on fishers.

9.2 Delivery of the increased control and enforcement budget

The increased budget has delivered an increase in human resources and assets broadly in line with what was planned.

Up until April 2020 the number of control and compliance operational roles successfully recruited as a result of the increased budget was 58, compared to a planned 62. Of these, five have since left the MMO. Currently 53 roles involving the day-to-day delivery of control and enforcement are funded by the increased budget, representing approximately 46% of the total number of roles. Twenty-seven of these are coastal MEO roles. A further 10 full-time equivalent roles are funded to support the delivery of the increased budget.

A new recruit training programme was successfully rolled out and delivered warranted officers faster than previously. Weaknesses in the programme were identified including lack of trainee support from mentors and gaps in the development of MEOs softer skills.

Addressing weaknesses in MEO training is important to better support MEO retention and MEO-fisher relationships.

Coastal offices saw a net increase in MEO numbers but a net loss in experience, as established MEOs were promoted to staff new fisheries patrol vessels (FPVs) and/or train new recruits. New central intelligence and investigations teams, supported by intelligence officers around the coast, were established.

Two new dedicated fisheries patrol vessels (FPVs) were brought into operation in 2019 under agreement with a commercial provider and have enabled the MMO to have an effective at sea presence independent of other providers. A new MoU with the Maritime and Coastguard Agency (MCA) provides for a flexible increase in aerial surveillance capacity if it is needed.

The increase in capacity has enabled the MMO to achieve a stronger, multi-location physical presence and inspect a greater proportion of the fleet more often. **Sustaining these improvements is contingent on resources being maintained.**

The number of inspections delivered in 2019 increased significantly on 2018. Inspections of vessels in port, of markets/premises and of vehicles were significantly higher than at any point since 2011[113]. At-sea vessel inspections saw the largest percentage increase on 2018 and more are being conducted than at any point since 2012.Inspection targets were newly implemented, although were not always met.

Further refinement is necessary to calibrate appropriate inspection target levels. Performance targets could cover a broader set of issues (such as time informally engaging fishers) to better reflect the wider role of an MEO. This may also provide greater incentive for delivering non-inspection activities. Revisiting inspection target levels and issues (see following bullet) in line with a coherent strategy and process that links inspections, (non)compliance indicators, data collection and analysis would support tracking and measurement of inspection efficacy.

The spatial, temporal and fleet coverage of inspections increased. The spatial footprint and intensity of surveillance and inspections at sea and on land increased. The temporal coverage has increased. More vessels were inspected more often. Out of hours inspections increased in line with the increase in standard hours inspections.

At a local area level, the increased number of staff (as well as relief provided by shifting intelligence and investigation responsibility to the new central team) were reported by MEOs to have permitted local offices to do more of their existing activities; novel activities were not implemented. Local office ashore inspections benefit from the presence and coordination with the FPVs.

Many of the benefits arising from the investments are at risk if the new staff recruited and trained on short term contracts are not retained at the end of the funding period.

Resourcing constraints present a risk to the viability of the FPVs, and maintenance of the uplifted at-sea presence, exacerbated by the reliance on MEOs 'volunteering' for at-sea patrols.

Long term patrol plans may help to manage staff and vessels better and avoid at-sea attrition. An increased proportion of MEOs contractually obliged to participate in at-sea patrols may ensure the longer-term viability of the FPVs. This may require additional employee incentives and training.

More informed, responsive, and coordinated tasking was supported by the FPVs and central intelligence team. However, informal intelligence is not systematically captured.

The increased capacity and control over at-sea assets enabled by the FPVs has allowed the MMO to be more reactive to intelligence. The central intelligence team has supported more systematic use of intelligence. When it occurred, the tasking of the FPVs in response to aerial surveillance is reported to work well.

MEOs were able to spend more time engaging with fishers (via inspections and informally), which should improve the flow of information from fishers. However, weaknesses remain in the capturing of informal intelligence by MEOs and that proactively reported by fishers. The value of intelligence is undermined by IT system limitations coupled with a relatively inexperienced team, as well as issues with the quality of communication between central and local teams.

Improvements to better leverage the value of informal intelligence may include tools and guidance to support MEOs to record information intelligence on MMO systems that interface with inspection report and other intelligence sources. A clear process

[113] The earliest year for which data was available.

for anonymous provision of intelligence by fishers could be established and promoted, which should be supported by a transparent structured system to record, process and action received intelligence (linking to the broader data system improvement recommendation).

Investigations are being concluded more rapidly and an increase case load is being better managed.

The additional team members within the dedicated intelligence and investigations team appear to have enabled more investigations to be carried out and closed over shorter time periods.

The new FPVs had a marked impact on the capacity of the MMO to conduct inspections.

The infringement detection rate of at sea inspections increased markedly in 2019. It is unclear whether this reflects a higher quality of inspection delivered by MMO staff on FPVs compared to RN fisher officers, or a benefit of the improved tasking and responsiveness of the FPVs. For other types of inspection, the detection rate remained in line with previous years – there has been no drop off resulting from the increased capacity. The efficacy of each hour of FPV inspection time relative to the number of infringements detected is greater than other inspection types (although FPV inspection also have a different cost profile and focus to other inspection types).

The MMO as an organisation is developing at-sea inspection capacity and experience, which is able to be advanced with the dedicated FPVs. Interviews highlighted that significant responsibility is placed on relatively inexperienced boarding officers to lead FPV patrols with attendant considerations for patrol efficiency, effectiveness, and safety at sea.

The MMO should seek to maintain control of its own at sea assets, rather than returning to reliance on the RN. Incentives for at sea patrols should be sufficient to ensure full utilisation of at sea assets and to build experience over an extended period.

9.3 Compliance drivers

Voluntary drivers help to explain differences in compliance levels amongst fishers better than deterrence drivers. Deterrence drivers are important regardless of a fisher's level of compliance.

The three drivers considered to be of most importance by fishers were all voluntary drivers, as were the drivers that best explain variation in compliance levels between fishers. In particular, awareness of the regulations was important. Further, whilst most fishers agree with the principle of regulation, disagreement with actual regulations (due to issues ranging from impact on profitability, fairness, suitability and effectiveness) was a commonly given reason for non-compliance. Lack of regulatory awareness and disagreement with regulations may enable fishers to justify their non-compliance based on (actual or fictitious) claims of poor regulatory design and communication. However, less compliant fishers appear less concerned about 'positive' voluntary drivers, such as their reputation and other fisher approval

Deterrence drivers were considered important by most fishers and were of similar importance to both more and less compliant fishers. Differing views on aspects of deterrence drivers (e.g. likelihood of inspection) did not tend to explain variation in compliance levels across fishers.

9.4 Creating an effective deterrence effect

9.4.1 Control-related deterrence drivers

The posited logic model linking control actions and deterrence drivers is supported by the evidence. **Relationships were observed between the control outcomes (MMO visibility and inspections) and the deterrence drivers** (likelihood of being inspected and likelihood of infringements being detected). Additional factors, such as perceptions about regulator effectiveness, were also found to relate to components in the logic model.

Compared to the 2019 Baseline, a greater proportion of survey respondents now perceive a greater likelihood of inspection and likelihood of detection. **The majority, however, still perceive the risk of inspection and detection to be low.** The strength of change appears to be greater ashore than at sea. A number of the variables which may influence these deterrence drivers also increased - a notable exception was MMO visibility at sea, reported to be lower than in the baseline despite the evident increased MMO presence at sea. A small number of clear examples of the effectiveness of the increased deterrence were identified.

The largest effect was seen for likelihood of inspection, which has the most obvious links with the capacity investments made by the MMO. A weaker effect was apparent for likelihood of detection, where a greater lag between MMO investment and changes in fisher perceptions might be expected.

There remain challenges with creating a sufficient deterrence effect. This is particularly the case for persistent offenders. Regulator visibility positively influences deterrence drivers, but the effect can be temporary. Detection avoidance behaviour limits the effectiveness of increased at sea assets and MEOs.

Alternative approaches and support from tighter regulatory controls may be needed, alongside control and enforcement investment, to sufficiently effect deterrence. Should additional regulatory change be necessary, the MMO should fully explore the impacts on fishers' operational flexibility, particularly for the coastal fleet.

For persistent offenders and those determined to ignore regulations, alternative control and enforcement models may be required. For example, imposing full transparency of fishing operations

The apparent deterrence effect linked to MMO visibility (e.g. behavioural change within the vicinity of a FPV) suggests mandatory use of remote surveillance technologies (and analysis of generated information) could be used to create a more permanent effect of being surveyed, but with reduced MMO physical presence required.

9.4.2 Enforcement-related deterrence drivers

The majority of sanctions issued were of minor severity - rebriefs. A higher proportion of sanctions stemming from at-sea inspections are more severe than from ashore inspections. Catch reporting offences account for the largest proportion of sanctions issued by the MMO – this is particularly the case for sanctions resulting from at sea investigations. Very few sanctions are issued for Access restriction infringements[114].

[114] Based on data from 2018 and 2019

However, analysing sanctions and the effectiveness of enforcement deterrence drivers is restricted by the coherence of the datasets maintained by the MMO.

Most fishers expect a detected offence to result in a sanction and consider the severity of sanctions sufficient to be a concern to them. However, about one in ten fishers are not concerned by sanctions and some fishers appear to include potential sanction costs in their operating model. In combination with views on a minority of fishers' capabilities of avoiding detection, this suggests that alternative control and enforcement models may be required to target persistent and determined rule-breakers. Some MMO interviewees raised questions regarding the effectiveness of fines and whether there is sufficient focus placed on seeing infringements through the sanctions process.

Procedures through which decisions are made for proceeding with prosecutions could be reviewed to ensure all viable cases are being taken on. Investigations may be better supported with financial analyses of the offending business and vessel-specific compliance performance data to support sanctions being set at appropriate levels and better targeted to the circumstances and fisher history. This evidence base could support increased awareness in courts of the rationale for recommended sanctions.

The influences of control and enforcement activity on enforcement-related deterrence drivers are less clear cut than those for control-related drivers. General deterrence may have a more obvious effect, than specific deterrence.

Fishers' own experiences and opinions of control and enforcement appear to have limited effect on their opinion of the strength of the enforcement deterrent; although specific deterrence does appear to occur for fishers committing more minor offences. A number of examples of fishers taking corrective actions to minimise the chances of reoffending following receipt of minor sanctions were identified. Clear examples of general deterrence impacting positively on local fleets were identified. It is less clear whether enforcement-related deterrence is sufficient to influence the compliance behaviour of the more persistent offenders.

MMO may consider how the general deterrence effect may be maximised.

There is a small degree of evidence indicating that the increased budget has had an influence on the sanction-related deterrence drivers. A potential lag between increasing inspection activity and changes in fisher perceptions regarding sanctions may mean any effect the increased budget is having may not yet be fully apparent.

9.5 Encouraging voluntary compliance

Awareness of regulations is one of the most important drivers of compliance but is challenging to improve.

Less compliant fishers tend to have lower levels of awareness of the regulations. The role of MEOs to educate and raise awareness of regulations is recognised. Issues of volume, complexity and consistency of regulatory information/communication/advice are inherent barriers to increased awareness which need to be addressed. Communication and advice that does not adequately address these issues may undermine fishers' engagement with MMO communications and advice, further exacerbating compliance issues. The increased resources have allowed for greater MEO-fisher interaction and hence provision of advice. It is not clear that this had an impact on general awareness levels.

How MMO communications are designed and delivered may benefit from review to maximise their reach and usefulness for fishers, taking into account the sources of information highlighted as important to the different groups in the Fisher Survey.

The process by which fisher enquiries are dealt with should be reviewed and strengthened, with appropriate recording and actioning processes to ensure adequate formal consideration is given to enquiries received. It should enable opportunity for MEOs to seek adequate support before providing advice if they are unsure and a system of advice provision verification to ensure accuracy and consistency.

Attitudes towards the regulations and regulator are important drivers of compliance, but the MMO's current approach to control and enforcement is unlikely to deliver significant changes in fisher attitudes.

Fishers generally agree with the principle of regulation but disagree with actual regulations implemented. This can impact on compliance. Such disagreement may occur for a range of reasons, such as perceptions of the regulations being unfit for purpose, unfair, impractical or economically restrictive. Fishers with poor MMO relations, and who feel they have less of a say in fisheries management, are more likely to have negative views on the regulations – but many negative views appear to be widespread amongst fishers. On most measures, there was no evidence that the increased budget had resulted in a meaningful change in fishers' attitudes. The largest improvement was in fisher agreement on whether fisheries regulations benefit fish stocks.

Increased fisher participation in fisheries management may offer the chance of more fundamental changes in fisher attitudes, in a way that is unlikely under the current model. Increased participation has the potential to positively influence multiple voluntary drivers. Participatory opportunities could be implemented for discrete issues such as greater involvement of fishers in data collection or scientific partnerships, and involvement in creating locally-tailored regulatory variations that better reflect local fisheries and practicalities, or explore more comprehensive approaches to co-management as is practiced in advanced fisheries management regimes such as New Zealand, Australia, USA, Iceland. Given the weak organisation and representation of English fleets, particularly the 10 metre and under fleet, in the short-term an achievable option could be to further develop and strengthen the existing industry-Government consultation and liaison groups.

Finding a balance between regulatory stability to enable business planning and flexibility to reflect local/regional variability may increase the incentive to comply with regulations, as fishers feel that the regulatory design and implementation better reflects the complexities of fishing businesses and the challenges of investing and operating in small scale fisheries.

Enabling measurable benefits for vessels that apply best practice compliance: The MMO could make greater use of the idea of earned recognition – as embodied in the MMO's 'trusted customer model' – linked to a flexible approach to control activities whereby fishers more directly recognise the benefit of voluntary compliance.

Greater focus could be placed on equipping MEOs with the skills, experience and opportunities to better build relationship with fishing communities. For example, spending time as invited observers aboard fishing vessels to gain familiarity with fishing operations and to develop positive relationships with vessel masters and owners. Increasing MEO awareness of the practicalities and challenges of fishing operations may further improve relationships between MMO and the fishing industry.

Social norms are of moderate importance. Simple approaches to nudge social norms may not have a meaningful effect on less compliant fishers.

Lower compliance is associated with less concern about a fisher's reputation, and limited expectation that other fishers would disapprove, although it is unclear why this is the case. Some evidence indicates concern about financial (rather than social) implications or reputational issues. Fishers widely recognise that compliance is important to their buyers. The compliance of others is important to fishers, although evidence of the impact on fishers' own compliance is mixed. Interventions that promote certain social norms alone may be insufficient to influence less compliant fishers.

MMO may consider how to create stronger compliance incentives through the fisheries supply chain. For example, there may be opportunities to engage with sustainable fisheries certification marques that emphasise transparency in the supply chain (e.g. Marine Stewardship Council), to strengthen audit sections related to control and enforcement, target communications and dialogue with important buyers of nationally caught seafood to encourage buyer-directed pressure of fishing businesses to comply with regulations, or other possible assurance schemes.

Part A: ANNEXES

Annex 1 Control and enforcement in England

A1.1 An overview of the process of control and enforcement in England

The MMO is responsible for the management and regulation of fisheries in English waters and enforces UK and EU legislation that protects and manages fisheries resources. Control and enforcement allows the MMO to ensure that fisheries rules and regulations are complied with and, if necessary, enforced.

The MMO's approach to control and enforcement is risk-based and intelligence-led. The MMO Compliance and Enforcement Strategy[115] specifies that control and enforcement activities, including monitoring, inspection, investigation and compliance actions, are targeted to areas where non-compliance is identified or predicted[116]. This is a response to the Regulators' Code (2014) that requires regulators to minimise the impact of regulation on business.

The **control** element of fisheries control and enforcement *usually* refers to the regulatory infrastructure. That is, legislation and regulatory structures that deliver fisheries policy objectives. For this evaluation, a distinct interpretation of the control component of control and enforcement is applied: the operational activities and processes regarding surveillance and inspection. Information relevant to control and enforcement is obtained from multiple sources and are of varying quality. The MMO routinely use VMS, AIS, Electronic recording and reporting, and landings declarations and sales notes to monitor fishing activity[117]. This information enables the MMO to assess where there are possible compliance issues. The information is then used to identify the priority areas for more targeted surveillance and inspections to be undertaken. MMO also undertakes communications to provide advice and guidance to ensure industry is prepared for regulation.[118]

The **enforcement** component of control and enforcement refers to the actions taken to ensure compliance with the regulatory system and is defined here as including the actions initiated once an instance of non-compliance is identified. The MMO Compliance and Enforcement Strategy states that the MMO seeks to achieve compliance firstly through applying 'soft' measures, including education, advice and guidance and enforcement action where this is justifiable and proportionate.

A1.2 The organisations involved in control and enforcement and how they interact with the MMO

To deliver control and enforcement in England and English waters, the MMO enters into agreements with other organisations (e.g. Inshore Fisheries and Conservation Authorities (IFCAs), Royal Navy (RN), Border Force (BF), Maritime Coastguard Agency (MCA)), as well as joint-working arrangement with other government authorities (e.g. devolved administrations, EU Member States and third countries).

[115] https://www.gov.uk/government/publications/compliance-and-enforcement-strategy

[116] Random control activities only occur if there is a need to fulfil specific identified compliance requirements. From a statistical perspective, this creates a bias that has implications for using existing control and enforcement data to analyse compliance, as control activities are directed at predicted high-risk areas where infringements are more likely to be detected than if control activities were randomly distributed.

[117] Remote Electronic Monitoring is currently undergoing trials

[118] MMO (2018). Marine and Fisheries Control and Enforcement (FI002). Outline Business Case (OBC). Version No: Draft 1.5. Issue Date: 1st August 2018

Inshore Fisheries and Conservation Authorities (IFCAs) – The IFCAs are made up of 10 independent authorities spread out along the English coast. Each is directly responsible for fisheries enforcement out to six nautical miles from land. IFCAs have distinct control and enforcement responsibilities under the Marine and Coastal Access Act 2009 but have fewer enforcement powers.

Where there is joint interest, IFCA and MMO can develop common approaches to respond to control and enforcement concerns. There are overlapping areas of interest between MMO and IFCAs such as technical conservation measures, where both undertake inspections and have the power to enforce accordingly. The IFCAs have on-shore and at-sea assets available that can be hired by the MMO for collaborative working and which contribute intelligence and data to the MMO and to the SFM database via the MCSS application. The capability of IFCA sea-going assets varies by region, with the majority of vessel assets limited to inshore waters. Fishery patrol capability outside of 6nm is restricted to specific IFCAs, e.g. Saint Piran operated by Cornwall IFCA.

Driven by the MMO, the IFCAs input to the National Intelligence Model resulting in regular intelligence sharing meetings where various agencies identify and prioritise risks to aid tasking.

Royal Navy (RN) – MMO has a service agreement with the RN to provide a number of fishery patrol days each year to undertake inspections and surveillance of fishing vessels within English waters of the UK EEZ. RN fishery patrol vessels embark MMO Seariders (who are able to train other seagoing officers) to undertake boardings at sea and MMO provide training to RN personnel to become warranted to carry out fishery inspections to MMO standards. This means that boardings and inspections of fishing vessels for control and enforcement purposes can be carried out independently of MMO personnel. Until recently, MMO trained their own officers aboard RN vessels, but this arrangement was superseded by training aboard the MMO chartered FPVs.

Border Force (BF) – The UK BF has maritime assets that can support fisheries patrols and there is the potential for joint-tasking opportunities. In practise, tasking of BF assets to non-fishery patrol priorities is limited due to other higher national maritime security requirements.

Joint Maritime Security Centre (JMSC). The newly formed JMSC combines the **Joint Maritime Operations Coordination Centre (JMOCC) and National Maritime Information Centre (NMIC).** JMOCC gathers streams of information from various agencies, including the MCA, BF, RN, security services, and the MMO. Information is held at the JMOCC above and beyond that held on the MCSS. The result is fused intelligence from different sources and coordination support to operations. MMO contributes to and has access to JMOCC intelligence that can be acted on for fisheries control and enforcement. MMO staff sit as part of JMOCC and an increased presence is anticipated as a result of the Increased budget. NMIC provides intelligence collation, cooperation and coordination. In 2019, the UK government created the Joint Maritime Security Centre (JMSC) to coordinate all the different agencies involved in UK maritime security and foster interaction between them.

Other EU Member States and third countries – VMS data from non-UK vessels operating in UK waters is received from EU Member State or third country' fisheries monitoring centres (FMC). Joint-working arrangements also exist. These include joint deployment plans (JDPs) and control reg art 80/81 operations as well as Common Control Programmes (CCP).

Informal sources of information – MMO follows the national intelligence model. Intelligence is passed *ad hoc* to MMO by the fishing industry via MEOs or via at-sea surveillance platforms that can be sent for verification and analysis.

A1.3 Functional aspects of control and enforcement

A1.3.1 Surveillance

Surveillance data stems from remote data (VMS/AIS), from observations aboard air and at-sea platforms, boardings and inspections of fishing vessels, premises and vehicles, and from records submitted by the fishing industry (vessels and merchants).

Since 2013, fishing vessels of all flags fishing in UK waters over 12 metres in length are required to transmit positional and directional data every 2-hours via VMS. AIS transmissions are required under the International Convention for the Safety of Life at Sea (SOLAS) to be emitted by all vessels, including fishing vessels, of ≥300GT. In addition, in UK waters, fishing vessels ≥15m in length (whether <300GT or not) are required to emit AIS transmission. For EU fishing vessels ≥15 metres in length, AIS data is accessed by MMO via AIS applications such as Marine Traffic or via the EU system run by the European Maritime Safety Agency (EMSA), which provides real-time positional and directional data.

Prior to the increased budget coming online the majority of surveillance at sea and boardings/inspections were carried out by RN vessels, with some fishery patrol capabilities stemming from cooperation with IFCAs, Border Force, Environment Agency, and Police. Aerial surveillance was previously sourced from aircraft directly chartered by MMO and is now provided under an MoU with the MCA. Currently the majority of fishery patrol and inspection effort is associated with commercial vessels chartered by MMO to provide at-sea control and enforcement platforms, MV Ocean Osprey and Ocean Dee.

The MMO can request access to electronic records of fishing activity (including logbook, landings declarations and sales) by EU fishing vessels fishing in, landing or selling into the UK or in UK waters. Paper logbooks can be accessed by MMO for those vessels inspected in UK waters or landing into a UK port. In addition, for UK-flagged vessels, vessels over 10 metres in length are required by law to submit paper (10-12m) or electronic (>12m) records of fishing activity. Prior notifications, logbook returns, etc. are available for analysis. For the 10 metre and under fleet, sales notes are submitted under the Registration of Buyers and Sellers legislation that stipulates buyers must submit sales notes that include reference to the vessel from which catch has been purchased.

Records of surveillance activities are uploaded to the SFM database via the MCSS front-end application. The MCSS database is hosted by Cefas in the SFM SQL database. MMO has full access to the MCSS database. It is unclear what level of access to information is available to non-MMO agencies (IFCA, RN and BF) to support timely tasking/intelligence sharing. IFCAs have access to MCSS, but some prosecution data is restricted (however not all IFCAs chose to use the system). RN, NMIC and JMOCC and BF have full access.

A1.3.2 Intelligence and tasking

Intelligence tasking, the direction of control assets to respond to intelligence leads, is based on information received from external (e.g. from IFCAs, or the fishing industry) or internal sources (e.g. MEOs). The MMO intelligence team grade the accuracy of the information and can conduct cross-checks with other data sources (e.g. VMS, logbook returns, prior notifications) to enhance accuracy. Once verified, an intelligence report is entered into a database by MMO intelligence officers (including uncorroborated information, which will be marked as such) and circulated to relevant MMO teams and to other enforcement agencies (e.g. IFCAs, Police).

Depending on the severity of the risk identified, a single report may be acted upon, or action may be deemed necessary when reports accumulate. When the intelligence reports flag a

compliance issue, the subject will be raised at a monthly Tasking and Coordination Group meeting. Actions thereafter determine whether there is a need to develop the report further, carry out an inspection or undertake an enforcement action based on an enforcement plan. The Tasking and Coordination Group can determine where to direct resources (people and surveillance platforms) to respond to areas of predicted or known high-risk.

A1.3.3 Investigations and enforcement

When an infringement is detected MEOs must demonstrate 'points to prove' in terms of information and evidence which must be gathered to ensure that a successful case can then be built. The building of a case file was previously completed by MEOs themselves in the regional offices but has now moved to a more centralised process. Evidence and cases are now handed over to a member of the Investigations Team with the intention of increasing consistency and efficiency of investigations. Depending on the nature of the case, a decision is made about the appropriate enforcement action to apply, from education through to raising a Prosecution of Fishing Vessel file[119] (PFV).

A1.3.4 Communication and outreach

A component of MMO's control and enforcement approach is communicating with internal assets and with the fishing industry to provide updates on regulatory changes. Internally this involves communicating rule changes to MEOs and other MMO personnel, including guidance on interpreting changes. Rule changes may stem from revisions to technical conservation measures (e.g. gear changes) to area closures, and to changes in reporting or monitoring requirements (e.g. introduction of inshore VMS). External outreach with the fishing industry is also important to communicate rule changes to encourage voluntary compliance with fishing rules and regulations.

A1.3.5 Statistics and analysis

Control and enforcement activities undertaken by MMO and external agencies results in a wealth of data that is held on databases and which is available for cross-checks and data mining to support intelligence gathering and investigations. MMO has a Statistics and Analysis Team that conduct analyses.

[119] Although this also includes investigation files for non-fishing sector e.g. merchants.

Annex 2 Evaluation research methods

A2.1 Fisher survey

A2.1.1 Survey design

The purpose of the survey was to provide evidence from the fishing fleet active in English waters on:

- Compliance levels
- Drivers of compliance
- Changes between 2018 and 2019
- The survey focussed on collected responses from fishing vessel owners and/or masters (i.e. not crew)

A2.1.1.1 Compliance levels

Collecting information on compliance required is a sensitive issue. Consideration was therefore given to the most appropriate techniques to gain reliable responses from respondents. Three main methods were considered: the randomised responses technique, the item count approach and ballot box approach. The ballot box approach was adopted as the most viable. Respondents are anonymised by allowing them to respond to the survey questions on a secret ballot and submitting this to a sealed, physical ballot box. The advantages included the simplicity to facilitate (time to administer and ease of understanding for the respondent – which was considered crucial to achieving survey participation), and the lower sample sizes required compared to the other methods. The structure of the survey first engaged the respondent with less contentious questions before moving gradually towards asking the most sensitive questions about individual non-compliance.

Participants were asked to rate their own compliance over the last year generally and then against four different categories of regulations (see Box A2.1). The last year was chosen as the period for participants to consider as it allowed for seasonal differences and avoids asking about too short a period, which may result in artificially high or low compliance levels. As the survey was conducted in January and early February it was also cognitively simple for respondents.

Respondents were asked to rate their compliance using a scale of 0-10, with 0 being ‘not at all compliant’ and 10 being ‘fully compliant’. It infers judgements on frequency and severity of non-compliance but did not explicitly ask about these. There is a degree of subjectivity in the interpretation of the 0-10 scale, but it is a widely recognised and understood scale.

Compliance with specific regulations was not asked, neither were questions explicitly asking about frequency of non-compliance (e.g. number of times non-compliant in a fishing trip, or % of fishing trips non-compliant) or the severity of non-compliance (minor infringements vs major infringements). There were a number of reasons for this, which apply to both specificity of regulation and scale:

- Increased specificity makes responses more incriminating. This was expected to increase the likelihood of dishonest responses and non-responses. In testing earlier versions of the questionnaire with fisher liaison officers, feedback indicated that there would be a risk of a wider boycott of the survey if fishers felt they were being asked overly sensitive questions.
- Increased specificity would have reduced the scope of fishers for which each question is relevant, meaning that more questions would need to be asked and smaller samples

achieved. For example, a longer list of specific regulations or infringements would have been required.
- Increased specificity would make the question response options more complicated, increasing the likelihood of non-response and the overall length of the survey e.g. multiple questions on frequency and severity would need to be available to ensure they were appropriate for all types of regulations and fishing segments.
- Including only specific regulations that are the MMO's priorities may imply that they are the regulations with the most severe compliance issues, and hence would not give a balanced view of 'compliance' as a whole.

Box A2.1 Definitions of the four regulatory categories for which compliance questions were asked in the Fisher Survey

- **Access restrictions**: where regulations prevent access to specific areas either seasonally or permanently, or where some gear types / certain activities are prohibited or restricted in particular areas either seasonally or permanently, e.g. spawning area / period closures, marine protected areas.
- **Technical conservation regulations**: regulations designed to protect and conserve sensitive/protected species or lifecycle stages, e.g. permitted gear specifications such as mesh size, mesh / escape panels. Regulations that prevent retaining prohibited species.
- **Catch reporting and control requirements**: requirements that specify what catch must be recorded and reported to regulators and how, requirements that specify vessels transmitted positional information, submission of sales notes. Includes the Landing Obligation.
- **Licence conditions**: conditions attached to a vessel licence that if not complied with could result in enforcement actions and that are not covered in the categories above. For example, exceeding declared engine power or other vessel characteristic, exceeding quota and effort limits, fishing without the appropriate entitlement/permit (shellfish/beam trawl, deep sea species, etc).

A2.1.1.2 Drivers of compliance

Likert questions were designed to reflect a broad range of potential drivers. The drivers were identified based on a targeted review of literature and learning from the MMO's 2019 Baseline Survey with fishers.

Three types of questions were asked:

- Questions which sought respondent opinion on driver topics in a compliance neutral style e.g. *Do you agree with the following statement: regulations are fair?* This type of question covered the widest range of drivers.
- Questions which explicitly asked about the importance of drivers to respondents with regards to compliance e.g. *How important is the following to you when making decisions about complying with fisheries regulations: fairness of the regulations?*
- Questions which asked respondents the reasons why they had been non-compliant with rules and regulations in the last 12 months (if they had).

A2.1.1.3 Changes between 2018 and 2019

Two types of questions were asked in order to gather evidence on change between the baseline period (pre-2019) and increased resource period.

- Respondent opinion of change: respondents were asked directly for their opinion on whether a given issue had changed over the last year e.g. the visibility of the MMO.

- Comparison with 2019 Baseline Survey: in March 2019 the MMO undertook an online survey with England fishers, achieving a sample of 361. The Fisher Survey undertaken here mirrored a number of questions from the 2019 Baseline Survey so that change between the two periods could be considered. Confidence in the degree of change indicated by comparing the two surveys is considered to be limited due to differences in the survey designs and sample participants. For example, the Fisher Survey included a higher proportion of Over 10m fishers than the 2019 Baseline Survey. Change is presented comparing descriptive statistics only. No statistical tests were conducted.

A2.1.1.4 Open text responses

Open text responses were recorded in an Excel spreadsheet with the objective of enabling the labelling and organisation of qualitative data to identify different themes to permit thematic analysis.

The approach to analysis was as follows:

1. Content analysis. Assign labels to words or phrases the represent important and recurring themes in each response. Manual coding (i.e. not automated).
2. Inductive coding: labels not predefined; first scan of 30 responses, identify labels, add columns. Definitions for each code were scripted and recorded.
3. Scan complete list of responses, identify additional labels. Add columns.
4. Repeat scan of complete list of responses.
5. Complete frequency analysis to enable themes to be ranked by importance (as defined by frequency of occurrence).

A2.1.2 Survey implementation

A survey pilot (trial) took place in November 2019, involving the same fisheries liaison officers (FLOs) who later delivered the full survey. The questionnaire was piloted through 14 fisher interviews to ensure that the questions were appropriately worded, intelligible to respondents, and delivered the anticipated information. The survey was reviewed and refined following the pilot study.

The full survey took place during January and early February 2020, with a total of 209 questionnaires completed.

The FLOs identified survey participants initially through their network of contacts, snowballing from contacts and participants, as well as further participants recruited through random encounters at ports.

The questionnaires were completed in person at local ports. The FLOs ensured the responses were anonymous by using a coding system to re-join the main (generally completed by the FLO asking the fisher the questions and recording the answers, to help encourage answers to the open questions) and ballot box (fully anonymous section on compliance, completed by the fisher themselves unless this was not possible) sections at particular points in the time period when the surveys were returned to the evaluation team.

A2.1.3 Quality Assurance (QA) of the results

The survey responses were compiled in an Excel worksheet ready for analysis. A full QA of the data was undertaken to check for any anomalous results and whether there were any obvious contradictions in responses that might undermine our confidence in the data.

The following general amendments were made to the raw data as part of the QA:

- Blank returns:
  - Where a response was expected but was not provided, 'NULL' was inserted.
  - Where a response was not expected, 'NA' was inserted.
  - *These categories have been treated accordingly in the analysis as NULL = No response, NA = excluded from analyses.*
- Re-classification of specific 'Other' gear into main categories 'Fixed' or 'Towed':
  - Reclassified as 'Fixed': Handlines, Drift/trammel nets, Rod and line, Rod fishing, Pots
  - Reclassified as 'Towed': Ring net
- Duplicate responses where one response was requested:
  - For Questions 4 (Main ICES area(s) fished), 6 (Main target fishery), 36a, 38a, 40a and 42a (Main reason for non-compliance with regulation category) some respondents provided more than one answer.

  This information was retained (duplicated) for the purposes of the analyses e.g. where the data have been analysed by ICES area, the responses from a participant who specified two (or more) ICES areas have been applied to each area.
- For a small number of individual responses, more specific amendments were made to the raw data to ensure consistency. Those were as follows:

Survey code	Amendment and rationale
NP19	Blank for Question 37 & 38a and 39 & 40a, but 'compliant' stated in 38b and 40b. Therefore inserted '10' into Question 37 and Question 39.
NR46	Principle fishing gear was missing (Question 5). Indicated 'mixed' for Question 6 (main target fishery) and 'scallops' in Question 6 – Other, therefore can reasonably assume uses dredges. Gear type therefore added as 'Towed'.
NR57, NR59	Question 43 - selected VW/WW and FAP. Recorded as FAP given higher seriousness.

- Sense check of responses:
  - Responses to specific questions were compared to see if there were any notable contradiction issues, particularly for questions 34 (own overall compliance level) vs questions 35, 37, 39 and 41 (own compliance level for specific regulation categories).
  - Whilst there were some inconsistencies noted for specific surveys, these represented a low proportion of the overall sample and so were not considered to be of concern for the analyses.

A2.1.4 Survey sample size and stratification

A total of 209 surveys were completed, representing 7% of the 3,034 vessels listed in the 2017 MMO fisheries statistics for the English administration.

A reasonable match between the target and actual sample sizes was achieved (Table A2.1). However, the differences reflect the observed (as reported by the FLOs) fleet structure which differed from the MMO statistics, upon which the target sample sizes were based. Practical considerations of aspects such as weather and time constraints also influenced the final sample.

A higher proportion of Over 10m vessels is also important for the survey as that component of the fleet are more likely to have seen the MMO on patrol or have been inspected by them, as

opposed to the 10m and under vessels who will largely have had most contact with the IFCAs and their local byelaws.

Table A2.1 Survey stratification targets from Evaluation Design report compared to final survey stratification.

Category	Sub-group	Target sample		Achieved sample	
		Number	Proportion	Number	Proportion
Vessel size	10 metre and under	160	80%	143	68%
	Over 10 metre	40	20%	66	32%
	Total	**200**	**100%**	**209**	**100%**
Geography	North East	50	25%	48	23%
	South West	60	30%	60	29%
	East	30	15%	25	12%
	South	50	25%	64	30%
	North West	10	5%	12	6%
	Total	**200**	**100%**	**209**	**100%**
ICES Subarea/Division*	Subarea 4	N/A (target sample based on geographical area)		74	35%
	Divisions 7h,j			8	4%
	Divisions 7f,g			43	21%
	Divisions 7d,e			115	55%
	Division 7a			13	6%
	Total**			**253**	**-**
Gear	Mobile	80	40%	60	29%
	Static	120	60%	147	70%
	Other	-	-	2	1%
	Total	**200**	**100%**	**209**	**100%**

*ICES Subarea/Divisions were equated to geographic regions by: North West = Division 7a, South West = Divisions 7f,g, 7h,j and 7e (of area 7de, split by fisheries liaison officer), South = Divisions 7d,e (split from South West by fisheries liaison officer) and North East and East = Subarea 4 (split by fisheries liaison officer).

**Note the total does not equal 209 because some respondents recorded that they fish in more than one ICES area.

A2.1.5 Weighting

Weighting survey samples prior to analysis is intended to make the aggregation of results better reflect the true population. Weights were not applied to the survey data. This was because:

- The small sample results in limited statistical power. This would be reduced further through weighting.

- The baseline characteristics available for the fisher population are uncertain (given, for example, differences in active vessels compared to registered vessels as indicated in differences between Seafish economic data and MMO fisheries statistics vessel data). The weights themselves would therefore have low confidence and hence any benefit of weighting to the population may be undermined.
- The sample was non-random; hence it is theoretically inappropriate to weight the data.

A2.1.6 Statistical analyses

A2.1.6.1 Tests for differences between groups

In order to test for statistical differences (with significance set at alpha = 5%) in responses to each question by the main groups investigated (Main gear type – Fixed and towed; Vessel length group – 10m and under, Over 10m; Main ICES area(s) fished – Subarea 4, Divisions 7a, 7de, 7fg, 7hj), a Kruskal-Wallis test was applied to the majority of questions. This test determines whether there is a systematic difference among groups, however not due to a difference in location (e.g. median) but in the shape or spread of the distribution of the data. Where test results are missing this is due to there being no need for the test (e.g. differences in responses to question 28 by group) or the sample sizes being too low to justify a test (e.g. differences in distributions of responses to questions 13 and 16 between ICES areas) (see Section A3.2).

The Dunn post-hoc test, adjusted for multiple paired comparisons using the Benjamini-Hochberg (1995) procedure, was used to identify which differences between individual ICES Areas contributed to the overall p-value for Question 32 (compliance decision-making drivers).

A Kruskal-Wallis test was also applied where Fisher Survey respondents were treated as groups based on their responses (e.g. Agree vs Disagree) and differences in the distribution of responses on a continuous scale were tested for e.g. differences in compliance score ratings (scale of 0 to 10) between the group who agreed and group who disagreed that the MMO has a visible presence at sea.

Whilst there are differing opinions over the most appropriate treatments and tests of Likert data, this non-parametric test is generally considered appropriate for such analyses and has therefore been applied to these data.

For questions 13 and 16, where the responses correspond to a scale of 0 to 100, the non-parametric Wilcoxon-Mann-Whitney U test has been used to test for differences in the distribution of the responses between groups.

For other analyses, a test for a relationship between two categorical variables was undertaken e.g. does knowing the value of one variable help to predict the value of the other variable. In these cases, the responses to two questions were aggregated into two groups, such as Agree vs Disagree and Likely vs Unlikely. The independence tests applied in these cases were either a Chi-square test of independence or Fisher's exact test, where sample sizes were small.

Non-parametric tests have been applied as the data generally do not conform with the assumptions of parametric tests e.g. homogeneity of variances and normal distributions. As with all statistical analyses, caution should be applied when basing observations solely on the outcomes of these statistical tests, particularly due to the relatively low sample sizes in some cases.

A2.1.7 Regression analyses

A2.1.7.1 Overview of the analysis

The objective of the following analysis was to determine the factors that significantly affect the compliance of fishers with regard to fisheries regulations. Data for these drivers and of fisher compliance was collected using the Fisher Survey (n=209). In the analysis, two main categories of drivers were considered:

- Deterrence drivers
- Voluntary drivers

Compliance with regulations was self-reported by fishers on a scale from 0 to 10 where 10 is fully compliant, and was assessed for the following types of regulation:

- Fisheries regulations (i.e. overall regulations enforced by the MMO)
- Access restrictions
- Technical conservation measures
- Catch reporting and control requirements
- Licence conditions

Ordinary Least Squares (OLS) regression analysis was used to quantify the impact of individual drivers on fisher compliance with regulations. Five models were run to reflect the drivers of compliance, one for each of the above regulation types. A more detailed description of the methodology used in this analysis is available in Section A2.1.7.3.

A2.1.7.2 Overview of the data

Independent variables

The initial survey dataset included 209 observations, each representing a response to the survey from an individual fisher. Due to the small sample size collected by the survey, answers following a scale (i.e. strongly agree to strongly disagree, very important to not important, very easy to very difficult) were re-grouped into fewer categories reflecting the “positive”, “neutral”, and “negative” responses. For example: *strongly agree, agree, neither agree nor disagree, strongly disagree* were regrouped to become *agree, neither agree nor disagree, disagree.* These answers were then recoded using a scale from 1-3 to translate the response into a numeric form that was appropriate for the analysis, with 1 reflecting the “negative” responses and 3 reflecting the “positive” responses.

The data were recoded to three-point scales primarily to ensure consistency in interpretation across the independent variables, as well as to ensure that there was a large enough sample under each value of the independent variables. Increasing the number of values that the independent variables could take would have resulted in difficulties producing large enough samples within each answer to achieve robust results.

In order for the scale mechanism to produce sensical results in the analysis, responses reflecting answers such as “don’t know” or “not applicable” were removed from the analysis. This was conducted to ensure that the coding framework used to scale the discrete responses was not skewed. Additionally, we did not to recode “don’t know” and “not applicable” to neutral responses as neutral responses already existed as options for many of the questions in the survey. Therefore, it was not possible to assume with validity that the “don’t know” and “not applicable” options captured neutrality as opposed to not knowing the answer, for example. Overall, it was agreed that including these responses could lead to incorrect or misleading outcomes in the analysis, as these answers may not capture the same fisher characteristics as those who responded using the neutral answer.

Due to the removal of "don't know" and "not applicable" responses, the number of observations used in each individual model is less than the total survey sample of 209. A full description of the number of observations used in each model is provided in Table A2.2.

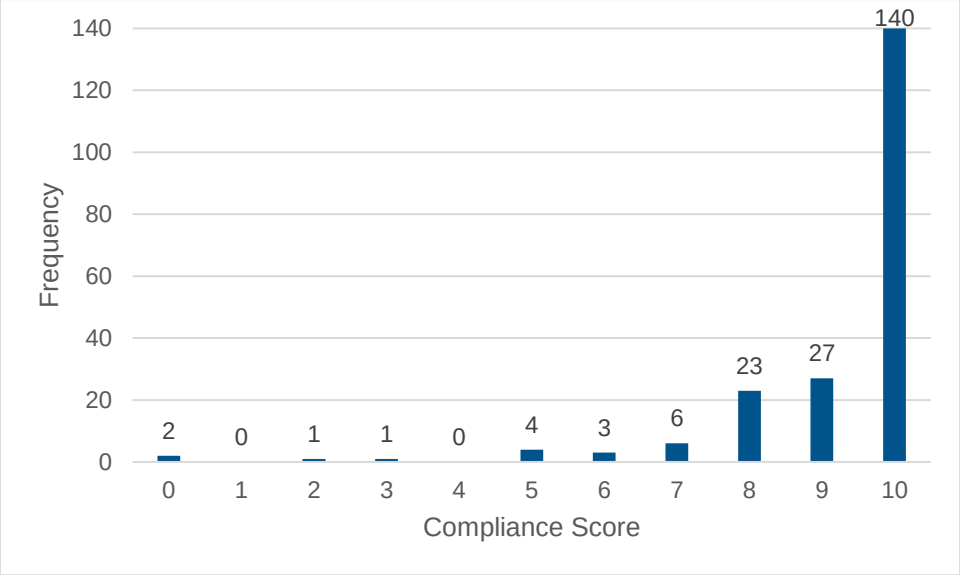
Table A2.2 Number of observations used in each regression model

Model	Number of observations used in regression analysis
Model 1: Fisheries Regulations	136
Model 2: Access Restrictions	156
Model 3: Technical Conservation Measures	152
Model 4: Catch Reporting and Control Requirements	179
Model 5: Licence Restrictions	181

Dependent variables

In order to measure the compliance of fishers with the relevant regulations in each of the five models, respondents were asked to rate their compliance on a discrete scale between 0 (not compliant at all) and 10 (fully compliant). For each of the dependent variables, the data was positively skewed with the majority of respondents recording their compliance level as 10. Figure A2.1 provides an example of this regarding compliance with fisheries regulations, where the significant majority have responded with a score of 10.

Figure A2.1 Responses to compliance with fisheries regulations (Q34)



A2.1.7.3 Methodology and approach

Definition and use of OLS estimation

The purpose of Ordinary Least Squares estimation is to determine the impact of an independent variable *X* on an outcome of interest *Y*, otherwise known as a dependent variable. Using the data provided in the survey sample, the OLS regression calculates the average impact of change in *X* on the *Y*, holding all the other variables in the model constant. These

impacts are outputted as coefficients that quantify the effect of a one unit increase in the independent variable on the outcome of interest.

In the context of fisher compliance with regulations, the aim of the regression analysis was to ascertain the impact of voluntary and deterrence drivers of compliance (independent variables) on the self-reported level of compliance with fisheries regulations (dependent variable) amongst fishers. The estimates obtained quantify how the variation in the characteristics of drivers of compliance amongst fishers translates into changes in their level of compliance with fisheries regulations.

In order for the OLS regression to produce unbiased and robust estimates, from which statistical inferences can be made, a number of assumptions need to be satisfied (detailed in Box 1). Statistical tests of these assumptions were made before conducting the analysis, and their outcomes are discussed below in the Robustness Checks section.

Box 2 OLS Assumptions[120]

Assumption 1: The model is linear in parameters

Assumption 2: The data is based on a random sample of observations

Assumption 3: None of the independent variables included in the model are constant, and there are no exact linear relationships among the independent variables

Assumption 4: The mean of the errors (or residuals) in the model is equal to zero

Assumption 5: The errors have the same variance given any values of the independent variables (homoskedasticity)

Assumption 6: The errors are independent of the explanatory variables and normally distributed

Using an iterative approach, it was decided that the OLS estimator was appropriate in determining the drivers of fisher compliance with fisheries regulations given the scope and nature of the data. Overall, OLS was the simplest and most robust method given that, even when some of the aforementioned assumptions are violated, it tends to perform well and produce estimates with lower bias than other estimators when using noisy data with a low sample size. For this primary reason, OLS was preferred to an ordered logistic model. As such, our approach was to conduct OLS first, and use an ordered logit if the results were theoretically nonsensical. Given that the results made theoretical sense, the OLS approach was used. Ordered logit and Poisson regressions were used as robustness checks, an explanation of which is available in the Robustness Checks section below.

Selection of independent variables

Correlation analysis

The independent variables used in the regression analyses were chosen using an iterative process. Firstly, a correlation analysis was conducted between the potential drivers of compliance (i.e. deterrence drivers and voluntary drivers) and the score of fisher compliance for each of the regulations. The aim of the correlation analysis was to determine which drivers of compliance were significantly[121] correlated with compliance with each of the regulations in the survey sample. The independent variables that were significantly correlated or close to

[120] Wooldridge, J.M., 2016. Introductory econometrics: A modern approach. Nelson Education.

[121] At the 95% significance level

significant[122] were included in the analysis, with one exception which is explained later in this section (Exclusion of overlapping variables). The outputs of the correlation analysis are presented in Table A2.3, where cells highlighted in blue indicate that the variable was included in the final analysis. The final form of each model was comprised of between 8-10 independent variables, the full outputs of which are presented in Section 0.

The models included some results that do not qualify for statistical significance at the 95% level, but were close to the threshold. Given the small sample size, it is expected that there is not enough variation in the model to produce statistically significant results for drivers that could actually be important in determining compliance. As such, variables that had p-values around the threshold were included as opposed to ignoring them in the analysis. To ensure this was conducted in a robust manner, correlation matrices were produced to spot check for correlations approximating +/- 0.8 to identify multicollinearity. Further tests were conducted using VIFs, with the results showing that no variables violated the multicollinearity assumption.

It was considered to only include variables with statistically significant correlations in the model, however there was concern that this could lead to omitted variable bias in the cases where only few variables were significant. This would limit the explanatory power of the model and resulting in bias in the results. It was also considered to remove the statistical significance associated with the p-values in exchange for a more agnostic approach, such as reporting z scores or confidence intervals and then allowing the reader to choose what constitutes 'significance'. However, it was decided that this created even more ambiguity surrounding which variables to use, in addition to being more complex to understand for readers with limited statistical knowledge.

The variables chosen to be included in the correlation analysis were largely similar across each model of compliance for the different fishing regulations. The drivers that were initially proposed for the model reflect those in the logic model which is underpinned by the theory of compliance.

Variables prefaced with Q27[123] and Q29[124] were only included in the correlation analysis for the model of compliance for all fisheries regulations, and the specific regulation to which the question referred.

Exclusion of overlapping variables

In the case of the model of compliance with Catch reporting and control requirements, two variables measuring the impact of "sense of moral duty" on compliance were significantly correlated. The variables in question were:

- Q26b: I feel morally bound to comply with fisheries regulations
- Q32j: How important is sense of moral duty/doing the right thing in making decisions about compliance

As these variables measure the same characteristic amongst fishers, including them both would lead to over-specification of the model and consequently make the estimates less precise[125]. In order to choose which of the two variables to include in the analysis, the model was tested by omitting one of each of the variables. The results found that by excluding Q32j and retaining Q26b, the goodness-of-fit of the model (adjusted R^2) was higher than by

[122] Variables that were close to significant at the 95% level were deemed to be those with p-values in the range of 0.10 to 0.05 (90-95% significance level). Variables with levels of significance on the lower end of this scale were selected if there were only few variables from the correlation analysis resulting in significant values at the 95% level.

[123] Q27: How aware do you feel you are of current fisheries regulations that apply to your main fishing activity? (Sub-questions stratified by area of regulation)

[124] Q29: How easy do you find it to comply with the different regulations? (Sub-questions stratified by area of regulation)

[125] Wooldridge, J.M., 2016. Introductory econometrics: A modern approach. Nelson Education.

removing Q26b and retaining Q32j. This indicates that Q26b is better at explaining moral duty characteristic amongst fishers than Q32j and is thus more suitable to use in the analysis.

Robustness checks

Heteroskedasticity

The homoskedasticity assumption detailed in Box 2 (Assumption 5) states that the variance of the unobserved errors (the difference between the predicted values and actual values of the dependent variable) are constant for all values of our independent variables. When the homoskedasticity assumption is violated, the model is determined to be heteroskedastic. This assumption is necessary to justify the use of statistical inference with the OLS estimates of the linear regression model.

In order to identify whether the homoskedasticity assumption was valid across the models, the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity was implemented. For all five models the tests rejected the null hypothesis that the variance of the errors was constant, signifying the models are heteroskedastic. In some cases, transformations to the data to account for heteroskedasticity were necessary. Therefore, a log-linear model was implemented, and the distribution of the errors observed. It was found that the transformation did not mitigate the problem, as the cone-like shape of the residuals remained unchanged.

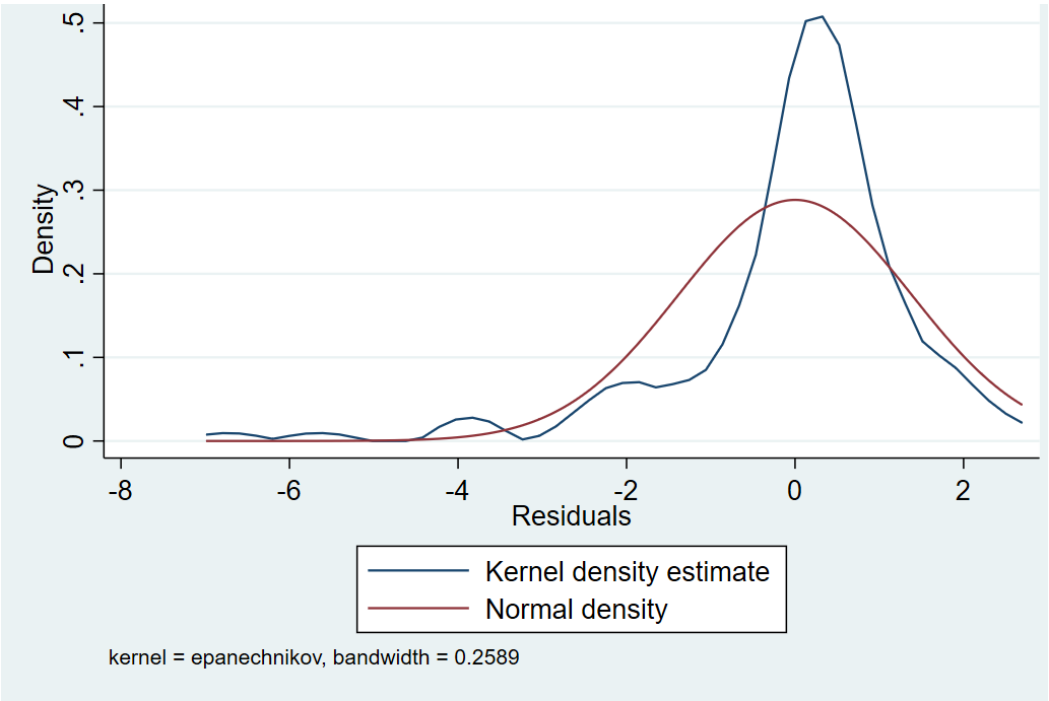
In order to correct for the heteroskedastic nature of the data, our regression analysis employed the use of robust standard errors in the OLS estimation. These standard errors adjust the confidence intervals which determine the significance of the regression results so that they are valid in the presence of heteroskedasticity.

Normality of errors

In order to test for the normality of errors (Assumption 6), the Shapiro-Wilk W test for normality was conducted. The results of this test rejected the hypothesis that the residuals were normally distributed. This result was not unexpected due to the high proportion of respondents selecting their compliance level as 10.

The residuals of the models were then plotted against a normal distribution for comparison to offer further insight into the distribution of the errors. Figure A2.2 illustrates this for the model concerning fishing regulations. This plot highlights that although the data is skewed it does approximate a normal distribution, which is often a key factor in determining the inferential properties of OLS. Similar results were obtained for the remaining four models. Poisson regressions were also run as a robustness check given that the dependent variable is bounded and positively skewed, which is a commonly used estimator when this is the case, and they produced similar results. Furthermore, it was acknowledged that the distribution of the data may better suit an alternative estimator (i.e. ordered logit) or a transformation (i.e. log-linear transformation). The distribution of the residuals was examined using a log-linear model, and the log transformation did not adjudicate the issue of the errors not being normally distributed. An ordered logit was also implemented, and the bulk of substantive results generated using OLS held in this instance (see Ordered Logit section below). Overall, this provided a suitable grounds justifying use of OLS as the chosen method of regression analysis.

Figure A2.2 Distribution of residuals for Model 1: Fisheries Regulations



Source: Survey of fishers' perspectives of fisheries regulations, compliance and enforcement (ICF calculations)

Multicollinearity checks

Multicollinearity occurs when there exists a high correlation between two or more independent variables in a given model. In order for the OLS to be able to isolate the estimated impact of each of our independent variables, it is key that they are independent from one another. This means that a change in one independent variable does not influence a change in another independent variable.

Variation inflation factor tests were conducted in order to identify the presence of multicollinearity. For each of the models, no multi-collinearity was identified, indicating that the independent variables within each of the five models were independent from one another.

Ordered Logit

It was acknowledged that the estimation of the model using an ordered logit approach was an appropriate option in the context of this analysis, and therefore we conducted robustness checks using this method. The use of the ordered logit estimator did not largely affect many substantive results across the models. An overview of the changes to the results is provided below:

- In models 3 and 4, there were no changes to the significance of variables at the 95% confidence level nor to the signs of the coefficients.
- In model 1, two variables that were not significant using OLS became significant using ordered logit (Q24b, Q32k), and one variable went from being positive to negative (Q24c) but its coefficient remained close to 0.
- In model 2, Q25a was not significant under OLS but was significant using ordered logit, whilst Q32e was significant under OLS but was not using ordered logit. Q13 was negative using OLS and positive using ordered logit, with the opposite occurring for Q32k (in both cases the magnitude of these changes was not large).
- In model 5, Q27d was significant under OLS but not ordered logit, and vice versa for Q32g.

Of all the variables that changed significance, only one variable had a non-significant p-value above 0.1 under the model where it was not significant (Q32k, p-value of 0.104). As such, there were no variables that went from being far from the threshold of significance to becoming significant (and vice versa). Overall, this exercise showed that the high-level results of the analysis continued to hold when they were modelled using ordered logit as an estimator.

Poisson regression

The analysis was also run using a Poisson regression in order to verify the robustness of the model. As the coefficients of a Poisson regression represent the difference in the logarithms[126] of expected counts that is expected to change by the respective regression coefficient following a one unit change in the predictor variable[127]. They cannot be directly compared to the coefficients outputted by the OLS models. However, across all five models the signs of the coefficients and their associated p-values estimated by the Poisson regression were similar to those estimated by OLS. This indicates that the OLS estimates is a robust analytical model to assess changes the predictor variable (in this case, levels of compliance).

A2.1.8 Correlation and regression analysis tables and outputs

A2.1.8.1 Correlation analysis outputs

The table below presents the outputs of the correlation analysis. The cells contain the correlation coefficients between each of the drivers and the level of compliance with the separate fishing regulation categories. The p-values are included in parentheses.

Cells coloured in blue were included in the regression of each of the compliance models. Cells coloured in green were not used despite being statistically significant (see. Exclusion of Overlapping Variables section).

Table A2.3 Correlation analysis outputs

Drivers	Compliance level				
	Fisheries regulations	Access requirements	Technical conservation measures	Catch reporting and control requirements	Licence conditions
Q10a: Do you agree that the MMO has a visible presence at sea?	-0.127 (0.072)	-0.130 (0.067)	-0.116 (0.103)	-0.008 (0.910)	-0.105 (0.142)
Q10b: Do you agree that the MMO has a visible presence in port?	-0.080 (0.256)	-0.002 (0.974)	0.008 (0.915)	0.058 (0.414)	0.001 (0.990)
Q12: In the last 12 months, has your vessel been inspected at sea by any fisheries regulator?	0.098 (0.161)	0.088 (0.208)	0.068 (0.335)	0.026 (0.709)	0.144* (0.040)
Q13: How likely you think it is that you will be inspected at sea on your next fishing trip by any fisheries regulator?	-0.143* (0.041)	-0.151* (0.032)	-0.086 (0.225)	-0.059 (0.409)	-0.148* (0.037)

[126] i.e. the power with which a number must increase to reach a one unit change on the compliance scale

[127] UCLA Institute for Digital Research and Education: Statistical Consulting. Poisson Regression. Accessed 11/08/2020.Available at: https://stats.idre.ucla.edu/stata/output/poisson-regression/#:~:text=We%20can%20interpret%20the%20Poisson,the%20model%20are%20held%20constant.

Drivers	Compliance level				
	Fisheries regulations	Access requirements	Technical conservation measures	Catch reporting and control requirements	Licence conditions
Q16: How likely you think it is that you will be inspected in port or ashore on your next fishing trip by any fisheries regulator?	-0.055 (0.431)	-0.039 (0.577)	-0.063 (0.373)	-0.043 (0.551)	-0.007 (0.924)
Q18: If a vessel does not comply with a fisheries regulation, what is the likelihood that fisheries regulators will detect the infringement?	-0.006 (0.938)	-0.103 (0.152)	0.027 (0.712)	0.035 (0.631)	-0.017 (0.815)
Q21a: Do you agree that if an offence is identified by the MMO, it is likely to result in a sanction	-0.141 (0.056)	-0.022 (0.771)	0.015 (0.841)	-0.071 (0.344)	-0.085 (0.253)
Q21b: Do you agree that sanctions for noncompliance are high enough to be of concern?	-0.029 (0.686)	-0.085 (0.238)	0.031 (0.670)	0.016 (0.824)	0.065 (0.372)
Q22: How do you rate your relationship with local MMO staff?	0.054 (0.465)	-0.077 (0.295)	0.117 (0.113)	0.061 (0.408)	-0.019 (0.792)
Q23b: Do you agree with the statement that “the MMO is an effective regulator of fisheries”?	-0.006 (0.937)	-0.144* (0.041)	0.075 (0.288)	0.137 (0.053)	-0.065 (0.362)
Q23c: Do you agree with the statement that “I respect decisions made by the regulators about fisheries management”?	0.064 (0.360)	-0.073 (0.296)	0.040 (0.576)	0.115 (0.103)	0.024 (0.737)
Q24a: Do you agree with the statement that “compliance with fisheries regulations is important to my buyers”?	0.086 (0.231)	0.007 (0.924)	0.074 (0.309)	0.102 (0.159)	0.079 (0.273)
Q24b: Do you agree with the statement that “fisheries regulations make it difficult for my fishing business to be profitable”?	-0.163* (0.019)	-0.081 (0.249)	-0.131 (0.062)	-0.117 (0.095)	-0.136 (0.053)
Q24c: Do you agree with the statement that “there are many cases when I could benefit financially from operating outside fishing regulations”?	0.189* (0.012)	0.120 (0.111)	0.137 (0.072)	0.051 (0.502)	0.099 (0.190)
Q25a: Do you agree with the statement that “regulations are fair”?	0.056 (0.430)	-0.178* (0.011)	0.075 (0.291)	0.091 (0.202)	-0.028 (0.691)
Q25b: Do you agree with the statement that “I have a say in how fisheries are managed”?	-0.031 (0.656)	-0.125 (0.075)	-0.099 (0.161)	-0.020 (0.780)	-0.071 (0.313)
Q25c: Do you agree with the statement that “fisheries regulations are necessary”?	0.083 (0.237)	-0.098 (0.162)	0.188** (0.007)	0.056 (0.428)	0.097 (0.167)
Q25d: Do you agree with the statement that “regulations benefit fish stocks”?	-0.020 (0.776)	-0.091 (0.194)	0.081 (0.249)	-0.012 (0.868)	-0.059 (0.405)
Q26a: Do you agree with the statement “that it is important to me that other fishers comply with regulations?	-0.040 (0.565)	-0.078 (0.267)	-0.006 (0.930)	0.212** (0.002)	0.125 (0.075)

Drivers	Compliance level				
	Fisheries regulations	Access requirements	Technical conservation measures	Catch reporting and control requirements	Licence conditions
Q26b: Do you agree with the statement "I feel morally bound to comply with fisheries regulations"?	0.184** (0.008)	-0.042 (0.549)	0.134 (0.057)	0.217** (0.002)	0.086 (0.222)
Q26c: Do you agree with the statement "other fishers would disapprove if I was not compliant with regulations"?	0.196** (0.005)	0.083 (0.237)	0.226** (0.001)	0.306*** (<0.001)	0.184** (0.009)
Q26d: Do you agree that it is important to you to observe any local fishing restrictions agreed by the fishing community?	-0.036 (0.610)	0.019 (0.784)	0.069 (0.337)	0.132 (0.063)	0.110 (0.125)
Q26e: Do you agree with the statement: "If other fishers are aware of a vessel not complying with fisheries regulations, they will report it to the MMO or IFCA"?	0.086 (0.226)	-0.072 (0.311)	0.137 (0.055)	0.045 (0.532)	-0.001 (0.984)
Q27a: How aware do you feel you are of Access Restrictions?	0.011 (0.884)	0.030 (0.675)	-	-	-
Q27b: How aware do you feel you are of Technical Conservation Measures?	0.028 (0.692)	-	0.159* (0.025)	-	-
Q27c: How aware do you feel you are of Catch Reporting and Control Requirements?	0.013 (0.852)	-	-	0.341*** (<0.001)	
Q27d: How aware do you feel you are of Licence Conditions?	-0.023 (0.743)	-	-	-	0.125 (0.077)
Q29a: How easy do you find it to comply with Access Restrictions?	0.209** (0.004)	0.126 (0.085)	-	-	-
Q29b: How easy do you find it to comply with Technical Conservation Measures?	0.083 (0.244)	-	0.183** (0.010)	-	-
Q29c: How easy do you find it to comply with Catch Reporting and Control Requirements?	0.064 (0.365)	-	-	0.284*** (<0.001)	-
Q29d: How easy do you find it to comply with Licence Conditions?	0.044 (0.538)	-	-	-	0.120 (0.092)
Q32a: How important to you is your awareness and understanding of the regulations when making decisions about complying with fisheries regulations?	0.169* (0.017)	0.040 (0.579)	0.132 (0.064)	0.049 (0.497)	0.109 (0.128)
Q32b: How important to you is the ease and difficulty of complying with regulations when making decisions about complying with fisheries regulations?	0.007 (0.926)	0.115 (0.105)	-0.067 (0.349)	0.114 (0.112)	0.117 (0.099)
Q32c: How important to you is the fairness of the regulations when making decisions about complying with fisheries regulations?	0.008 (0.908)	0.088 (0.216)	-0.067 (0.346)	0.006 (0.930)	-0.055 (0.443)
Q32d: How important to you is agreeing with the purpose or legitimacy of the regulation when	-0.024 (0.739)	0.044 (0.533)	-0.097 (0.173)	0.071 (0.321)	-0.005 (0.949)

Drivers	Compliance level				
	Fisheries regulations	Access requirements	Technical conservation measures	Catch reporting and control requirements	Licence conditions
making decisions about complying with fisheries regulations?					
Q32e: How important to you is the opportunity to save costs or improve catch value when making decisions about complying with fisheries regulations?	-0.077 (0.309)	-0.190* (0.012)	-0.124 (0.103)	-0.106 (0.166)	-0.050 (0.514)
Q32f: How important to you is complying with the requirements of buyers when making decisions about complying with fisheries regulations?	-0.013 (0.854)	-0.084 (0.246)	-0.126 (0.083)	-0.029 (0.694)	-0.061 (0.404)
Q32g: How important to you is the likelihood that other fishers comply with/beak the regulation when making decisions about complying with fisheries regulations?	-0.055 (0.445)	-0.129 (0.072)	-0.077 (0.286)	-0.115 (0.114)	-0.150* (0.038)
Q32h: How important to you is the likelihood of being inspected or detected when making decisions about complying with fisheries regulations?	0.010 (0.888)	0.039 (0.585)	-0.049 (0.498)	0.163* (0.023)	0.025 (0.729)
Q32i: How important to are the severity of sanctions that may be imposed for any infringement when making decisions about complying with fisheries regulations?	-0.024 (0.742)	-0.005 (0.948)	0.016 (0.823)	0.137 (0.058)	0.074 (0.302)
Q32j: How important to you is the sense of moral duty/doing the right thing when making decisions about complying with fisheries regulations?	0.014 (0.844)	0.069 (0.332)	0.033 (0.644)	0.154* (0.031)	0.054 (0.449)
Q32k: How important to you your reputation as a fisher when making decisions about complying with fisheries regulations?	0.141* (0.045)	0.201** (0.004)	0.094 (0.183)	0.173* (0.015)	0.243*** (0.001)

* p < 0.05, ** p <0.01

A2.1.8.2 Outputs of OLS modelling

The table below presents the outputs of the regression analyses. The cells contain the regression coefficients representing the impact of each of the drivers and the level of compliance with the separate fishing regulations. The p-values are included in parentheses.

The models explain a relatively low level of the variation of the variance in the data. This can be attributed to the small sample size, the noisy nature of the data provided by the survey, and the lack of variation within the three-point scale used to construct the responses for the independent variables. It could also be the case that the choice of independent variables considered in the modelling process, which were drawn from the literature on compliance drivers did not sufficiently reflect the main drivers of fisher compliance in the sample, and that the variation in compliance could have been linked to explanatory variables not included in the model (latent variables). The tables also report the adjusted R-squared in order to account for the number of explanatory variables used in the models. To supplement this, the RMSE values

of the models were also analysed. These ranged from 1.3 (model 5) to 2.3 (model 4), which are reasonable values considering the sample size and skewed nature of the data.

Model 1: Fisheries regulations

Table A2.4 OLS Outputs (Model 1)

Drivers of compliance	Regression coefficient
Q13: What is the likelihood that you will be inspected at sea on your next fishing trip by any fisheries regulator?	<0.001 (0.773)
Q21a: Do you agree that if an offence is identified by the MMO, it is likely to result in a sanction?	-0.113 (0.325)
Q24b: Do you agree with the statement “fisheries regulations make it difficult for my fishing business to be profitable”?	-0.203 (0.081)
Q24c: Do you agree with the statement “there are many cases when I could benefit financially from operating outside fishing regulations”?	0.075 (0.581)
Q26b: Do you agree with the statement “I feel morally bound to comply with fisheries regulations”?	0.315 (0.293)
Q26c: Do you agree with the statement “other fishers would disapprove if I was not compliant with regulations”?	0.400 (0.154)
Q29a: How easy do you find it to comply with access restrictions?	0.350* (0.025)
Q32a: How important is your awareness and understanding of the regulations in making decisions about complying with fisheries regulations?	0.265 (0.519)
Q32k: How important is your reputation as a fisher in making decisions about complying with fisheries regulations?	0.581 (0.104)
constant	4.822* (0.032)
N	136
R squared	0.248
Adjusted R squared	0.194
RSME	1.43

* p < 0.05, ** p <0.01

Model 2: Access restrictions

Table A2.5 OLS Outputs (Model 2)

Drivers of compliance	Regression coefficient
Q10a: Do you agree that the MMO has a visible presence at sea?	-0.137 (0.240)
Q13: What is the likelihood that you will be inspected at sea on your next fishing trip by any fisheries regulator?	-0.00228 (0.695)
Q23b: Do you agree that the MMO is an effective regulator of fisheries?	-0.159 (0.094)
Q25a: Do you agree that fisheries regulations are fair?	-0.271 (0.057)
Q25b: Do you agree with the statement “I have a say in how fisheries are managed”?	-0.250 (0.247)

Drivers of compliance	Regression coefficient
Q32e. How important is the opportunity to save costs or improve catch value in making decisions about complying with fisheries regulations?	-0.352** (0.004)
Q32g. How important is likelihood that other fishers comply with/break the regulation in making decisions about complying with fisheries regulations?	-0.0727 (0.469)
Q32k: How important is your reputation as a fisher in making decisions about complying with fisheries regulations?	0.144 (0.668)
constant	11.590*** (<0.001)
N	156
R squared	0.138
Adjusted R squared	0.091
RSME	1.47

* p < 0.05, ** p <0.01

Model 3: Technical conservation measures

Table A2.6 OLS Outputs (Model 3)

Drivers of compliance	Regression coefficient
Q24b: Do you agree with the statement “compliance with fisheries regulations is important to my buyers”?	-0.153 (0.238)
Q24c: Do you agree with the statement “there are many cases when I could benefit financially from operating outside fishing regulations”?	0.0753 (0.712)
Q25c: Do you agree that fisheries regulations are necessary?	0.219 (0.607)
Q26b: Do you agree with the statement “I feel morally bound to comply with fisheries regulations”?	0.279 (0.384)
Q26c: Do you agree with the statement “other fishers would disapprove if I was not compliant with regulations”?	0.423 (0.176)
Q26e: Do you agree with the statement “If other fishers are aware of a vessel not complying with fisheries regulations, they will report it to the MMO or IFCA”?	0.002 (0.986)
Q27b: How aware are you of technical conservation measures?	0.284 (0.502)
Q29b: How easy do you find it to comply with Technical Conservation Measures?	0.180 (0.295)
Q32a: How important is your awareness and understanding of the regulations in making decisions about complying with fisheries regulations?	0.595 (0.165)
Q32f: How important is complying with the requirements of buyers in making decisions about complying with fisheries regulations?	-0.307* (0.014)
constant	4.866 (0.051)
N	175
R squared	0.149
Adjusted R squared	0.102
RSME	1.64

* p < 0.05, ** p <0.01

Model 4: Catch reporting and control requirements

Table A2.7 OLS Outputs (Model 4)

Drivers of compliance	Regression coefficient
Q23b: Do you agree that the MMO is an effective regulator of fisheries?	0.0722 (0.759)
Q26a: Do you agree with the statement “It is important to me that other fishers comply with regulations”?	-0.163 (0.804)
Q26b: Do you agree with the statement “I feel morally bound to comply with fisheries regulations”?	0.450 (0.276)
Q26c: Do you agree with the statement “other fishers would disapprove if I was not compliant with regulations”?	0.766* (0.036)
Q27c: How aware are you of catch reporting and control requirements?	1.296* (0.040)
Q29c: How easy do you find it to comply with Catch Reporting and Control Requirements?	0.524* (0.015)
Q32h: How important is the likelihood that other fishers comply with/break regulations in making decisions about complying with fisheries regulations?	0.314 (0.337)
Q32i: How important is the severity of sanctions that may be imposed for any infringement in making decisions about complying with fisheries regulations?	0.308 (0.347)
Q32k: How important is your reputation as a fisher in making decisions about complying with fisheries regulations?	0.314 (0.564)
constant	-1.676 (0.443)
N	180
R squared	0.250
Adjusted R squared	0.210
RSME	2.30

* p < 0.05, ** p <0.01

Model 5: Licence conditions

Table A2.8 OLS Outputs (Model 5)

Drivers of compliance	Regression coefficient
Q12: In the last 12 months, has your vessel been inspected at sea by any fisheries regulator?	0.126 (0.564)
Q13: What is the likelihood that you will be inspected at sea on your next fishing trip by any fisheries regulator?	-0.002 (0.685)
Q24b: Do you agree with the statement “compliance with fisheries regulations is important to my buyers”?	-0.068 (0.430)
Q26c: Do you agree with the statement “other fishers would disapprove if I was not compliant with regulations”?	0.380 (0.155)
Q27d: How aware are you of licence conditions?	0.421 (0.059)

Drivers of compliance	Regression coefficient
Q32b: How important is ease/difficulty of complying with regulations in making decisions about complying with fisheries regulations?	0.124 (0.449)
Q32g: How important is the likelihood that other fishers comply with/break the regulation in making decisions about complying with fisheries regulations?	0.286* (0.049)
Q32k: How important is your reputation as a fisher in making decisions about complying with fisheries regulations?	0.270 (0.306)
constant	7.070*** (<0.001)
N	181
R squared	0.108
Adjusted R squared	0.067
RSME	1.27

* p < 0.05, ** p <0.01

A2.1.8.3 Differences in decision drivers between compliant and non-compliant fishers

Following the regression analysis, a separate descriptive analysis was conducted in order to determine the existence of any differences amongst the characteristics of more compliant and least compliant fishers. The additional t-test analysis was conducted to look at whether there were significant differences between a more and a least compliant fisher group, considers only their decision drivers i.e. the drivers that fishers stated as being of importance to their compliance (those included in Q32 of the survey). This was conducted in addition to the regression models and to the analysis of stated reasons for actual offences, to provide an additional evidence strand.

In order to stratify the sample of fishers into “more compliant” and “least compliant” fishers, a threshold of 7 and above was used. Those with a self-reported score of 7 or above were more compliant, whilst those with a score below 7 were the least compliant. The threshold of 7 was used as it enabled us to create two groups of reasonable sizes whilst still providing a basis upon which to differentiate fishers based on their compliance. It was selected so that those with the lowest self-reported compliance could be examined against those with more moderate and higher compliance. The least compliant group especially are of particular policy interest. If the threshold for the more compliant group was lowered, the sample for the least compliant group would have been too small, whereas if it had raised the threshold the of the least compliant group would have been diluted with fishers who tended towards more moderate and higher levels of compliance. Ultimately, the threshold of 7 was an arbitrary choice which was judged to provide the most appropriate balance in ensuring there was a large enough sample size whilst maintaining a distinction in compliance levels between the groups.

Furthermore, it is a legitimate possibility that fishers could be compliant with one regulation and not another (i.e. a fisher could comply with Access restrictions but not Catch reporting and control requirements); and that different drivers may influence their compliance in each case. Therefore, it is important to distinguish whether fishers are compliant within the context of the specific regulations rather than only labelling them as a “more compliant” or “less compliant” vessel overall. Breakdowns of each group are available in Table A2.9.

T-tests were then conducted to identify any potential differences in the means for the drivers between the compliant and the non-compliant group. Only three decision drivers reported a

significant difference in means between the more compliant and least compliant groups. The coefficients obtained from the t-test are described in Table A2.10.

Box 3 Interpreting the difference in means

The values for the difference in means presented in Table A3.11 represent the **difference in the average value of a driver of compliance** for the non-compliant group and the compliant group.

The calculations use the non-compliant group as a base. Therefore, a positive (+ve) value indicates that the non-compliant group have a higher average for a given characteristic than the compliant group. A negative (-ve) value indicates that the non-compliant group have a lower average for a given characteristic than the compliant group.

Table A2.9 Number of fishers in the more compliant and least compliant groups

	More compliant fishers		Least compliant fishers	
	Number	%	Number	%
Model 1: Fisheries regulations	198	94.7	11	5.3
Model 2: Access restrictions	197	94.3	12	5.7
Model 3: Technical conservation measures	193	92.3	16	7.7
Model 4: Catch reporting and control requirements	174	83.3	35	16.7
Model 5: Licence conditions	196	93.8	13	6.2

The coefficients below represent the difference in the averages of each of the decision drivers for the more compliant and least compliant group for each of the models. The p-values are indicated in parentheses.

Table A2.10 Results of t-tests conducted on decision drivers between compliant and non-compliant fishers

Drivers of compliance	Model 1	Model 2	Model 3	Model 4	Model 5
Q32a: Awareness and understanding of the regulations	-0.218 (0.054)	-0.098 (0.368)	-0.100 (0.293)	0.0480 (0.468)	-0.098 (0.368)
Q32b: Ease/difficulty of complying with regulations	-0.186 (0.327)	-0.227 (0.212)	0.062 (0.698)	-0.121 (0.291)	-0.181 (0.303)
Q32c: Fairness of the regulation	0.062 (0.798)	-0.203 (0.360)	0.028 (0.891)	-0.084 (0.543)	0.186 (0.384)
Q32d: Agreeing with the purpose or legitimacy of the regulation	0.0564 (0.836)	-0.120 (0.615)	0.237 (0.285)	-0.194 (0.196)	-0.052 (0.821)
Q32e: Opportunity to save costs or improve catch value	0.0629 (0.814)	0.593* (0.025)	0.142 (0.534)	0.287 (0.076)	0.112 (0.662)
Q32f: Complying with the requirements of buyers	0.021 (0.934)	0.214 (0.401)	0.350 (0.112)	0.097 (0.536)	0.310 (0.223)
Q32g: Likelihood that other fishers comply with/break regulation	0.042 (0.872)	0.326 (0.168)	0.187 (0.381)	0.149 (0.325)	0.326 (0.168)
Q32h: Likelihood of being inspected or having an infringement detected	-0.168 (0.464)	-0.152 (0.470)	0.0432 (0.820)	-0.214 (0.108)	-0.152 (0.470)

Drivers of compliance	Model 1	Model 2	Model 3	Model 4	Model 5
Q32i: Severity of sanctions that may be imposed for any infringement	-0.135 (0.531)	-0.0477 (0.809)	-0.103 (0.565)	-0.261* (0.036)	-0.314 (0.111)
Q32j: Sense of moral duty/doing the right thing	-0.103 (0.548)	-0.072 (0.664)	0.017 (0.904)	-0.153 (0.146)	-0.072 (0.664)
Q32k: Your reputation as a fisher	-0.355* (0.029)	-0.397* (0.011)	-0.179 (0.190)	-0.172 (0.081)	-0.485** (0.002)
N: total	206	206	206	206	206

* p < 0.05, ** p <0.01

A2.2 Sanctioned fisher interviews

A2.2.1 Fisher recruitment

A mixed recruitment approach was adopted due to the challenges of identifying and contacting sanctioned fishers. The approach consisted of:

- Fisher Survey follow-on: a face-to-face survey was conducted with fishers as part of the evaluation. At the end of the survey, fishers were asked whether they would be willing to participate in a further interview about their experiences of being sanctioned.
- Team networks: interview candidates were identified through the research team's own networks and approached for interview.
- MMO communication: the MMO distributed an email invitation to participate in sanctioned fisher interviews to a random subsample of 500 fishers drawn from the MMO's fisher database
- MMO engagement: Fishers were approached directly by local Marine Enforcement Officers
- Snowballing: interviewed fishers were asked to pass on the interview invitation to, and directly suggest, fishers who may be willing to participate.

Across the above options just under half of the interviewees were engaged through the MMO actions (nine responding to the MMO email communication and one recruited by an MEO), another eight were recruited by the research team through survey follow-ons and existing contacts. The remaining three were identified through snowballing.

Challenges in recruiting fishers for interview meant that there was limited control on interviewee characteristics, such as, location, gear type used, severity of the offence and motivations for committing the offence. The self-selection bias and small sample size means the sample may not be representative of the sanctioned fisher population. Coupled with the small sample size (21 interviewees), this inhibits generalisation from the interview findings.

A2.2.2 Interview programme implementation

Interviews were semi-structured in nature, following a detailed topic guide with headline questions and a series of prompts agreed in advance with the MMO.

A total of 21 interviews were carried out between 31st January 2020 and 28th February 2020. Interviewees were asked their preference for the interview to be conducted over the phone or face to face. Eleven interviews were held face to face and ten conducted over the phone. Interviews lasted between 30 min and nearly two hours, with the majority completed in just under an hour. Where interviewees provided their consent, interviews were recorded.

Interviewees participated on an anonymous basis, and the results presented in this document are reported in aggregate.

A **limitation** of the interview programme is the potential introduction of social desirability bias. This stems from the nature of the interview topic e.g. asking questions about why an offence was committed and whether it has been committed again. Design characteristics built to limit the effect of social desirability bias included: stressing the independence of the researchers from the MMO; stressing that the interview was not about intelligence gathering for the MMO; stressing the confidential nature of their names and responses, that no detailed information would be directly passed to the MMO and that the interview report would use generalised and aggregated information from across interviewees; conducting interviews in a location of the interviewee's choice (e.g. their home, or anonymously by phone).

A2.2.3 Respondent characteristics

Geographical area: The majority of interviewees were located in the South, South West and South East of England with fewer located in the North.

Type of sanction: Ten interviewees received a less severe sanction (verbal or written warning) with an additional ten receiving a more severe sanction (fixed administrative penalty, points/suspensions of licence and court prosecution). One interviewee was waiting to hear back from the MMO on their sanction; but expected that to be a less severe sanction.

Gear type: The majority of the interviewees (13) used static gear, seven used mobile gear and one used a combination of both.

Table A2.11 Respondent characteristics

#	Type of sanction	Gear Type	Region
1	Less Severe	Static	South / South West
2	Less Severe	Static	South / South West
3	Less Severe	Static	South West
4	Less Severe	Static	South West
5	Less Severe	Static	South
6	Less Severe	Static	South East
7	Less Severe	Static	North East
8	Less Severe	Static	North East
9	Less Severe	Mobile	South East
10	Less Severe	Mobile	South East
11	More Severe	Mobile	East
12	More Severe	Static	South / South West
13	More Severe	Mobile	South West
14	More Severe	Mobile	South West
15	More Severe	Mobile	South West
16	More Severe	Static	South West
17	More Severe	Static	South
18	More Severe	Static	South East
19	More Severe	Static and Mobile	South East
20	More Severe	Mobile	East
21	More Severe	Static	East

A2.3 MMO and other agency interviews

The interview sample included MMO marine enforcement officers, area managers, and individuals from relevant organisations who work in partnership with the MMO (e.g. IFCAs, Defra and devolved administration authorities (DAs)). The total sample was 25, 18 of which were MMO staff. Interviews were conducted by telephone during February and March 2020.

Interview questions covered the following topics:

- What has been secured and delivered through the increased budget.
- Activities of local staff and centrally controlled assets deployed and how this differs from the baseline.
- Views on whether the new resources have achieved the stated operational outcomes and perceptions on what has worked well and less well.
- Role of the increased budget in alleviating challenges/barriers to delivering control and enforcement (e.g. human resources, regulatory changes, relationships with fishers).
- Perceived relationship between control and enforcement and fisher behaviour (i.e. factors influencing fisher compliance).
- Views on the effect of the increased budget on compliance drivers.

Whist the total sample size was small, a representative sample of interviewees were engaged spanning different roles and experience at the MMO as well as other relevant organisations.

Table A2.12 Distribution of interviewees by role

Role	Number of interviewees
MMO Functional Manager	5
MMO MEOs (>1-year experience)	7
MMO New MEOs (<1-year experience)	3
Other officers / MMO staff	3
IFCAs	3
Defra EU Exit & fisheries policy	1
Devolved administrations (Wales, Scotland, Northern Ireland)	3

A2.4 Secondary data analysis

A2.4.1 Sources of data

Dataset name	Description
Inrep (inspections report, at sea)	Contains records associated with boarding and inspecting a vessel at sea. Circumstances may dictate that a full inspection cannot be conducted (e.g. in poor weather conditions). Providing the vessel has been boarded and a full or partial inspection has been carried out, this should be recorded as a boarding at sea within the Inrep dataset.

Portsum (port summary, shore-side / ashore)	Subset: Boarding – contains records associated with boarding and inspecting a vessel which is tied up alongside in port. Circumstances may dictate that full inspection may not be necessary. Providing the vessel has been boarded and a full or partial inspection has been carried out, this should be recorded as fishing vessels boarding in port.
	Subset: Market/premises (aka landed catch assessment)[128] – contains records associated with an inspection of fish landed on a market or other premises where the catch has been placed.
	Subset: Vehicle/transport – contains records associated with an inspection of a vehicle used to transport fish.
Patrol area searched	Contains information relating to the spatial coverage of Fishery Patrol Vessels and aircraft. This provides a list of ICES rectangles which were entered in a given day.
Patrol summary reporting	Contains a daily record of a patrol undertaken by a Fishery Patrol Vessel, but does not provide any indication of the patrol area covered.
PFV	Contains records of prosecution of fishing vessels files (PFV) which is an investigation into individual offences against National or European fisheries legislation. This dataset contains investigations deriving from offences identified during at sea and ashore inspections.

A2.4.2 Defining secondary data indicators

The starting point for the analysis was to develop a long list of indicators based on preliminary discussions with the MMO about what data are held by the MMO relevant to C&E. An initial list of more than 40 indicators addressing 13 of the 27 evaluation questions was pared down to a reduced list of indicators in discussion with the MMO, as a result of known limitations in the available data.

The MMO Statistics and Analysis team extracted the relevant datasets and made these available to the evaluation team. As the evaluation team worked through the datasets, additional data limitations were identified and discussed with the MMO. A final set of 18 indicators were deemed viable given the available data and were taken forward for analysis.

A2.4.3 Defining compliance categories

The secondary data analysis included an analysis of detected infringements. To gain insights into the types of infringements, compliance categories were defined. The rationale for and approach to defining (non)compliance categories is that a single non-compliance measure is too restrictive to provide insights into compliance with regulations, hence sub-categories needed to be defined. The 300+ infringements were simplified into 4 compliance categories: i) Infringements of Access restrictions; ii) Infringements of Technical conservation measures; iii) Infringements of Catch reporting and control requirements; and iv) Infringements of License conditions. The definitions of those compliance categories are provided in Section A2.1.

[128] Where a landing has been monitored but the vessel concerned was not boarded as part of the inspection, (irrespective of whether the logbook has been cross referenced with the catch landed) then this is entered as a Landed Catch Assessment. This fourth subset of the Portsum dataset was not analysed.

A2.4.4 Data cleaning and manipulation

Due to inconsistencies in the data and to meet the requirements of the indicators, the secondary data were 'cleaned' and modified prior to analysis. Full work logs detailing the process followed are available separately. A summary is provided below:

- Some individual vessels were associated with different length groups in the raw data. Where length groups could be reliably reassigned across all records (e.g. where one record was associated with a length group and the other was 'unknown', but the vessel length was the same) this was done for the in rep (at sea) and portsum (in port/ashore) inspections data.
- The inrep dataset contains 3 fields relating to the gear types associated with each vessel inspection record (Gear_in_use, Licence_primary_gear, Licence_secondary_gear). The portsum dataset (for vessel inspections) contains the latter two of these fields. Gear categories were assigned to these fields. Those gear categories are: Hand, Beam trawl, Bottom trawl, Pots and traps, Seine, Net, Dredge, Rod and line, Long lines, Midwater trawl, Other, Not known
- For some analyses, gear categories have been further aggregated into gear types, namely 'Fixed' and 'Towed', to align with the Fisher Survey analyses and to simplify the metrics. The gear categories above that are underlined were classed as 'Fixed' and those not underlined were classed as 'Towed', with exception of Other and Not known which were labelled as 'Unknown' for the purposes of gear type analyses.
- In order to analyse the portsum (inspections in port/ashore) data geographically, a region has been applied to each record that aligns with the Fisher Survey geographical stratification (east, northeast, northwest, southwest, south, southeast). Due to the inconsistencies and missing values in the multiple fields that relate to inspection location in the dataset, a number of steps were followed to assign a region where possible (details available separately).
- For the inrep (inspections at sea) data, ICES Divisions have been aggregated into ICES Areas/Subareas as follows[129]:

FAO/ICES Division code[130]	ICES Subarea, ICES Division	Geographic Area
27.4.b, 27.4.c	Subarea 4, Divisions 4b,c	Central and southern North Sea
27.7.a	Subarea 7, Division 7a	Irish Sea
27.7.f, 27.7.g	Subarea 7, Divisions 7f,g	Celtic Sea North and Bristol Channel
27.7.h, 27.7.j	Subarea 7, Divisions 7h,j	Celtic Sea South and South-West of Ireland - East
27.7.d, 27.7.e	Subarea 7, Divisions 7d,e	English Channel

- For indicators / metrics where inspection / infringement counts were standardised by total number of inspection hours (e.g. number per hour of inspection), anomalies in the recorded inspection lengths had to be addressed. In summary, the following inspection times were

[129] ICES division 27.7.b (West of Ireland) was excluded, as were NULL values. Divisions 24.4.a (Northern North Sea) and 27.7.k (South West of Ireland) were not present in the data.

[130] All fall within FAO fishing area 27. Code as recorded in MMO Statistical data.

considered as anomalous and were replaced with the average inspection time for each inspection type (vessels at sea, vessels in port, vehicles and markets/premises):

  - Inrep: Inspection times out with 0.5 and 8 hours were perceived to be anomalous.
  - Portsum (vessels): Inspection times out with 0.5 and 4 hours were perceived to be anomalous.
  - Portsum (market and vehicles): Inspection times out with 0.5 to 4 hours were perceived to be anomalous.

- For indicators / metrics where sanction types were investigated, Inrep and portsum datasets were used to assess the provision of rebriefs (verbal and written rebriefs).

  Inspections which led to an investigation (i.e the opening of a PFV), and generally perceived as more serious sanctions, were investigated independently of initial inspections using the PFV dataset.

A2.4.5 Presentation of the analyses

Filters applied to the MMO data sources for the different types if analyses are provided in the table below.

Analysis type	Dataset (s)	Filters
Number of inspections on vessels at sea, vessels in port, markets/premises and vehicles	Inrep and portsum	■ Inspection provider = MMO, RN, IFCA + SR ■ Inspection port nationality = GBE ■ Observer nationality = GBE ■ Inspection type = Boarding (vessels), market/premises, vehicles
Geographic distribution of inspections at sea	Inrep	■ Inspection provider = MMO, RN, IFCA + SR ■ Year = 2018, 2019
Number of patrols per given ICES rectangle	Patrol area searched	■ Year = 2014-2019 ■ Patrol type = Air and Sea ■ Excluded: 27.8.a, 27.8.d, 27.8.e, 27.6.a ■ Provider = MMO, RN
Infringements detected at sea by provider	Inrep	■ Inspection provider: MMO, RN, IFCA + SR ■ Report type = Infringement (inspection where infringement detected)
Total number of inspections, infringements and rebriefs from Portsum and Inrep and total number of sanctions issued from PFV's (2014-2019)	Inrep Portsum and PFV	■ Report type = Infringement ■ Year = 2014-2019 ■ Observer nationality = GBE ■ Inspection port nationality = GBE ■ Infringement outcome = WR and VR ■ Inspection provider = MMO, RN, IFCA + SR ■ Excluded: Case dropped, outstanding warrant still to be issued, action pending further investigation, taken into account
Proportion of each sanction category following investigations in 2018 and 2019 (at-sea and shore-side inspections)	PFV	■ MMO investigation = Yes ■ Detector type = sea and port ■ Detector group = MMO FPV, MMO port, RN FPV ■ Case status outcome = advisory letter, official warning, admin penalty paid, court case – guilty, case forwarded to OMS/3rd country, admin penalty offered ■ Excluded: Case dropped, outstanding warrant still to be issued, action pending further investigation, taken into account ■ Year = 2018, 2019

Proportion of each regulation category breached in 2018 and 2019 which resulted in an investigation and sanction (at-sea and shore-side inspections)	PFV	■ MMO investigation = Yes ■ Detector type = sea and port ■ Detector group = MMO FPV, MMO port, RN FPV ■ Category = Access restrictions, Catch reporting, Licence conditions, Technical conservation measures ■ Excluded: Case dropped, outstanding warrant still to be issued, action pending further investigation, taken into account ■ Year = 2018, 2019
Proportion of each sanction category by vessel length in 2018 and 2019 (vessels at sea and vessels in port)	PFV	■ MMO investigation = Yes ■ Detector type = sea and port ■ Detector group = MMO FPV, MMO port, RN FPV ■ Case status outcome = advisory letter, official warning, admin penalty paid, court case – guilty, case forwarded to OMS/3rd country, admin penalty offered ■ Excluded: Case dropped, outstanding warrant still to be issued, action pending further investigation, taken into account ■ Year = 2018, 2019 ■ Vessel length
Proportion of each regulation category breached by vessel length in 2018 and 2019 (vessels at sea and vessels in port)	PFV	■ MMO investigation = Yes ■ Detector type = sea and port ■ Detector group = MMO FPV, MMO port, RN FPV ■ Category = Access restrictions, Catch reporting, Licence conditions, Technical conservation measures ■ Year = 2018, 2019 ■ Excluded: Case dropped, outstanding warrant still to be issued, action pending further investigation, taken into account ■ Vessel length
Geographic distribution of offences detected during MMO shore side inspections per year	Portsum	■ Inspection port nationality = GBE ■ Observer nationality = GBE ■ Report type = Infringement
Proportion of infringements detected per region by type of ashore inspection	Portsum	■ Observer nationality and Inspection port nationality = GBE ■ Report type = Infringement ■ Inspection type = vessels, markets/premises, vehicles

- Where data permits, the analysis presented includes the percentage change between two comparison years / periods:
  - April to December 2019 (post-increased budget) and April to December 2018.
  - 2019 and 2018 (whole calendar years.
  - 2019 and 2014 (or 2011 for some analyses; whole calendar years).
- Indicators relating to inspections at sea generally include inspections performed by the Royal Navy (RN), MMO on-board MMO assets (MMO – essentially 2019 only) and MMO seariders on-board IFCA patrol vessels (IFCA + SR). For some analyses, these inspection providers have been presented separately.

- Regions applied for shore-side inspection/infringement analyses match the regions applied to the Fisher Survey. For the at-sea inspections, FAO subareas have been aggregated into ICES Subareas / Divisions which again align with the fishery survey.
- Analyses by vessel nationality are generally grouped into UK and non-UK. UK-flagged vessels refer to those identified as originating from all the devolved countries, plus the Channel Islands and Isle of Man.
- Analyses by gear are presented as gear categories and / or gear type (group) – see above for explanation.
- Analyses by vessel length are presented as length groups (10m and under, Over 10m-12m, Over 12m).

A2.4.6 Sanctions data limitations

These datasets have significant limitations which limit the scope of feasible analysis. It is not possible to link the Portsum dataset of infringements detected during inspections to the sanctions issued following an investigation in the PFV dataset. Similarly, sanction outcomes are rarely updated in the Portsum dataset if the infringement has led to an investigation, therefore, this database was not used to summarise severe sanctions. Whilst there is a means of linking infringements detected from inspections at sea (Inrep dataset) with the associated investigation sanction (PFV dataset), there were a small number of cases where there was a mismatch between sanction outcome recorded following an inspection and that resulting from an ensuing investigation

Therefore, to produce comparable analysis between ashore and at sea inspections, Inrep and Portsum datasets where used only to investigate the distribution and proportion of rebriefs issued. It is understood that rebriefs are primarily issued at the time of inspection and do not warrant any further investigation, lending a higher confidence in such records.

All records in Inrep and Portsum which led to an investigation were analysed using the PFV dataset. Although it is perceived that sanctions arising from an investigation are generally more serious, there are cases where evidence resulting from the investigation does not amount to a severe offence and the result is a lesser sanction, such as, an advisory letter.

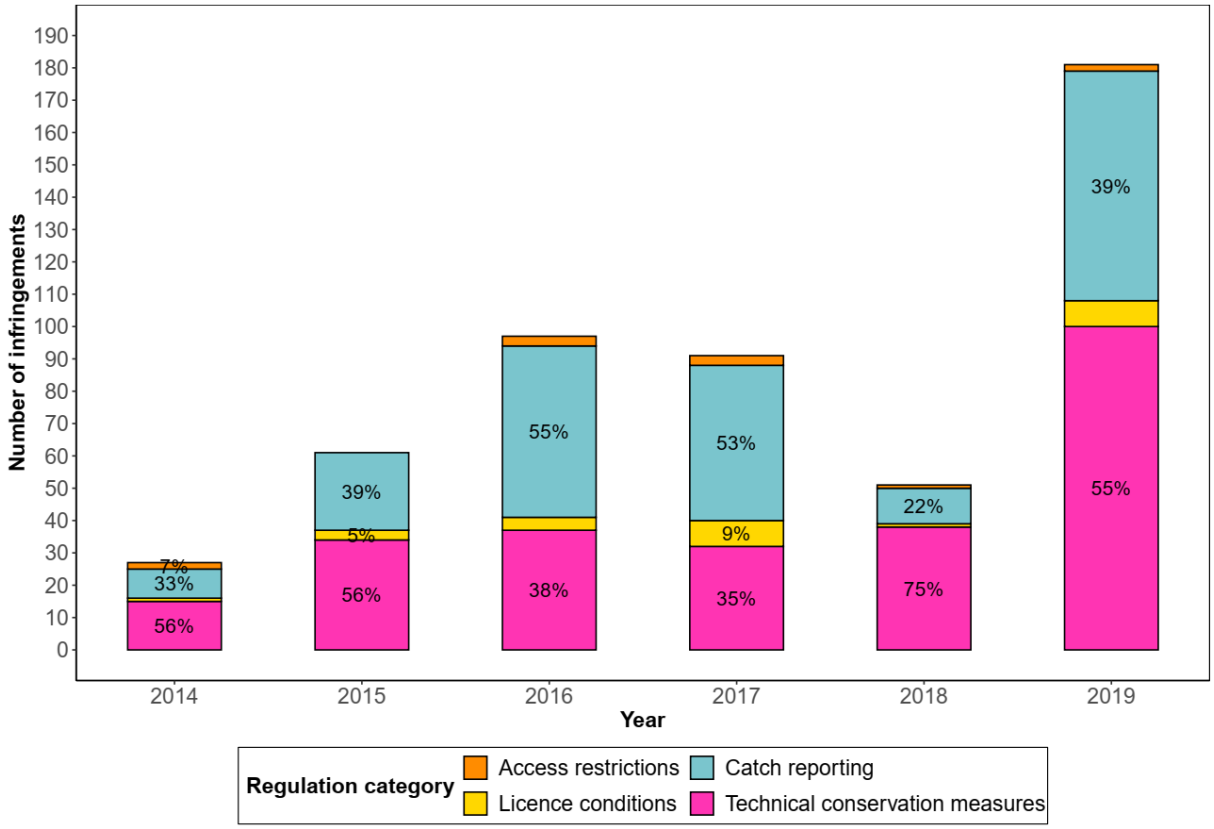
Annex 3 Data Annex

Table A3.1 Proportion (%) of Fisher Survey respondents rating their compliance as 0-10 (where 0 = Not at all compliant and 10 = Fully compliant) for each regulation category and overall

	0	1	2	3	4	5	6	7	8	9	10
Access restrictions	1.0	0.0	0.5	1.0	0.5	1.4	1.4	1.4	3.8	3.3	84.2
Catch reporting	4.3	0.5	0.0	0.5	1.9	4.8	4.8	3.8	10.5	5.7	60.3
Licence conditions	0.5	0.5	0.0	0.0	1.0	3.3	1.0	1.0	2.9	4.3	83.3
Technical conservation measures	1.4	0.0	0.0	0.5	1.0	3.3	1.4	1.9	7.2	8.6	72.2
Overall compliance	1.0	0.0	0.5	0.5	0.0	1.9	1.4	2.9	11.0	12.9	67.0

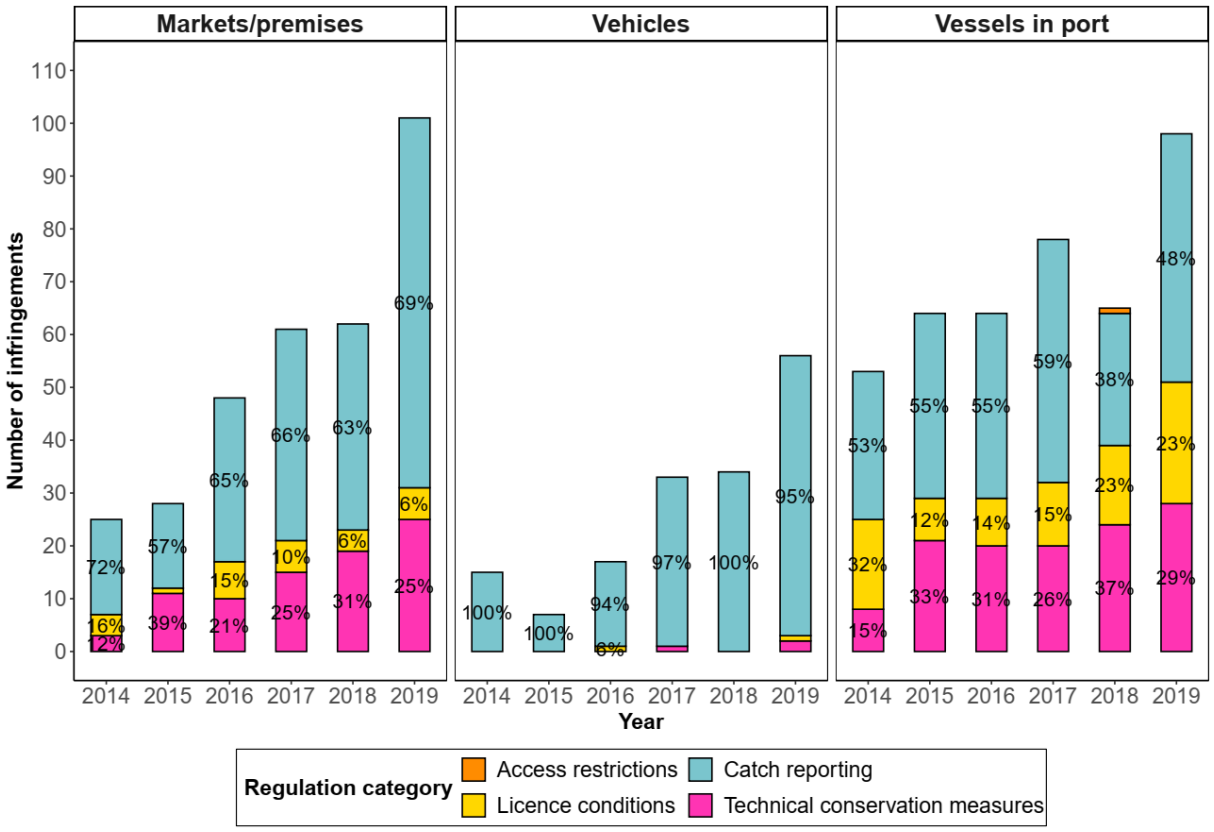
Source: Fisher Survey

Figure A3.1 Number of infringements detected per regulation category per year (2014-2019) during at-sea inspections. Also showing each category as the percentage (%) of all categorised infringements (not the % of all detected infringements i.e. some were not assigned to a regulation category).



Source: MMO Statistical data, Inrep (inspections at sea)

Figure A3.2 Number of infringements detected per regulation category per year (2014-2019) during shore-side inspections by the MMO. Also showing each category as the percentage (%) of all categorised infringements (not the % of all detected infringements i.e. some were not assigned to a regulation category)



Source: MMO Statistical data, Portsum (inspections in port/ashore)

Table A3.2 Number and distribution of MEOs warranted between August 2018 and end of 2019

Region	MMO office	Additional MEOs post-increased budget
North East	Beverley (formerly MMO Grimsby)	1
North East	MMO, Central Riverside, North Shields	3
North East	MMO, Scarborough	1
East	Customs House Harwich	1
East	MMO, Lowestoft	2
East	Scarborough	1
South East	Hastings	3
South East	MMO, IFCA Ramsgate	1
South East	MMO, Shoreham	2
South	MMO, Portsmouth	1
South	MMO, The Fish Quay Plymouth	3
South West	MMO, New Fish Quay Brixham	6
South West	MMO, Hayle Renewables Business Park	3
South West	MMO, The Quay Poole	4
North West	MMO, Preston	2
North West	MMO, Wisbech Road, Kings Lynn	1
Total		**35**

Region	Additional MEOs post-increased budget
North East	5
East	4
South East	7
South	2
South West	14
North West	3

Source: Training & RBS officer, MMO HR data

Table A3.3 Number of MMO inspections of vessels in port by region and year (2014-2019) and % change between 2019 and two reference years.

Region	2014	2015	2016	2017	2018	2019	% change 2014-19	% change 2018-19
North East	189	383	590	525	432	746	294.7%	72.7%
East	412	287	217	109	47	275	-33.3%	485.1%
South East	197	180	293	258	134	253	28.4%	88.8%
South	323	430	472	534	533	553	71.2%	3.8%
South West	216	198	470	420	467	909	320.8%	94.6%
North West	20	34	60	38	80	104	420.0%	30.0%
Total	**1357**	**1512**	**2102**	**1884**	**1693**	**2840**	**109.3%**	**67.7%**

Source: MMO Statistical data, Portsum (inspections in port/ashore)

Table A3.4 Number of MMO inspections of vessels in port by region (9-month period of April – December, 2018 and 2019)

	April-Dec 2018	April-Dec 2019	% change
North East	313	623	99%
East	39	262	572%
South East	114	214	88%
South	455	430	-5%
South West	360	789	119%
North West	65	93	43%
Total	**1346**	**2411**	**79%**

Source: MMO Statistical data, Portsum (inspections in port/ashore)

Table A3.5 Number of times a patrol entered each ICES area by RN, MMO and IFCA + SR FPVs (combined) in English EEZ waters per year (2011-2019) and percentage change between reference years

ICES area	2011	2012	2013	2014	2015	2016	2017	2018	2019	% change from 2011	% change from 2018
Divisions 4b,c	232	154	117	103	104	58	58	30	105	-55%	250%
Division 7a	61	30	14	23	14	11	3	1	11	-82%	1000%
Divisions 7d,e	306	301	322	325	331	185	141	124	192	-37%	55%
Divisions 7d,e/7f,g	32	22	28	26	14	7	3	0	5	-84%	NA
Divisions 7f,g	102	98	89	60	36	25	18	7	43	-58%	514%
Divisions 7h,j	75	64	31	16	15	6	21	4	27	-64%	575%

Source: MMO Statistical data, Patrol area searched

Table A3.6 Number of times a patrol entered each ICES area by RN and MMO FPVs (combined) in English EEZ waters per year (for full years 2018 and 2019; for 9-month period April to December 2018 and 2019)

	2018	2019	% change
Divisions 4b, c	10	102	920
Division 7a	0	9	NA
Divisions 7d,e	87	168	93%
Divisions 7d,e/7f,g		1	NA
Divisions 7f,g	5	36	620
Divisions 7h,j	4	24	500
Total	**106**	**340**	**221**

Table A3.7 Number of MMO at-sea and shore-side inspections in England by type and year (2014-2019) and percentage change between 2019 and two reference years.

Inspection type	2014	2015	2016	2017	2018	2019	% change 2014-19	% change 2018-19
Vessels in port	1357	1512	2102	1884	1693	2840	109.3%	67.7%
Markets/ premises	758	973	1301	997	966	1850	144.1%	91.5%
Vehicles	115	160	166	303	307	748	550.4%	143.6%
Vessels at sea	0	0	0	0	0	368	NA	NA
Total	**2230**	**2645**	**3569**	**3184**	**2966**	**5438**	**143.9%**	**83.3%**

Source: MMO Statistical data, Portsum (inspections in port/ashore)

Table A3.8 Frequency of unique vessel inspections at sea (2018 and 2019)

	Inspection count (times per year)							
	1	2	3	4	5	6	7	8
2018	142	27	4	0	0	0	0	0
2019	257	62	15	2	0	0	0	1
Change	115	35	11	2	0	0	0	1

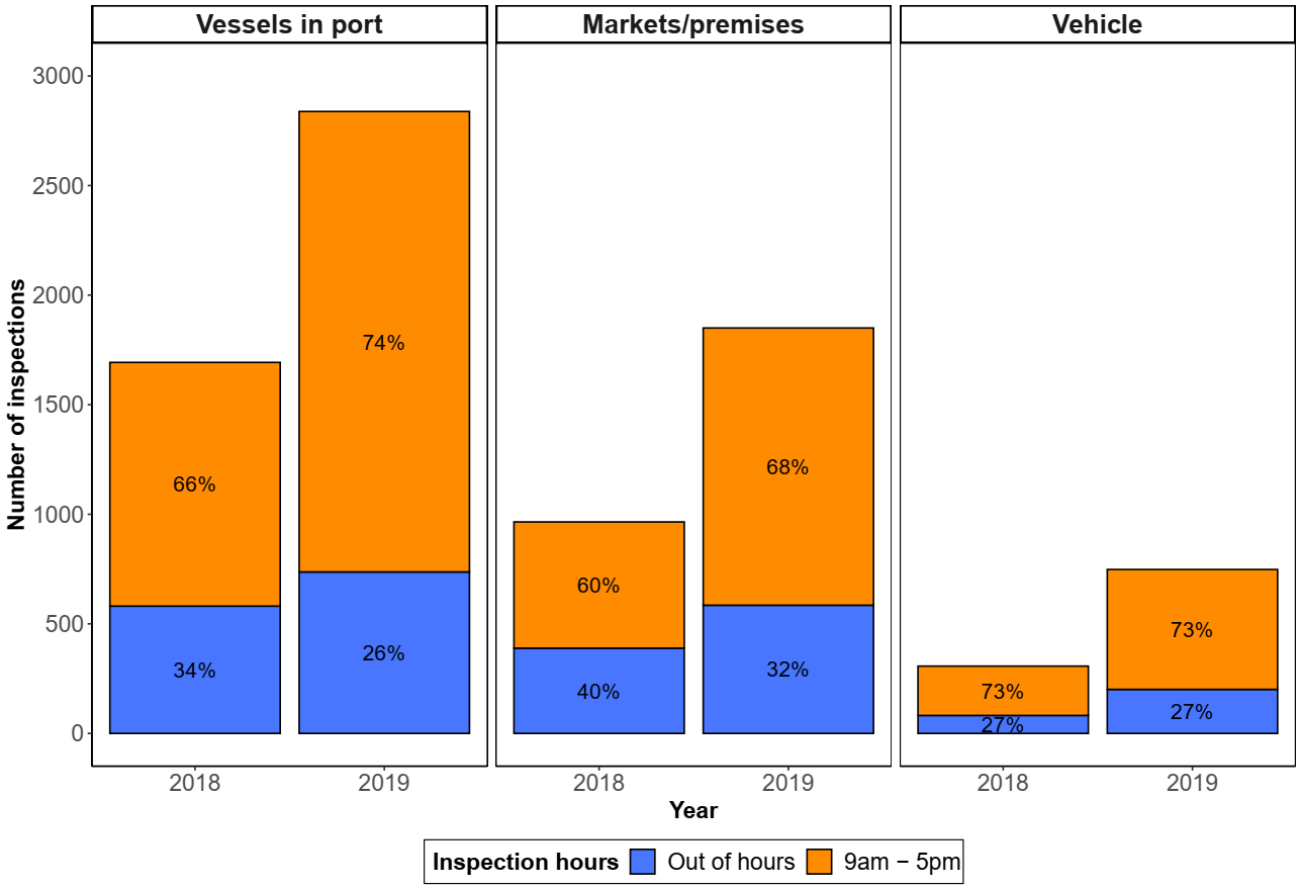
Source: MMO Statistical data, Inrep (inspections at sea)

Table A3.9 Frequency of unique vessel inspections in port (2018 and 2019)

	Inspection count (times per year)																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	24	29
2018	378	128	69	30	17	11	7	4	0	0	1	0	0	0	1	0	0	0	0
2019	422	226	108	70	48	33	18	13	11	3	5	3	0	1	1	1	0	0	0
Change	**44**	**98**	**39**	**40**	**31**	**22**	**11**	**9**	**11**	**3**	**4**	**3**	**0**	**1**	**0**	**1**	**0**	**0**	**0**

Source: MMO Statistical data, Portsum (inspections in port/ashore)

Figure A3.3 Out of hours inspections of vessels in port, markets/premises and vehicles (2018 and 2019)



Source: MMO Statistical data, Portsum (inspections in port/ashore)

Table A3.10 Total number of infringements detected by MMO vessel inspections in port and at sea (2014-2019) and percentage change between 2018 and 2019.

	2014	2015	2016	2017	2018	2019	% change 18-19
Vessels in port	74	88	102	108	95	132	38.9%
Vessels at sea	118	111	150	102	68	246	261.8%

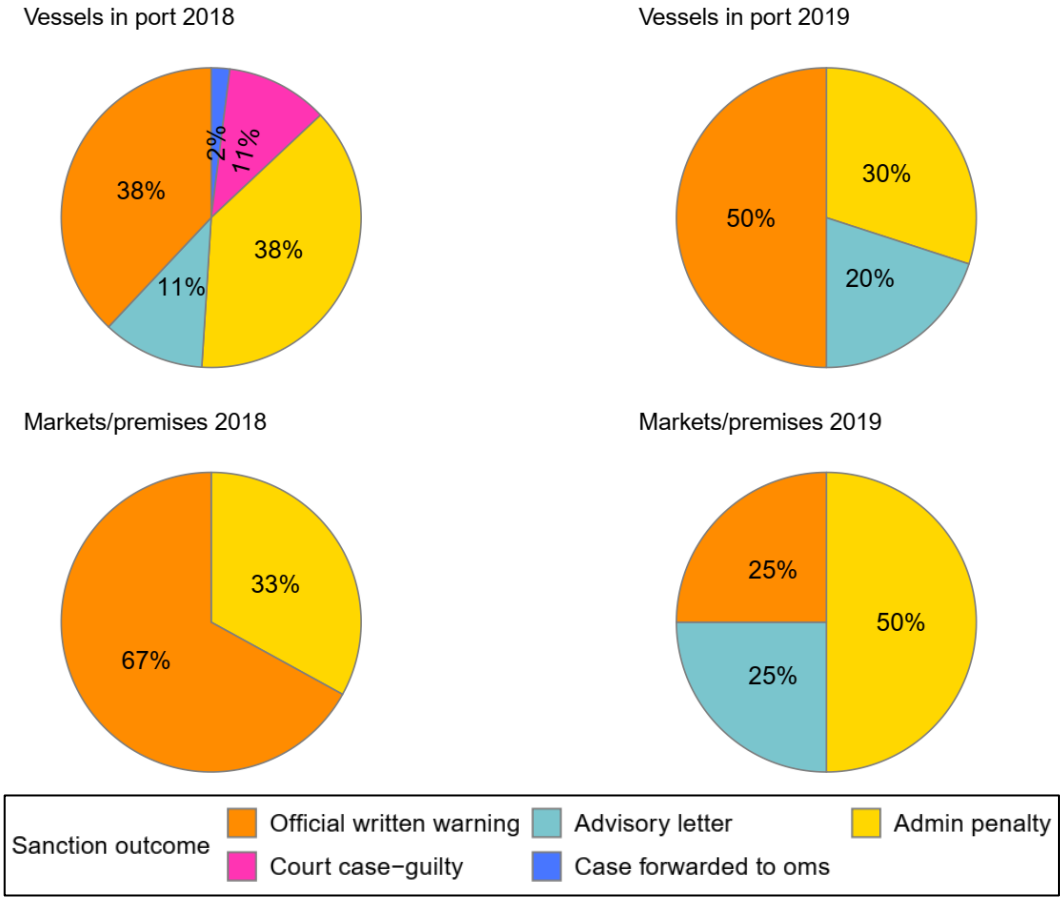
Source: MMO Statistical data, Inrep (inspections at sea), Portsum (inspections in port)

Table A3.11 Proportion (%) of Fisher Survey respondents specifying 'very important' or 'important' for each driver

		Fisher Survey question										
		32a	32b	32c	32d	32e	32f	32g	32h	32i	32j	32k
ICES area	Subarea 4	82.4	82.4	68.9	60.8	71.6	51.3	54.0	85.1	71.6	73.0	81.0
	Division 7a	76.9	69.2	69.3	53.9	61.6	69.3	61.6	61.6	84.6	84.7	92.3
	Divisions 7d,e	80.9	58.2	48.6	41.8	43.4	47.8	47.8	56.6	66.1	77.4	80.0
	Divisions 7f,g	93.0	65.1	51.1	32.6	37.3	48.9	41.9	55.8	67.4	79.1	95.3
	Divisions 7h,j	87.5	50.0	62.5	25.0	50.0	62.5	50.0	62.5	87.5	75.0	100.0
Vessel length	10m and under	80.5	68.5	61.6	51.1	56.7	52.5	55.3	64.4	66.5	74.2	81.1
	Over 10m	84.8	66.6	50.0	42.4	51.5	53.0	47.0	68.2	75.8	81.9	86.4
Gear	Fixed	83.0	68.7	56.5	46.9	56.5	56.4	56.5	63.3	68.7	75.5	85.0
	Towed	80.0	65.0	60.0	50.0	51.7	43.3	43.3	71.7	71.7	80.0	80.0

Source: Fisher Survey

Figure A3.4 Breakdown of sanction outcomes resulting from case investigations following MMO inspections of vessels in port and markets/premises (2018-2019)



Source: MMO statistical data – PFV investigation data

Table A3.12 Number of sanctions resulting from investigations in 2019 following ashore and at sea inspections by vessel length and regulation category

Type of inspection	Vessel length category	Regulation category	Number of sanctions
Ashore	10m and under	Technical conservation measures	4
Ashore	10m and under	Licence conditions	3
Ashore	10m and under	Catch reporting and control measures	1
Ashore	Over 10m-12m	Technical conservation measures	1
Ashore	Over 10m -12m	Catch reporting and control measures	3
Ashore	Over 12m	Technical conservation measures	4
Ashore	Over 12m	Licence conditions	2
Sea	10m and under	Technical conservation measures	2
Sea	Over 12m	Technical conservation measures	16
Sea	Over 12m	Catch reporting and control measures	4

Source: MMO statistical data, PFV investigation data

Table A3.13 Number of sanction outcomes resulting from investigations in 2019 following inspections of vessels at sea and in port (ashore) by vessel length category

Type of inspection	Vessel length category	Sanction outcome	Number of sanctions
Ashore	10m and under	Admin penalty	2
Ashore	10m and under	Official written warning	5
Ashore	10-12m	Advisory letter	2
Ashore	10-12m	Official written warning	2
Ashore	Over 12m	Admin penalty	2
Ashore	Over 12m	Advisory letter	1
Ashore	Over 12m	Official written warning	3
Sea	10m and under	Official written warning	2
Sea	Over 12m	Court case - guilty	1
Sea	Over 12m	Admin penalty	2
Sea	Over 12m	Advisory letter	1
Sea	Over 12m	Official written warning	14

Source: MMO statistical data, PFV investigation data

Table A3.14 Number of infringements by inspection type and region in 2018 and 2019

Region	Year	Inspection type	Number of Infringements
East	2018	Vessels in port	39
North East	2018	Vessels in port	313
North West	2018	Vessels in port	65
South	2018	Vessels in port	158
South East	2018	Vessels in port	89
South West	2018	Vessels in port	331
East	2019	Vessels in port	260
North East	2019	Vessels in port	612
North West	2019	Vessels in port	93
South	2019	Vessels in port	202
South East	2019	Vessels in port	204
South West	2019	Vessels in port	765
East	2018	Market/Premises	75

North East	2018	Market/Premises	146
North West	2018	Market/Premises	21
South	2018	Market/Premises	118
South East	2018	Market/Premises	67
South West	2018	Market/Premises	195
East	2019	Market/Premises	224
North East	2019	Market/Premises	322
North West	2019	Market/Premises	88
South	2019	Market/Premises	211
South East	2019	Market/Premises	207
South West	2019	Market/Premises	475
East	2018	Vehicle	63
North East	2018	Vehicle	27
North West	2018	Vehicle	30
South	2018	Vehicle	45
South East	2018	Vehicle	13
South West	2018	Vehicle	53
East	2019	Vehicle	130
North East	2019	Vehicle	116
North West	2019	Vehicle	52
South	2019	Vehicle	84
South East	2019	Vehicle	93
South West	2019	Vehicle	180

Table A3.15 Views on fishing regulations (% who agree/disagree with statements on regulations) by views on fisher relationship with MMO and opinion on whether they have a say in fisheries management

		How do you rate your relationship with local MMO staff?		I have a say in how fisheries are managed	
Statements on fishing regulations	**Opinion**	**Excellent / good**	**Poor / very poor**	**Agree**	**Disagree**
Fisheries regulations make it difficult for my fishing business to be profitable	Agree	64	89	65*	78*
	Disagree	36	11	35*	22*
	Total	100	100	100	100
	n	86	28	23	142
Regulations are fair	Agree	50	11	67	22
	Disagree	50	89	33	78
	Total	100	100	100	100

Statements on fishing regulations	Opinion	How do you rate your relationship with local MMO staff?		I have a say in how fisheries are managed	
		Excellent / good	Poor / very poor	Agree	Disagree
	n	86	27	24	138
MMO is an effective regulator of fisheries	Agree	65	22	74	46
	Disagree	35	78	26	54
	Total	100	100	100	100
	n	83	23	23	117
I respect decisions made by the regulators about fisheries management	Agree	58	7	64	35
	Disagree	42	93	36	65
	Total	100	100	100	100
	n	89	27	28	133

Source: Fisher Survey

Note: Analysis excludes neutral, don't know and non-responses

** Difference between groups not significant. All other differences presented in the table were significant*

A3.2 Statistical analyses of differences between groups (Fisher Survey)

Significant test results ($p < 0.05$) are highlighted in blue. Degrees of freedom = 2 for tests in Table A3.16 and Table A3.17, and df = 5 for Table A3.18. The test applied to questions 13 and 16 was the Wilcoxon-Mann-Witney U test, for all other questions (where applicable) a Kruskal-Wallis test was applied.

Table A3.16 Differences between responses to each question by main gear type (Fixed, Towed).

Question number	Test statistic	p-value	Question number	Test statistic	p-value	Question number	Test statistic	p-value
Qu_9a	5.81	0.055	Qu_23c	3.38	0.184	Qu_32b	1.69	0.430
Qu_9b	16.44	<0.001	Qu_24a	0.71	0.701	Qu_32c	1.17	0.556
Qu_9c	1.71	0.425	Qu_24b	1.20	0.55	Qu_32d	2.31	0.315
Qu_9d	1.53	0.465	Qu_24c	3.19	0.203	Qu_32e	0.22	0.896
Qu_10a	5.98	0.05	Qu_25a	2.03	0.362	Qu_32f	1.95	0.377
Qu_10b	10.26	0.006	Qu_25b	1.04	0.595	Qu_32g	3.63	0.163
Qu_10c	2.14	0.343	Qu_25c	4.07	0.131	Qu_32h	0.21	0.902
Qu_11a	2.64	0.267	Qu_25d	2.24	0.327	Qu_32i	1.85	0.397
Qu_11b	2.75	0.253	Qu_26a	0.00	0.999	Qu_32j	1.27	0.531
Qu_12	1.35	0.51	Qu_26b	7.46	0.024	Qu_32k	5.30	0.071
Qu_13	0.10	0.809	Qu_26c	0.35	0.839	Qu_32l	No test applied (insufficient data)	
Qu_14	8.21	0.017	Qu_26d	3.88	0.144	Qu_33	0.11	0.947
Qu_15	0.75	0.687	Qu_26e	0.40	0.817	Qu_34	6.06	0.048
Qu_16	0.08	0.939	Qu_27a	9.13	0.01	Qu_35	3.27	0.195
Qu_17	6.26	0.044	Qu_27b	3.17	0.205	Qu_36a	0.08	0.771
Qu_18	12.87	0.002	Qu_27c	4.43	0.109	Qu_37	4.37	0.113
Qu_19	6.96	0.031	Qu_27d	7.40	0.025	Qu_38a	5.53	0.019
Qu_20	7.21	0.027	Qu_28	No test applied (no rationale for test)		Qu_39	0.94	0.627
Qu_21a	2.68	0.262	Qu_29a	3.81	0.149	Qu_40a	0.66	0.417
Qu_21b	0.50	0.779	Qu_29b	2.05	0.359	Qu_41	4.14	0.126
Qu_22	1.28	0.528	Qu_29c	4.49	0.106	Qu_42a	0.83	0.363
Qu_23a	1.02	0.601	Qu_29d	2.20	0.333	Qu_43	6.59	0.037
Qu_23b	6.47	0.039	Qu_32a	0.45	0.799	Qu_44	4.13	0.127

Table A3.17 Differences between responses to each question by vessel length category (10m and under, Over 10m)

Question number	Test statistic	p-value	Question number	Test statistic	p-value	Question number	Test statistic	p-value
Qu_9a	25.65	<0.0001	**Qu_23c**	4.61	0.032	**Qu_32b**	0.17	0.682
Qu_9b	12.27	<0.001	**Qu_24a**	4.72	0.03	**Qu_32c**	1.23	0.267
Qu_9c	0.55	0.457	**Qu_24b**	5.87	0.015	**Qu_32d**	2.40	0.122
Qu_9d	2.31	0.129	**Qu_24c**	2.03	0.154	**Qu_32e**	0.03	0.874
Qu_10a	7.65	0.006	**Qu_25a**	15.53	<0.001	**Qu_32f**	0.02	0.878
Qu_10b	10.22	0.001	**Qu_25b**	16.84	<0.0001	**Qu_32g**	1.66	0.197
Qu_10c	16.42	<0.001	**Qu_25c**	3.45	0.063	**Qu_32h**	0.85	0.357
Qu_11a	1.51	0.22	**Qu_25d**	0.80	0.371	**Qu_32i**	2.66	0.103
Qu_11b	4.46	0.035	**Qu_26a**	4.59	0.032	**Qu_32j**	0.31	0.579
Qu_12	2.73	0.098	**Qu_26b**	1.67	0.196	**Qu_32k**	2.34	0.126
Qu_13	0.09	0.839	**Qu_26c**	7.25	0.007	**Qu_32l**	No test applied (insufficient data)	
Qu_14	0.08	0.781	**Qu_26d**	7.97	0.005	**Qu_33**	0.84	0.360
Qu_15	1.41	0.235	**Qu_26e**	5.67	0.017	**Qu_34**	1.03	0.310
Qu_16	0.17	0.173	**Qu_27a**	12.49	<0.001	**Qu_35**	3.75	0.053
Qu_17	11.16	0.001	**Qu_27b**	4.79	0.029	**Qu_36a**	0.24	0.621
Qu_18	13.87	<0.001	**Qu_27c**	13.41	<0.001	**Qu_37**	0.39	0.531
Qu_19	6.27	0.012	**Qu_27d**	9.65	0.002	**Qu_38a**	0.36	0.549
Qu_20	8.00	0.005	**Qu_28**	No test applied (no rationale for test)		**Qu_39**	6.47	0.011
Qu_21a	0.02	0.882	**Qu_29a**	1.54	0.214	**Qu_40a**	0.02	0.895
Qu_21b	2.00	0.157	**Qu_29b**	3.94	0.047	**Qu_41**	0.11	0.743
Qu_22	8.53	0.004	**Qu_29c**	18.70	<0.0001	**Qu_42a**	0.10	0.748
Qu_23a	3.02	0.082	**Qu_29d**	10.35	0.001	**Qu_43**	3.66	0.056
Qu_23b	4.73	0.03	**Qu_32a**	6.52	0.011	**Qu_44**	2.61	0.106

Table A3.18 Differences between responses to each question by main ICES area(s) fished (Subarea 4, Division 7a, Divisions 7d,e, Divisions 7f,g, Divisions 7h,j)

Question number	Test statistic	p-value	Question number	Test statistic	p-value	Question number	Test statistic	p-value
Qu_9a	16.194	0.003	**Qu_23c**	6.601	0.159	**Qu_32b**	18.320	0.001
Qu_9b	3.997	0.406	**Qu_24a**	8.875	0.064	**Qu_32c**	12.940	0.012
Qu_9c	15.374	0.004	**Qu_24b**	21.357	<0.001	**Qu_32d**	20.261	<0.001
Qu_9d	3.506	0.477	**Qu_24c**	2.451	0.654	**Qu_32e**	33.895	<0.0001
Qu_10a	5.422	0.247	**Qu_25a**	9.649	0.047	**Qu_32f**	5.160	0.271
Qu_10b	10.293	0.036	**Qu_25b**	7.784	0.10	**Qu_32g**	8.818	0.066
Qu_10c	11.078	0.026	**Qu_25c**	7.456	0.114	**Qu_32h**	18.479	0.001
Qu_11a	12.563	0.014	**Qu_25d**	1.854	0.763	**Qu_32i**	9.419	0.051
Qu_11b	26.474	<0.0001	**Qu_26a**	3.182	0.528	**Qu_32j**	1.234	0.873
Qu_12	1.548	0.818	**Qu_26b**	4.575	0.334	**Qu_32k**	14.718	0.005
Qu_13	No test applied (insufficient data)		**Qu_26c**	18.127	0.001	**Qu_32l**	No test applied (insufficient data)	
Qu_14	4.556	0.336	**Qu_26d**	12.068	0.017	**Qu_33**	14.789	0.005
Qu_15	5.046	0.283	**Qu_26e**	24.927	<0.001	**Qu_34**	5.931	0.204
Qu_16	No test applied (insufficient data)		**Qu_27a**	1.285	1.091	**Qu_35**	6.839	0.145
Qu_17	5.676	0.225	**Qu_27b**	0.736	0.947	**Qu_36a**	8.450	0.076
Qu_18	8.342	0.08	**Qu_27c**	1.121	0.891	**Qu_37**	16.458	0.003
Qu_19	1.877	0.758	**Qu_27d**	5.194	0.268	**Qu_38a**	2.083	0.721
Qu_20	2.588	0.629	**Qu_28**	No test applied (no rationale for test)		**Qu_39**	2.871	2.871
Qu_21a	2.252	0.69	**Qu_29a**	6.222	0.183	**Qu_40a**	2.658	0.617
Qu_21b	2.648	0.618	**Qu_29b**	7.648	0.105	**Qu_41**	3.326	0.505
Qu_22	32.749	<0.0001	**Qu_29c**	13.676	0.008	**Qu_42a**	8.971	0.062
Qu_23a	10.198	0.037	**Qu_29d**	10.051	0.04	**Qu_43**	4.619	0.329
Qu_23b	4.490	0.344	**Qu_32a**	8.868	0.065	**Qu_44**	31.522	<0.0001