Investigating Information Verification and Observer/REM Coverage Levels in Fisheries Worldwide

MSC

Fisheries

March 2025

Submitted by

MRAG

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Document Control			
Title	Investigating information verification and observer/REM coverage levels in fisheries worldwide		
Document ID			
MRAG ID	GB13310		
Version	V005		
Prepared by		Approved by	
JMC, KM, EV, RS, WF		JMC	
Internal Use Only	Client Only	General Release	
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Acronyms

AFMA	Australian Fisheries Management Authority
AMMOP	Alaska Marine Mammal Observer Program
BFAR	Bureau of Fisheries and Aquatic Resources
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
DAFF	Department of Agriculture, Fisheries and Forestry
DFFE	Department of Forestry, Fisheries, and the Environment
DFO	Department of Fisheries and Oceans
DOS	Digital Observer Services
DPIRD	Department of Primary Industries and Regional Development
EEZ	Exclusive Economic Zone
EMS	Electronic Monitoring System
ETP	Endangered, Threatened, and Protected
FAD	Fish Aggregating Device
FAO	Food and Agriculture Organization
FISF	Faroe Islands Sustainable Fisheries
FISMIS	Fisheries Information and Monitoring System
FOA	Fisheries Observer Agency
FSC	Free School
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IFOP	Institute of Fisheries Development
IFQ	Individual Fishing Quota
IOTC	Indian Ocean Tuna Commission
ISF	Iceland Sustainable Fisheries
ISSF	International Seafood Sustainability Foundation
JFA	Japan Fisheries Agency
LFA	Lobster Fishing Area
LRQA	Lloyd’s Register Quality Assurance Limited
MARPOL	Marine Pollution
MFMR	Ministry of Fisheries and Marine Resources
NAFO	Northwest Atlantic Fisheries Organization

NEFOP	Northeast Fisheries Observer Program
NMFS	National Marine Fisheries Service
NWIFC	Northwest Indian Fisheries Commission
OIA	Organizacion Internacional Agropecuaria
PCR	Public Certification Report
PSMFC	Pacific States Marine Fisheries Commission
REM	Remote Electronic Monitoring
RFMO	Regional Fisheries Management Organisation
ROP	Regional Observer Programme
SARA	Species At Risk Act
SARPC	Reunion Freezer Longliner Shipowners Association
SERNAPESCA	Servicio Nacional de Pesca
SFSAG	Scottish Fisheries Sustainable Accreditation Group
SPRFMO	South Pacific Regional Fisheries Management Organisation
TAAF	Les Terres Australes et Antarctiques Françaises
TUNACONS	Tuna Conservation Group
UCSL	United Certification Systems Limited
VMS	Vessel Monitoring System
WCPFC	Western & Central Pacific Fisheries Commission
WCPO	Western Central Pacific Ocean
WWF	World Wildlife Fund

1 Executive Summary

This report summarises the results of a review of 52 fisheries, collecting information on logbooks / self-reporting by vessels, and independent monitoring through observer programmes and Remote Electronic Monitoring (REM). Of the fisheries selected, 48 were provided by MSC, and a further four added by MRAG. The selected fisheries represent a wide range of gear types, geographic scales and objectives.

The aim was to gain an understanding of widely adopted practices of fisheries monitoring, verification, and observer / REM coverage levels, with a view to developing guidelines and minimum standards for assessments, specifically looking at:

- Logbook / self-reporting requirements on catch and operational data and what variations exist within and between fisheries;
- If and how these data are verified;
- The design and objectives of monitoring programmes in place; and
- Observer and REM coverage levels and protocols.

This review was carried out primarily using the MSC assessment reports, and supplementing this information with further research as needed. Fisheries were broken down by region, Europe (13), Oceania (4), Asia (8), Africa (3), Americas (13) and a separate category for just RFMOs (11). For each fishery, the information was organised in a table, also detailing the geographic range, scale and gear type. In some cases, individual fisheries encompassed multiple gear types and regions, which had their own monitoring and recording requirements. From this table, an analysis was conducted looking at trends in the logbook, observer and REM requirements for these factors.

Logbooks were found to have widespread use in all but two fisheries. Self-reporting in this way is the most common form of monitoring fishing activities, being largely required by the relevant authorities, but verification of logbooks is inconsistent.

Observer coverage in these fisheries varied from 0-100% coverage. What is clear is that it was difficult to get any clear trends in coverage rates. It was not possible to state that fishery W using gear X targeting species Y should have Z% coverage. As the coverage is defined differently between fisheries, ranging from hooks monitored to deployment days, it can be difficult to directly compare coverage levels, even within a fishery there can be different observation rates depending on the gear type or the particular element of the programme being sampled. However, percentage coverage was estimated for the sake of comparison, as well as the metric used. Coverage was found to increase in larger scale fisheries operating further from shore, as these more frequently have the facilities and ability to accommodate an observer on board during fishing activity and are likely to remain at sea for longer periods of time. Programmes whose primary purpose was compliance tended to have higher coverage rates, they also utilised REM to a larger extent.

REM is an emerging tool for fisheries monitoring. The majority of fisheries reviewed did not have any REM in place, but a small number did make use of CCTV for monitoring purposes, or were in the process of implementing / had previously implemented a trial programme.

2 Introduction

This report investigates information verification in global fisheries, from self-reporting by vessels to independent monitoring through observer programmes and Remote Electronic Monitoring (REM)[1]. The aim is to provide a better understanding of practices currently being undertaken in a range of fisheries and help produce a set of guidelines and minimum standards when undertaking assessments.

This study builds on previous work undertaken by MRAG for the MSC which looked at general good practices in Monitoring Control and Surveillance, including observer programmes (MRAG Ltd., 2019), and a follow up study on the optimal levels of observer coverage according to the management aims of the fisher (MRAG Ltd., 2021). Amongst other things, these reports highlighted the importance of defining exactly what 'coverage' means, especially when trying to use it as a baseline for any comparative analysis. There are several metrics that can be used, the main ones this report will consider are:

- **Vessels:** Proportion of vessels to be covered by an observer.
- **Trips:** The number of vessel trips that carry an observer.
- **Days:** The number of sea days that are covered by observers.
- **Effort:** The amount of fishing effort that should be covered by observers. This in turn can be defined at different levels such as hauls, trawls, and hooks.
- **Catch:** The proportion of catch that should be sampled.

As an example, a fishery can have 100% vessel coverage, sample 50% of hauls for endangered, threatened and protected (ETP) species bycatch, but only 10% of the catch for the target species. The increasing use of REM also adds another element to this as it needs to account for the coverage of the REM system itself as well as the coverage of any video footage reviewed.

While the primary purpose of this study was not to define optimum coverage levels but rather to report on commonly adopted practices, it is important to recognise that there are several factors that will define what the coverage levels should be. Primarily amongst these are the management objectives of the fishery. These can be defined as (based on NMFS (2004)):

- Catch/effort monitoring for in-season management and/or stock assessment;
- Bycatch monitoring for in-season management and/or stock assessment;
- Protected, endangered and threatened species monitoring;
- Technical monitoring for better understanding of fishing effort and catch per unit effort;
- Compliance monitoring, such as monitoring behaviour in closed areas or during seasonal closures, adherence to MARPOL regulations or compliance with discard bans; and,
- Crew welfare and safety (not strictly a management objective for a fishery but becoming an increasingly important consideration for fisheries managers).

Other factors influencing monitoring implementation include the scale of the fishery (in terms of number and size of vessels, number of trips per year, annual landings), location (remoteness and accessibility), gear type and target species. Moreover, fisheries operating under sustainability certifications such as the MSC generally have more comprehensive

[1] Remote Electronic Monitoring (REM) can also be referred to as an Electronic Monitoring System (EMS) or Electronic Monitoring (EM). For the purpose of this report, it will be referred to as REM and only include monitoring through the use of onboard cameras.

monitoring measures in place, due to the regulatory requirements to maintain certification, and such fisheries are more likely to have the resources and infrastructure necessary to adopt and implement such practices. As most fisheries in this review are MSC-certified, they represent a subset with relatively higher capacity, commitment, and awareness of monitoring practices, which may not represent broader industry challenges and non-certified fisheries.

Logbooks

Logbook reporting protocols can vary according to regulatory requirements and type of fishery but will consistently contain baseline information such as fishing activity date, time and catch. When assessing logbook requirements the type of data recorded, the reporting frequency of these data and the reporting method used should be considered. Verification methods against other data sources, such as observer data, port inspections or REM data, can be used by authorities to ensure this information is being collected accurately.

While the MSC does not mandate specific logbook requirements as a condition for certification, keeping comprehensive records can enhance a fishery's scoring under the MSC Fisheries Standard[2]. Data collection on components of a fishery's operations helps demonstrate that they are well-managed and sustainable, thereby providing an incentive to keep comprehensive documentation. These components include:

- Catch: Detailed records of all catches, including species, quantities, and locations.
- Effort: Information on fishing effort, such as the number of trips, gear used, and time spent fishing.
- Bycatch: Consistent documentation of bycatch, including retained and discarded species, and ETP interactions, to assess and mitigate impacts on the ecosystem.
- Verification: Verifying logbook data through independent audits and inspections improves data credibility.

In some instances, the level of documentation encouraged may exceed regulatory body requirements for a given fishery. Therefore, adopting such practices can strengthen a fishery's overall assessment and demonstrates sustainable management in practice.

Observer Monitoring

Observer coverage targets vary depending on regulations, legislation, fishery-specific monitoring strategies, or certification requirements, including those of the MSC. In the context of MSC certification, certain clauses, particularly those relating to in-scope species, ETP/out-of-scope species and habitats, set monitoring objectives that fisheries must meet to maintain certification. However, these certification-driven targets can differ distinctly from legally mandated observer coverage requirements, which may be lower or less comprehensive.

Observer coverage is implemented in fisheries at different levels, and can vary greatly in scope, methodology and purpose. Some programmes operate as dedicated, fishery-specific initiatives to collect catch, bycatch, ecosystem interactions, and compliance data. Others may operate through broader monitoring efforts, where data collected primarily for one fishery, can also contribute to the monitoring of others. In these instances, where observer programmes designed for one fishery may record incidental catch or interactions in other fisheries, the programme indirectly contributes to monitoring and compliance though not through targeted efforts. Such indirect monitoring may provide useful data but may not necessarily align with

[2] Fisheries program documents | Marine Stewardship Council

wider conservation objectives. Understanding such nuances is essential to determine the extent and effectiveness of observer coverage programmes across different fisheries.

The level of observer coverage is influenced by operational, logistical and financial challenges. While some may achieve 100% observer coverage, this does not necessarily equate to full monitoring of all fishing activities. For instance, in longline fisheries with 100% observer coverage, usually only a fraction of the hauled line is observed. Similarly, in fisheries where nets have a long soak period of days or weeks, measuring coverage by individual hauls is impractical. Is it therefore important to develop an understanding of how observer coverage is applied in practice, rather than focusing solely on numerical targets.

Remote Electronic Monitoring

Remote Electronic Monitoring (REM) is a system whereby data and video footage are acquired using GPS, sensors and CCTV cameras, and is becoming an increasingly widespread tool for fisheries management as a means of compliance, improving data collection, and strengthening fishery sustainability. REM offers a way to ensure adherence to regulations while enabling transparency across vessels and the wider industry. REM is growing in popularity as it can be significantly cheaper than observers and provides the advantage of observation coverage 24 hours a day, 7 days a week.

To this end, there are a growing number of regulatory frameworks and guidelines that have been, and continue to be, developed to support the implementation of REM. This is most prevalent across large-scale fisheries operating in national or RFMO jurisdictions. In a 2024 review, WWF captured some of the standards that have been set for various REM programmes:

1. **The Forum Fisheries Agency**: Drafted standards covering REM hardware, data analysis, and data management
2. **European Union:** Created technical guidelines and specifications for REM application in EU fisheries[3]
3. **Spain:** Issued UNE 195007 Standard[4] *Electronic observation on fishing vessel,* detailing REM requirements
4. **Chile:** Issued national resolutions of technical standards for image recording devices on vessels
5. **United States:** Released multiple guidelines including the Northeast Multispecies Sector EM Standards, the Northeast Fisheries Science Centre EM Reviewer Guidance, and various region-specific electronic monitoring service plans.
6. **Scotland:** Recently published an Invitation to Tender: "*Modernisation of Scotland's Inshore Commercial Fishing Fleet Framework"* whereby Marine Scotland is initiating modernisation efforts for its inshore fishing fleet.
7. **New Zealand:** Updated their Fisheries (Electronic Monitoring on Vessels) Regulations in 2023, and the Ministry for Primary Industries published an Invitation to Tender: *"On-board cameras",* looking for service providers to supply, install, maintain and support EM solutions on an initial subset of the commercial fishing fleet that presents the highest risk of interactions with Māui dolphins.

[3]https://www.efca.europa.eu/sites/default/files/Technical%20guidelines%20and%20specifications%20for%20the%20implementation%20of%20Remote%20Electronic%20Monitoring%20%28REM%29%20in%20EU%20fisheries.pdf

[4] https://www.une.org/encuentra-tu-norma/busca-tu-norma/norma/?c=N0066627

8. **Australia:** Published an Invitation to Tender: *"Exploration of Electronic Monitoring Services"* to identify market capability and capacity, and understand costings, outlining its REM programme through industry-targeted communications.
9. **ISSF:** Set minimum standards for longline and purse seine fisheries[5]

This is not a comprehensive list and a number of RFMOs such as IOTC and ICCAT have also recently brought out their own sets of standards. REM is a recent yet rapidly evolving area, and understanding the current landscape is key to identifying best practices for future applications.

[5] https://www.iattc.org/GetAttachment/e72d12bb-88ed-419f-93fe-3bb4303b4133/WSEMS-03-MISC_ISSF-Minimum-Standards-Electronic-Monitoring-Systems-in-Tropical-tuna-purse-seine-and-longline-fisheries.pdf

3 Methodology

This study investigated the information verification processes and observer/REM coverage levels in fisheries worldwide. A list of 53 fisheries was developed, primarily consisting of those provided by the MSC and sourced from the MSC Track a Fishery search engine. A desk-based review was then conducted, broken down into three tasks:

- Task 1: Desk-Based Review of Fishery Monitoring Programmes
- Task 2: Collating Observer and REM Coverage Data
- Task 3: Characterisation of Monitoring Programmes

Task 1: Desk-Based Review of Fishery Monitoring Programmes - Data gathering and identification of monitoring practices.

The first task involved conducting a desk-based review of monitoring practices across selected fisheries. For each fishery, the following parameters were assessed:

1. **Operational Zone:** Each fishery was classified according to its operational zone(s). This included Inshore (within 12nm of the coast), Exclusive Economic Zones (EEZs), or High Seas. This provided a foundation for understanding how the fishery's scope influences its monitoring programmes and regulatory oversight.
2. **Geographic Area**: The broader geographic and jurisdictional context for each fishery was specified based on FAO area/subarea designations. This included FAO statistical areas and relevant Regional Fisheries Management Organisation (RFMO) jurisdictions. This information helped build an understanding of the extent to which fisheries were subject to national, regional or international monitoring and compliance frameworks.
3. **Scale**: Fisheries were classified based on vessel size and operational range. Fisheries were categorised as 'small scale' if most vessels were $\leq$15 metres in length, or the majority of fishing activity was completed within 12 nautical miles (nm) from the shore. 'Large scale' fisheries were therefore those that exceeded 15 m in length or operated beyond 12nm from the shore. Using this classification helped understand the resourcing for monitoring activities, which is known to differ based on operational scale.
4. **Gear Type**: Each fishery's gear types were specified as this is an important factor in determining the monitoring needs of a fishery, as different gear types present varying environmental impacts and, therefore, monitoring requirements and challenges. Some gear types also require greater resources in order to achieve the same coverage levels of fishing activity, such as three hauls in a day for a trawl fishery versus 20,000 hooks in a longline fishery.
5. **Management Agency:** The governing bodies responsible for setting and enforcing observer and REM coverage requirements were identified for each fishery. This included national authorities, regional organisations, or international regulatory agencies (e.g., RFMOs, national fishery departments). This helped delineate the regulatory environment which influences each fisheries monitoring requirements.
6. **Coverage Requirements**: The observer and REM coverage requirements were described. The observer coverage required was specified as a percentage, along with how this was applied, i.e. to a proportion of vessels within a fleet, or as a percentage of days of a fishing trip. This information laid the groundwork for understanding the mandated monitoring practices that each fishery was subjected to.
7. **Fishery Coverage**: This metric referred to the actual level of observer or REM coverage within each fishery, recorded as a percentage. This was either reflected as

a proportion of fishing events or trips, or a proportion of the fleet, that was monitored by observers or REM systems, as compared to mandated coverage requirements.

8. **Logbook – Reporting Requirements:** The mandated requirements and the management agencies responsible for enforcing them (e.g. local ministries and authorities, state requirements, broader international frameworks or RFMOs) were identified. When available, specific reporting parameters were detailed, including:
    - Type of data recorded: Landings, discards, bycatch, ETP interactions, fishing effort;
    - Reporting frequency: Required submission intervals (e.g. daily, per trip, weekly etc);
    - Reporting method: The format used to record logbook data (e.g. paper logbooks, e-logbooks).

    It was anticipated that this information would be consistently available amongst the fisheries however, collecting a baseline dataset provided insights into the diversity of reporting obligations and the extent of standardisation across different management agencies.
9. **Logbook – Reporting Protocols:** Where reporting was documented, the extent to which fisheries adhered to, or exceeded regulatory requirements, was evaluated. Cases where fisheries fell short or demonstrated higher levels of compliance were noted. This allowed for an understanding of what can realistically be implemented, and whether fisheries perceived additional benefits from more comprehensive reporting, potentially leading to voluntary improvements in data collection a fleet-wide consistency in reporting protocols.
10. **Logbook – Third-party Verification:** The presence or absence of external verification processes was determined. Where applicable, the role of third-party entities and their purposes, such as fishing port personnel for enforcement, scientists for ongoing research, management agencies for compliance monitoring, was documented. Additionally, when available, the frequency of logbook submissions to third-party agencies was recorded to provide insight to the level of robustness of the verification processes.
11. **REM fisheries – REM Review Rates:** Mandated requirements for REM were documented. For the purpose of this assessment, REM was defined as onboard visual monitoring systems, such as use of CCTV, to record fishing operations. VMS, though a form of electronic tracking, did not fall under this definition, as its primary function is for geospatial analysis of fishing activity and evaluation of fishing efforts, rather than direct fisheries monitoring and compliance verification.
12. **REM fisheries – REM Review Protocols:** Where REM systems were in place, the review protocols were described, such as the personnel responsible for REM footage analysis, whether data was cross-referenced with other monitoring tools such as logbooks, observer reports or port inspections and if the footage was submitted to regulatory authorities.

Each fishery was categorized in a table according to the abovementioned criteria. The fisheries were grouped by Europe, Oceania, Asia, Africa, Americas and RFMOs to facilitate cross-regional comparisons, and provided a foundation for further analysis in the subsequent tasks.

Task 2: Observer and REM coverage data review and analysis.

The data from Task 1 was collated into a comprehensive table to enable a comparative analysis across the various fisheries. Each fishery's information was recorded in a tabular

format that distinguished between mandated coverage levels (as per regulatory requirements) and actual implemented coverage (as reported by the fishery). The metric used to determine observer coverage (e.g. percentage of fishing trips, days at sea, or gear deployments monitored etc), was also documented for a better understanding of their implementation. This enabled a direct evaluation of the extent to which fisheries adhered to monitoring requirements.

For fisheries using REM systems, additional data on coverage levels and review protocols were also assessed to determine the effectiveness of REM as a monitoring tool.

This analysis allowed for a comparison of observer and REM coverage levels against regional, operational, and gear trends, finding patterns in monitoring capacity and effectiveness. Additionally, it provided insights into REM as a monitoring tool and how coverage varies by management agency and fishery scale. This was subsequently used to identify what factors influence the implementation of effective monitoring programs.

Task 3: Characterisation of Monitoring Programmes – Analysis of Objectives and Effectiveness

The third task looked into the broader objectives of observer and REM programmes in each fishery. The specific aims of monitoring programmes were identified to determine how their objectives vary depending on management agencies, regulatory frameworks, conservation priorities, and fishery management needs. From this, observer and REM programmes were assessed to determine whether their design adequately addresses particular management or conservation concerns, and how these objectives influenced the scope and implementation of monitoring activities.

The outputs from Tasks 1 and 2 allowed for a comparative analysis of coverage levels and practices across fisheries, management agencies, regions, gear types and fishery scales. This included evaluating common gaps in implementation as well as highlighting best-practice examples from fisheries with effective observer or REM programmes.

To assess the effectiveness of monitoring programmes, observer and REM data across fisheries was evaluated, as well as the extent to which this data was verified and assessed for additional purposes. The analysis also considered regional and fishery-specific challenges that may influence implementation pressure and feasibility, and how conservation and management priorities influence monitoring design. Together, this provided an evaluation of how observer and REM programmes are structured and their effectiveness in achieving conservation and management objectives.

4 Results

4.1 Fishery Monitoring Programmes: Design and Objectives

4.1.1 Europe

A total of 13 European fisheries were investigated. A summary of observer coverage, REM presence, and logbook verification across these fisheries is provided in Table 1.

The observer coverage requirements for the European fisheries investigated in this study were not always apparent. While coverage requirements for the fisheries jointly managed under RFMOs were more readily available, for the fisheries managed solely by national authorities it was not possible to determine their observer coverage requirements, due to a lack of accessible information.

Table 1. European fisheries observer coverage and presence/absence of remote electronic monitoring and logbook verification.

Fishery	Observer coverage	REM	Logbook verification
North Atlantic albacore artisanal fishery	2.05% (Troll); 3.28% (Pole-and-line).	Yes	Yes
Cantabrian Sea purse seine anchovy fishery	1.3% of trips.	Yes	Yes
Western Asturias Octopus Traps Fishery of Artisanal Cofradias	1.1% of fishing days.	No	No
Venetian Wild Harvested Striped Clam	None.	No	Yes
SATHOAN French Mediterranean Bluefin tuna artisanal longline and handline fishery	1.7% (2022-2023).	No	Yes
FISF Faroe Islands North East Arctic cod, haddock and saithe	<1% (Low/ unknown).	No	Yes
Norway North East Arctic cod	5% (for the Russian segment of the fishery). Reference fleet, not observers, used in Norwegian segment.	No	Yes
ISF Icelandic summer spawning herring trawl and seine	Unknown, described as ‘low’	No*	Yes
North Sea brown shrimp	None.	No	Yes
Scottish Fisheries Sustainable Accreditation Group (SFSAG) Rockall haddock	Annual days observed ranged from 17-38 p.a. between 2014 to 2021. Not able to calculate coverage with no total days fished.	No	Yes
Wash brown shrimp	Under 5% (13 trips between 2015 and 2017).	No	Yes
Barents Sea cod, haddock and saithe	100% in the Russian fishing zone, 5% in the fishery as a whole	No	Yes

Fishery	Observer coverage	REM	Logbook verification
Curonian Lagoon perch	Unknown	No	Partial**

* Drones are used to monitor the vessels closer to shore to pick up anomalies such as discarding

** Unclear how systematic this is, report states '…logbooks can be checked at any time.'

Observer Coverage

Observer programmes were present in 10 of the 13 European fisheries assessed, though coverage levels were not given in two of them, they were just described as low. The highest overall observer coverage was found in the North Atlantic albacore artisanal fishery, where troll and pole-and-line vessels had rates of 2.05% and 3.28%, respectively. In most cases, where it could be calculated, observer coverage ranged between <1% to 3.2%. The Barents Sea cod, haddock, and saithe fishery was the only case where 100% observer coverage was required in specific circumstances—namely when vessels operate within Russian waters (LRQA, 2022a). Coverage rates for the fishery as a whole are given as 5%, although the metric used to calculate this is not specified (UCSL, 2024). The Norway North East Arctic cod fishery, also in the Barents sea, is similarly managed by both Norwegian and Russian agencies. Russian vessels have approximately 5% coverage, while the Norwegian segment is covered by a reference fleet. The Norwegian Reference Fleet is a group of fishing vessels that provide the Institute of Marine Research (IMR) with detailed catch and effort data to support stock assessments and fisheries management. Established in 2000, the fleet includes high-seas and coastal vessels that monitor commercial catches, bycatch, and biodiversity using research vessel-like sampling methods. The fleet also facilitates additional data collection and fosters collaboration between researchers and the fishing industry.

The FISF Faroe Islands Northeast Arctic cod, haddock, and saithe fishery mandates 100% observer coverage for vessels operating in Russian waters but has no such requirement for those fishing in Norwegian waters. In 2019, the fishery reported 200 observer days but does not provide the total number of fishing days, preventing calculation of an overall coverage rate (DNV Business Assurance, 2023). This issue is also observed in the SFSAG Rockall haddock fishery, where only total observer days are reported without reference to overall fishing effort (Control Union (UK) Limited, 2023).

A common pattern among fisheries with observer programmes is that coverage often falls below management authority requirements. Among the 13 fisheries examined in this category, eight stated the purposes for observer coverage as the following:

- Four had observer programmes for scientific data collection;
- One had observer coverage primarily for compliance monitoring; and
- Three reported a combination of scientific and compliance monitoring.

Logbook and Self-Reporting Requirements

Logbook reporting is a standard requirement across all 13 European fisheries assessed. In all cases, common practice for logbooks includes information on catch composition, gear type, and fishing location. Some fisheries also require the reporting of discarded species, while others make no mention of discards. Purse seine fisheries, such as the Cantabrian Sea purse seine anchovy fishery, specifically include reporting requirements for slipping events (the release of dead or dying fish).

Verification of Logbook Data

Third-party verification of logbook data was reported in 12 out of the 13 fisheries assessed. The most common method of verification involved cross-checking logbooks against sales records, typically conducted by port inspectors or government authorities. Only two fisheries utilised paper logbooks and were only used by a part of the fleet, while the rest use e-logbooks. However, whether this verification occurs at every landing event or at a particular frequency is unclear. Verification in the Curonian Lagoon perch fishery was unclear, while vessel captains have to complete logbooks on a set by set basis and submit them to the relevant authorities it was only stated that '…logbooks could be checked at any time'. (UCSL United Certification Systems Limited, 2023). The Western Asturias Octopus Traps Fishery assessment report made no specific mention of logbook verification.

Remote Electronic Monitoring

Two fisheries were found to use REM in Europe. The Cantabrian Sea purse seine anchovy fishery reported to use REM on board four vessels between April 2022 and May 2024, with a total coverage of 2.7% in 2023. Results from the REM suggest the purpose is to monitor bycatch, discards and interactions with ETP species (Morant and Ríos, 2025). The North Atlantic albacore artisanal fishery also use REM. A pilot study conducted in 2019 compared the effectiveness of REM against physical observers, demonstrating consistent results between the two monitoring methods in terms of catch composition, bycatch species, size frequencies, and interactions with ETP species. In 2020, due to the COVID-19 pandemic, the fishery transitioned to full REM coverage for both the trolling and live bait fleets. The system enabled detailed analysis of fishing activity, including vessel location, fishing operations, and catch handling. Observations from REM indicated high selectivity in the fishery, with albacore making up over 99.8% of retained catches (Bureau Veritas Certification Holding SAS, 2021).

4.1.2 Oceania

Four fisheries were reviewed within the Oceania region, three of which operate within Australia and one in New Zealand. These include the Australia orange roughy (eastern zone trawl) fishery, the Australia southern bluefin tuna purse seine fishery, the Western Australia octopus fishery, and the New Zealand hake, hoki, ling, and southern blue whiting fishery. They represent mostly large-scale operations, with the Western Australia octopus fishery as the only small-scale reference.

Table 2. Oceania fisheries observer coverage and presence/absence of remote electronic monitoring and logbook verification.

Fishery	Observer coverage	REM	Logbook verification
Australia orange roughy eastern trawl zone (MRAG Americas Inc., 2025a)	~50% of trips	Yes	Yes
Australia purse seine southern bluefin tuna (MRAG Americas Inc., 2025b)	11.1% average (12.6% of shots in 2021; 9.6% of shots in 2022)	No	Yes
Western Australia octopus (Bio-inspecta, 2024)	None	No	Yes

New Zealand hake, hoki, ling and southern blue whiting (LRQA, 2025a, 2025b, 2025c)	54.7%* (trawl) – 13.4%* (longline) of tows**	Yes	Yes

*Fisheries New Zealand consider 30% sufficient for most fisheries
**There is also 100% dockside monitoring

Logbook and Self-Reporting Requirements and Verification

The four fisheries all utilise logbooks to record daily catch data and reporting requirements are clearly stated for each. The information captured includes catch and effort data by species caught and weight, operational data such as date, location, and gear type, as well as any ETP interactions. Some form of third-party verification of logbook data is conducted in each fishery. The Australian orange roughy fishery employs dockside verification as catches are offloaded and the Australian Fisheries Management Authority (AFMA) regularly analyse logbooks and catch disposal records against fish receiver records. In the southern bluefin tuna fishery, the Department of Agriculture, Fisheries and Forestry (DAFF) submits annual monitoring, control and surveillance reports to CCSBT, which contain details on both retained and non-retained catch, observer coverage, VMS use and other compliance activities. The New Zealand fisheries differ slightly in that logbooks are mainly reviewed by onboard observers, but supplemented by verification during in-port inspections. The verification method for logbooks in the Western Australia octopus fishery is less robust with solely data on the whole weight of octopus catch being analysed annually by the Department of Primary Industries and Regional Development (DPIRD).

Observer Coverage

The orange roughy fishery mandates 100% observer coverage for the first 3 trips for that vessel - lowering to 50% thereafter if they meet certain criteria (discard threshold). The southern bluefin tuna fishery requires a minimum of 10% observer coverage, which was achieved in 2021 with 12.6%, however in 2022 the fishery was just below this requirement at 9.6%. The New Zealand fisheries have a target coverage of 30% for hake, hoki, and ling, and 100% for southern blue whiting. Actual observer coverage rates vary between 30% and 100% depending on the species, stock and year. For example, in 2020-21 the hake, hoki, ling and southern blue whiting fisheries had respective observer coverage rates of 46%, 37%, 48% and 77%. No specific observer coverage information is provided for the Western Australia octopus fishery.

Remote Electronic Monitoring (REM)

The orange roughy fishery has approximately 52% of its landed catch covered by CCTV during port monitoring and is expected to trial on-board cameras in 2025. The southern bluefin tuna fishery has no apparent REM usage however it does employ compulsory VMS usage. The New Zealand fisheries also employ mandatory VMS with ongoing implementation of REM cameras. Fisheries New Zealand have been installing on board cameras on vessels of various high-risk fisheries since August 2023 for more accurate monitoring of bycatch, discards and general fishery compliance. By March 2025, all bottom longline vessels and all trawl vessels less than or equal to 32 metres in LOA, fishing in any area of the New Zealand EEZ, will be equipped with cameras (New Zealand Government 2017). No REM requirements are currently specified for the Western Australia octopus fishery.

4.1.3 Asia

A total of eight fisheries were reviewed in this region, covering Southeast Asia, Japan, and Russia. Of these, three are located in Southeast Asia (Indonesia, the Philippines, and

Vietnam), three in Japan, and two in Russia. They primarily operate within EEZs or inshore waters, just two Japanese owned tuna fisheries, the Kyowa-Meiho Japan skipjack and yellowfin purse seine fishery, and the Kochi and Miyazaki offshore pole-and-line fishery, extend into the high seas.

Table 3. Asia fisheries observer coverage and presence/absence of remote electronic monitoring and logbook verification.

Fishery	Observer coverage	REM	Logbook verification
Indonesian pole-and-line and handline fishery for skipjack and yellowfin tuna of Western and Central Pacific archipelagic waters (Global Trust Certification, 2025a)	~2% of trips observed.	Yes	Yes
Philippine small-scale handline yellowfin tuna (SCS Global Services, 2024a)	None mentioned.	No	Yes
Vietnam hand gathered Ben Tre clam (Control Union (UK) Limited, 2024e)	None (Guards on-site broodstock areas).	No	Yes
Kochi and Miyazaki Offshore Pole and Line Albacore and Skipjack (Control Union (UK) Limited, 2025)	None.	No	Yes
Maruto Suisan rope grown Pacific oyster (Control Union (UK) Limited, 2024f)	None.	No	Yes
Kyowa-Meiho Japan skipjack and yellowfin tuna purse seine (SCS Global Services, 2024b)	100% of trips.	No	Yes
Tymlat Karaginsky Bay salmon (MRAG Americas Inc., 2024a)	None.	No	Yes
Bratsk Reservoir perch (UCSL United Certification Systems Limited, 2023)	None.	No	Yes

Observer Coverage

Observer coverage requirements vary significantly across the fisheries. The Kyowa-Meiho Japan skipjack and yellowfin purse seine fishery maintains 100% observer coverage, ensuring comprehensive monitoring of fishing activities. The Indonesia pole-and-line fishery consists of 20 separate UoAs with different levels of monitoring (through observer, port sampling and video) given for each one. For at sea observations, these range from 0.04% up to 64%, across the fishery as a whole the coverage is around 2%. There are some UoAs that have no at sea observation and are only covered through dockside monitoring. In the Vietnam Ben Tre clam fishery, on-site guards are stationed at designated broodstock areas to monitor fishing activities at all times, rather than employing formal observer programs. For the remaining fisheries, no explicit observer coverage requirements or data on observer implementation were reported, this is mainly due to the vessels being too small to carry an observer or the fishery having no vessels at all.

Logbook and Self-Reporting Requirements

Logbook reporting is mandatory for all fisheries except for the Maruto Suisan oyster fishery in Japan, which only maintains harvest records for traceability and food safety purposes. In the Indonesia pole-and-line fishery, logbooks are required for all fishing vessels exceeding five gross tons, with an electronic logbook system (e-PIT) used to record catch and landing data. Paper logbooks are also used and verified by fishing port personnel. In the Philippine handline yellowfin tuna fishery, logbooks documenting catch and effort data must be submitted monthly to the Bureau of Fisheries and Aquatic Resources (BFAR) for review. The Vietnam Ben Tre clam fishery requires daily logbooks that record the catch of all retained species, interactions with ETP species, and fishing locations. These records are regularly reviewed by scientists for ongoing research.

In Japan, the Kochi and Miyazaki offshore pole-and-line fishery mandates logbook reporting, which includes catch and effort data as well as bycatch, although bycatch reporting remains inconsistent. Logbooks from this fishery are verified by the cooperative upon landing and submitted to the Japan Fisheries Agency (JFA) within ten days of the fishing trip. The Kyowa-Meiho Japan purse seine fishery requires logbooks for every fishing set, with mandatory data reporting that includes vessel details, departure and arrival ports, transhipment activities, set locations, species-specific catch weight, discards, and interactions with ETP species. These logbooks must be submitted daily to the Western and Central Pacific Fisheries Commission (WCPFC). In Russia, the Tymlat Karaginsky Bay salmon fishery has mandatory logbook reporting that records catch data and interactions with Russian red-listed species, which are checked by enforcement agencies during inspections. The Bratsk Reservoir perch fishery also mandates logbook reporting, requiring fishers to record catch weight by species and submit a summary of catch data to local authorities twice per month.

Third-party logbook verification practices differ among the fisheries. In the Indonesia pole-and-line fishery, paper logbooks are verified by fishing port personnel. In the Vietnam Ben Tre clam fishery, logbooks are regularly reviewed by scientists for research purposes. The Japan offshore pole-and-line fishery implements verification through cooperatives upon landing before submission to JFA.

Remote Electronic Monitoring

REM usage remains limited across these fisheries. In the Indonesia pole-and-line fishery, 0.5% of trips in Fisheries Management Areas (FMAs) 715 and 716 were reviewed via time-lapse cameras between 2018 and 2019. No data on REM implementation were reported for the other fisheries. A pilot study using video monitoring mechanisms was proposed for the Kochi and Miyazaki fishery, starting in November 2024 with all components installed by January 2025. This would be primarily to monitor seabird interactions, however it is unclear what progress has been made.

Challenges in observation and data collection persist across the reviewed fisheries, particularly in small-scale operations. Stakeholder discussions highlighted financial constraints, geographic distances, and limited observer availability as key barriers to achieving adequate observer coverage in the Indonesia pole-and-line fishery. The Japan purse seine fishery demonstrates the most rigorous monitoring and reporting framework, with 100% observer coverage and daily logbook submissions to WCPFC.

4.1.4 Africa

A total of three MSC certified fisheries were reviewed in this region, all of which were based in the South Africa region – the South African hake fishery, the Namibian hake fishery and Tristan de Cunha rock lobster fishery. These fisheries are a combination of large (Namibian hake) and small scale (rock lobster) and in the case of the South African hake fishery, include both large and small sectors.

Table 4. Summary of observer coverage, REM and logbook verification for fisheries around Africa.

Fishery	Observer coverage	REM	Logbook verification
Namibia hake trawl and longline fishery	100% (trawl), 48% (longline) by trip	No	Yes
South Africa hake trawl	9% offshore days, 6% inshore days	Trial	Yes
Tristan da Cunha rock lobster	100% of trips	No	Yes

Observer Coverage

Observer coverage varies from 100% to less than 1% depending on the metric used. The Tristan Fisheries Department maintains a policy of 100% Sea Fishery Observer coverage on all vessels licensed to fish within Tristan's EEZ, though this was impacted by COVID-19 in 2020. The rock lobster fishery operates with a single vessel using baited traps and hoop nets. In contrast, the Namibian hake trawl and longline fishery has observer coverage of 100% and 48% (in terms of trips) for the trawl and longline fleets, respectively.

In Namibia, the Fisheries Observer Agency (FOA) administers and manages the observer programme. The mandate of FOA is strictly to observe, record, and report, with no enforcement powers[6]. Non-compliance issues recorded by observers are reported to the Directorate of Operations in the Ministry of Fisheries and Marine Resources (MFMR) for further action, while scientific data collected is forwarded to the Directorate of Resource Management. All licensed commercial fishing vessels operating in Namibian waters are required to carry observers under the Marine Resources Act No. 27 of 2000 (MFMR, 2000), though exemptions may be granted through non-observer authorisation letters. These are typically issued when vessel size limits observer accommodation or when observer availability is constrained. The limited number of available observers (129) falls short of the 230 required for full coverage across all registered vessels, making 100% observer coverage impractical in certain cases (FOA, 2023).

Similarly, the South African hake trawl fishery, composed of both large offshore and small-scale inshore sectors, has varying observer coverage rates reported using different metrics. The small-scale inshore fleet and large-scale offshore fleet reportedly monitor 1–2% of trawls for invertebrates, 0.4–1% for large bycatch, and 1–4% for fish. The small-scale fleet also monitors 1% of trawls for seabird interactions with trawl warps, with overall observer coverage

[6] https://foa.com.na/what-we-do/

at 6% of seadays. The large-scale offshore deepwater fleet reports coverage at 9% of seadays and on 44% of vessels (Lloyd's Register, 2024).

While coverage data is provided for each fishery, mandated observer requirements are not always clearly stated. In some cases, self-monitoring and reporting are integrated into fishery management strategies for ETP species and habitat impacts, with third-party observers verifying compliance. This is achieved through the submission of e-logbooks on a monthly basis, reporting fishing dates, times, species codes, and identifications. The Department of Forestry, Fisheries, and the Environment (DFFE) uses this information to assess whether fleets comply with relevant regulations.

Remote Electronic Monitoring

None of these fisheries are required to employ REM. However, the South African hake fishery trialled its use with the specific objective of monitoring discarding practises and ETP interactions. Using on board cameras, the pilot was then able to effectively monitor 23% of the catch from a single trip, compared with the 2% that was covered by an on-board human observer. Moreover, there has been early success in using machine learning to detect seabird strikes on trawl wraps, and an automated system to detect tori lines has been prototyped.

4.1.5 Americas

A total of thirteen MSC-certified fisheries were reviewed in the Americas region, three of which are located in South America and ten in North America. All of the South American fisheries are located in the Atlantic Ocean, whereas the locations of the North American fisheries are more diverse, spread across the Pacific Ocean, the Gulf of California, inland freshwater, Gulf of Mexico and the remaining five are located in the Atlantic Ocean. These fisheries are all operating within EEZs, with a select few (menhaden, seabob shrimp and Argentine red shrimp) operating exclusively within coastal waters. In addition, there is a fairly even split of large-scale and small-scale fisheries.

Table 5. Americas fisheries observer coverage and presence/absence of remote electronic monitoring and logbook verification.

Fishery	Observer coverage	REM	Logbook verification
Alaska salmon (MRAG Americas Inc, 2024b)	None.	Yes (2025/2026)	Yes
US west coast limited entry groundfish trawl (MRAG Americas Inc, 2024c)	100% of trips (federal vessels), 40% of trips (Makah tribe vessels).	Yes	Yes
US Atlantic surf clam and ocean quahog (SCS Global Services, 2022 and 2024c)	2% of trips.	No	Yes
US Gulf of Mexico menhaden (Global Trust Certification Ltd, 2024a)	None.	Yes	No
US Atlantic spiny dogfish, winter skate and little skate (MRAG Americas Inc, 2023 and 2025c)	15% of gillnet and bottom trawls; 4.3% for longline	No	No

Maritime Canada inshore lobster trap (Global Trust Certification, 2021 and 2025b)	1% of trips in LFAs 33, 34 and 35.	No	Yes
Cedar lake walleye and northern pike (LRQA, 2022b and 2024b)	None.	No	No
Canada Atlantic halibut (Global Trust Certification Ltd, 2024b)	4.3% of landings, 0.9% of trips. 92% dockside monitoring in 2022.	No	Yes
Sonora, Gulf of California small pelagics (SCS Global Services, 2023)	18.3% of trips (2023-2024).	No	Yes
The Bahamas spiny lobster (Control Union (UK) Limited 2024g)	Dockside observer study in 2017 – minimal % coverage.	No	No
Suriname Atlantic seabob shrimp (LRQA, 2022c and 2024c)	Below 1% (1 observed trip per quarter).	No	Yes
Chile austral hake trawl and longline (Global Trust Certification, 2023)(SAI Global, 2019)	83% of trips (66.5% of trawls; 100% of longline); and 100% dockside monitoring.	Yes	Yes
Argentine red shrimp coastal trawl in Chubut province (OIA, 2025)	299 hauls observed (voluntary). 15% of hauls (mandatory).	No	No

Logbook and Self-Reporting Requirements

All American fisheries analysed have some form of mandatory logbook reporting requirement, except for Cedar Lake walleye and northern pike, which operates slightly differently. In this example, catch is recorded through commercial landings and an index netting program. Commercial fishers must report catches sold through dealers using a Fish Purchase Form, which is distributed to multiple parties, including the government. Index netting is conducted annually in the Southeast Basin and every three years in the Northwest Basin to monitor fish populations, particularly walleye. This program provides some insight into discarded catch, as the commercial fishery does not report non-landed or non-saleable fish (Pierre et al., 2023). The Alaska salmon fishery[7] only mandates reporting for the gillnet portion of this fishery. Of the fisheries that do require logbook reporting, the data generally includes catch and effort data as a minimum, though application and additional information collected varies. In the case of the Bahamian spiny lobster fishery, catch reporting only applies to foreign vessels fishing within the Bahamian EEZ. Section 10 of the governmental Fisheries Act (2020)[8] mandates survey and data collection through logbook compliance, where data is usually collected on paper logbooks and subsequently entered to an electronic data management system (FISMIS). These data must contain at a minimum the vessel position and catch on board prior to entry and departure of the EEZ, port, and any closed areas. The two Canadian fisheries, the Maritime Canada inshore lobster trap fishery and Canada Atlantic halibut, further report on lost gear, as well as ETP species interactions through the mandated additional Species at Risk Act (SARA) logbooks and marine mammal interaction forms provided by the Department

[7] https://www.fisheries.noaa.gov/alaska/resources-fishing/alaska-recordkeeping-and-reporting-logbook-logsheets

[8] https://img1.wsimg.com/blobby/go/3cc51733-d4fe-4572-b5fa-01fb8ab0ebdb/downloads/Fisheries%20Act%202020.pdf?ver=1655850445264

of Fisheries and Oceans (DFO). These additional logbooks are mandatory for both fisheries, although return rates are not fully representative of this, with only 69% compliance for halibut and 1%-81% for lobster – the latter varying greatly depending on the lobster fishing area (LFA) from which catches are reported. The Suriname Atlantic seabob fishery is required to report all ETP and marine mammal interactions and monitor bycatch and ecosystem impacts. The Argentine red shrimp coastal trawling fishery also provides supplementary information, as the Province states in Resolution N° 525/2022 that unwanted catch found in fishing gears or destined for the crew shall be reported in Electronic Fishing Reports.

Eight out of the thirteen fisheries have integrated third-party verification of logbooks into their management procedures. The US west coast groundfish fishery federal vessels report logbook data to the PacFIN database managed by the Pacific States Marine Fisheries Commission (PSMFC) and the Makah vessels submit logbook data to the Northwest Indian Fisheries Commission (NWIFC), however information on the frequency of data submission is unclear. Additionally, the Surinamese Atlantic seabob shrimp fishery and Chilean austral hake fishery have their logbooks reviewed by the relevant fisheries management authorities. The Chile hake fishery is required to fill out an eLogbook after each fishing haul, documenting catch, discard and bycatch information, which is submitted to the National Fisheries Service. The fishing log is also used to provide additional information to support certification of the catch at landing, where catch data is verified. The small pelagics fishery in Sonora, Gulf of California and the Chilean austral hake fishery are the only American fisheries reviewed that have logbooks verified by on-board observers.

Observer Coverage

Observer coverage varies from 5.9% to 100% for the fisheries with mandatory observer coverage. In contrast, observer coverage for the fisheries with no mandatory requirement varies from 0% to 68%. The fishery pulling this range up to 68% observer coverage is the Chilean austral hake fishery. The voluntary observer programme is managed by the Institute of fisheries development (IFOP) and its primary aim is to monitor ETP species interactions within the fishery, which is supplemented by 100% dockside monitoring by Servicio Nacional de Pesca (SERNAPESCA) agents. Observer coverage targets, in the context of MSC certification, sets monitoring objectives that fisheries must meet to maintain certification, which differ from legally mandated coverage requirements that may be lower or less comprehensive. Of the five fisheries with mandatory observer coverage and clearly defined targets, only two met their targets according to the most recently available data. These were the US West Coast limited entry groundfish trawl fishery and the Argentine red shrimp fishery, meeting their respective targets of 100% (20% for Makah tribe vessels) and 10% observer coverage.

The US groundfish trawl fishery observers collect information on the size of catches, and the proportion of bycatch, which are available to verify vessel reported bycatch. The Argentine fishery deploys a Provincial On-Board Observer Programme from the Secretary of Fisheries of Chubut, and a Private On Board Observer Programme, to record ETP interactions, notably Chondrichthyes. All vessels are required to have an observer to monitor such interactions and ensure shark finning does not take place. The two fisheries that did not meet their coverage targets were the US Atlantic spiny dogfish, winter skate and little skate fishery and the Canadian Atlantic halibut fishery. Respectively, actual observer coverage for these fisheries fell short and were reported as 19% and 4.3%. Although the small pelagics fishery in Sonora, Gulf of California had not met their target coverage of 20%-30% in 2022 (averaging 9.7% from

2017-2022), the level of coverage for the 2023-2024 season had risen to 18.3% and ongoing efforts are being made to train more observers for this fishery (SCS Global Services 2025). Observer programs such as the NAFO observer scheme and Northeast Fisheries Observer Program (NEFOP) are present within the Canadian inshore lobster trap fishery and the US Atlantic surf clam and ocean quahog fishery respectively. However, due to the nature of these fisheries' low discard fractions, as well as larger scope of the programs, target observer coverage (although not detailed) and observer deployment priority is relatively low. In reflection of this fact, actual observer coverage was 1% in only LFAs 33, 34 and 35 for the lobster fishery, and 0.5-2% for the surf clam and ocean quahog fishery.

Observer coverage in the Alaskan salmon fishery is slightly more nuanced in that observer programs have not run specifically for this fishery since 2013, however observations of salmon bycatch are still indirectly monitored and recorded through the broader North Pacific observer program in place for groundfish and halibut and facilitated by NMFS. In addition to this, NMFS is set to reinstate the Alaska marine mammal observer program (AMMOP) within the next one to two years, which focuses on the driftnet and gillnet gear types. Although this is positive news, historical data from the AMMOP shows highly variable and inconsistent observer coverage throughout the fishery. Similarly, the Suriname Atlantic seabob shimp fishery operated an observer program from 1998-2020 and has begun reimplementation.

The recent Seabob Management Plan 2023-20[9] requires observers from the Directorate of Fisheries to deploy observers at random, aiming for one observed trip per quarter – with two observers. These observers record the date, time and areas fished, as well as the catch composition and weight, and discarded and retained species. In 2024, the fishery ran all year round with 18 licensed vessels. Typically, trip duration is 6-8 days long, which would result in an observer coverage percentage below 1% through extrapolation. Looking at other more nuanced fisheries, although the Bahamas spiny lobster fishery does not operate an observer programme, a study was conducted on lobster size-frequency distribution by dockside observers in 2017 with minimal percentage coverage.

There is currently no observer programme in the Gulf of Mexico purse seine fishery, although funding has been made available to start a programme specifically to monitor bycatch. This was due to start in 2024 and be short term, covering one 28 week fishing season, a proposed 2% of the fishery's total net sets per year. Despite the lack of a long-term observer programme, vessels in this fishery are required to accommodate an observer upon request. In addition to this, it is also worth noting that this fishery has a unique and highly selective approach to locating the target species, using spotter planes to identify schools of menhaden for the fishing vessels.

Remote Electronic Monitoring

As a whole, REM usage in the American fisheries investigated is low with only three of the fisheries currently making use of REM and one fishery set to introduce REM in 2025/26. Video cameras are the primary form of electronic monitoring used with the following review rates: 10% of hauls per trip for the US groundfish trawl fishery (noting that as of 2023, this includes only 10 shore based IFQ trawl vessels); 9.7% coverage during pilot EM study in 2022 for the US menhaden fishery; and 61% of images reviewed in 2022 for the Chilean austral hake

[9] https://seabob.sr/wp-content/uploads/2024/02/SEABOB_VMP_2023_-_20261.pdf

fishery. For the Chile austral hake fishery, EM is a requirement as per Resolution No. 3885 of SERNAPESCA, with requirements for camera location, height, direction and angle by fishery, type of vessel and fishing gear in fishing vessels, among others, which came into force in 2020[10].

4.1.6 RFMOs

A total of 10 fisheries and two transhipment programmes (both IOTC and ICCAT) were reviewed that fall under the jurisdiction of RFMOs. The specific RFMOs reviewed include ICCAT, IOTC, CCAMLR, CCSBT, WCPFC, IATTC and SPRFMO. All these fisheries are large-scale and largely take place in the high seas and to some extent within the EEZs of some countries. Gears used within the fisheries assessed include longline, purse-seine (FADs and free school), pole-and-line and trawl, with the addition of a transhipment programme for ICCAT/IOTC/CCSBT and the ICCAT regional observer programme for bluefin that takes tuna from ranched farm cage operations.

Table 6. RFMO managed fisheries observer coverage and presence/absence of remote electronic monitoring and logbook verification.

Fishery	Observer coverage	REM	Logbook verification
SARPC toothfish	100% trips, 25% of the longline effort	No	Yes
Capsen & Grand Bleu Atlantic Ocean purse seine skipjack and yellowfin tuna fishery	87% for FAD sets and 46% for FSC sets between 2018 to 2022	Yes	Unknown
Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery	100% trips	Pilot	Yes
Echebastar Indian Ocean purse seine skipjack tuna	100% of trips and 91 % of all sets since 2022	No	Yes
Maldives pole & line skipjack tuna	Numbers of observed trips per year (1, 2, 54, 5, 7, 9, 0 trips per year respectively between 2017 - 2023).	Unclear	Unknown
Chilean Jack mackerel industrial purse seine fishery	22.3% of trips	Yes	Yes
Silla WCPO longline tuna fishery	1.87% trips	No	Yes
ICCAT / IOTC / CCSBT Transhipment Regional Observer Programmes	100% of transhipments	No	Yes
Aker Biomarine Antarctic krill	100% vessels and days fished.	Yes	Yes
ICCAT Regional Observer Programme (ROP) for Bluefin Tuna	100% of operations from capture to farm to harvest	Pilot	Yes

[10] https://sprfmo.int/assets/Meetings/SC/10th-SC-2022/SC10-Doc29-Electronic-monitoring-systems-in-Chile-CL.pdf

Fishery	Observer coverage	REM	Logbook verification
South Georgia Patagonian toothfish longline	100% of trips	Yes	Yes

Observer coverage

Observer coverage ranges from 100% to less than 1%, largely due to differing jurisdictional requirements. But in any case, all have some level of coverage. In the case of the Maldives pole & line skipjack tuna fishery, observer coverage was not reported as a percentage, but as a number of trips observed per year without a total number of unobserved trips for that year. All other fisheries report coverage as a percentage of days, fleet, or trips (Global Trust Certification Ltd., 2025c). For example, the Capsen & Grand Bleu Atlantic Ocean purse seine skipjack and yellowfin tuna fishery has 87% observer coverage for FAD sets and 46% for FSC sets between 2018 and 2022 (Control Union (UK) Limited, 2024b). These lower values are attributed to Covid, data collection errors, and equipment malfunctions, despite the RFMO's requirement for 100% observer coverage. This highlights how operational challenges can affect practical observer coverage despite regulatory requirements.

In the Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery, 100% of trips are observed (SCS Global Services, 2022a), as required by the IATTC, though practical observer coverage on sets is likely lower, as in other fisheries. The Echebastar Indian Ocean purse seine skipjack tuna fishery reports 100% observer coverage for trips and 91% coverage for all sets since 2022, reflecting the challenge of fully covering all fishing effort, despite 100% trip coverage. The Maldives pole & line skipjack tuna fishery reports numbers of observed trips per year (2017-2022), but without a total number of unobserved trips for that year, which makes it difficult to calculate exact coverage (Global Trust Certification Ltd., 2025c*)*.

The Chilean Jack mackerel industrial purse seine fishery reports 22.3% of trips observed, and is primarily monitored for scientific purposes, rather than compliance (Global Trust Certification Ltd., 2024c). This contrasts with the Silla WCPO longline tuna fishery, which reports only 1.87% observer coverage based on hooks, reflecting a very low level of observer deployment compared to other fisheries that use trip or set-based measurements (Control Union (UK) Limited. (2024a). Despite this, observers in the Silla fishery contribute supplementary information to logbook recordings, especially for interactions with sharks and endangered, threatened, and protected (ETP) species that are not recorded elsewhere.

The ICCAT / IOTC / CCSBT Transhipment Regional Observer Programmes are deployed to monitor 100% of transhipments in the High Seas, ensuring compliance across multiple RFMO jurisdictions. This demonstrates how observer programmes can be expanded beyond fishing operations to monitor transhipment activities, which are critical in international fisheries management.

In the Aker Biomarine Antarctic krill fishery, observer coverage is reported as 100% of vessels and days fished, but it is measured as days, since nets can remain in the water continuously for 1.5 to 2 weeks, making it impractical to monitor by set or haul (Lloyd's Register, 2024b). Similarly, the ICCAT Regional Observer Programme (ROP) for Bluefin Tuna requires 100% observer coverage of operations from capture to farm to harvest, which goes beyond traditional fishing operations and includes the entire supply chain, from fish capture to processing.

The South Georgia Patagonian toothfish longline fishery has 100% observer coverage on trips, but like other longline fisheries, the coverage of actual fishing effort (e.g., hauled longline) is likely lower in practice, though not explicitly mentioned (LRQA. (2024). This demonstrates the common issue in longline fisheries, where full trip coverage doesn't always equate to full effort coverage.

Remote Electronic Monitoring

The use of REM in fisheries under the jurisdiction of RFMOs is varied. Of the 10 assessed, four do not use REM, two have trialled it or conducted pilot projects, and four are actively implementing it.

Among the fisheries not using REM, all but one currently have 100% observer coverage in terms of trips (SARPC toothfish, ICCAT / IOTC / CCSBT Transhipment Regional Observer Programmes and the Eastern Pacific Ocean tropical tuna purse seine fishery). The exception is the Silla WCPO longline tuna fishery, which falls below the 5% observer coverage requirement.

The transhipment programme has 100% observer coverage and can monitor most transhipped fish products, in compliance with management rules. On the other hand, the SARPC toothfish fishery requires 100% observer coverage per trip, but in practice, observers monitor approximately 25% of hauled line, which is reported to the Terres Australes et Antarctiques Françaises (TAAF). This is a relatively high percentage and its primary purpose is to specifically facilitate accurate biological data collection, rather than compliance. The Eastern Pacific Ocean tropical tuna purse seine fishery does not currently have REM but may introduce an EMS specifically to provide external validation that shark finning is not taking place. The Silla WCPO longline tuna fishery, in contrast, remains below the minimum RFMO requirement however, it is stated that the fishery would implement REM if mandated by the Korean Ministry of Fisheries (Control Union (UK) Limited. (2024a).

Those fisheries that do use REM vary across objectives, gear types, regions and whether fishing takes place in the high seas or EEZs. In two of the four cases that REM is used, it is stated that the implementation of REM is specifically to achieve coverage requirements set out by the RFMO (Global Trust Certification Ltd., 2025c; Lloyd's Register, 2024b). These cases are the Maldives pole & line skipjack tuna fishery and the Aker Biomarine Antarctic krill trawl fishery. No further detail of why the Maldives pole & line skipjack tuna fishery uses REM was provided other than to achieve the required 5% coverage set by IOTC. The Aker Biomarine Antarctic krill fishery, on the other hand, not only states the purpose of the REM, but also the review protocol. This protocol explains that for vessels wanting to modify their gear using net monitoring cables, vessels must monitor interactions with sea birds, where observers randomly review 15-minute video segments to achieve 20% coverage of fishing time. The other cases where REM is used are in two purse seine fisheries, where the aim is to monitor for compliance with regulations on catches, discards and incidental catches. In the case of Echebastar Indian Ocean purse seine skipjack tuna fishery, REM also ensures compliance of using non-entangling FADs, and REM reviews are conducted annually, with verification by AZTI.

The last two fisheries of the 10 RFMO jurisdiction fisheries have utilised REM as pilot projects/trails. Both of these are tuna fisheries (Capsen & Grand Bleu Atlantic Ocean purse seine skipjack and yellowfin tuna fishery and ICCAT Regional Observer Programme (ROP) for Bluefin Tuna), covering purse seine, longline and cage operations for different purposes. The Atlantic purse seine skipjack and yellowfin fishery used an external service provider to analyse 14 trips across five vessels between March and August 2023 to evaluate vessel

activity, FAD usage, and ETP species interactions. The ICCAT ROP has implemented a REM trial with a pilot project underway to monitor 100% of harvesting operations to verify the 100% observer coverage conducted between November 2022 and May 2024. This pilot uses the same external service provider as the Atlantic purse seine skipjack and yellowfin fishery (Digital Observer Services (DOS)) to verify the footage. The project aimed to test Satlink's Seatube Nano+ REM system on bluefin tuna processing vessels to assess its ability to monitor crew interactions with hauled fish, using logbook data from two vessels for comparison.

Logbook and Self-Reporting Requirements

All the 'traditional' fisheries assessed under the RFMO category (bar the anomaly examples cited above) utilise logbooks and report them to the relevant jurisdiction authority, as a requirement of the RFMO. Typically, they all report the same kind of haul-by-haul data. This includes: vessel ID, time, location, species, quantities, effort, and in some cases discards. In all these cases, the predominant purpose of the logbooks is to monitor catches for scientific purposes but also to ensure compliance with regional rules/CMMs. Reporting of discarded catch to management agencies was identified in the Chilean Jack mackerel industrial purse seine fishery and the Silla WCPO longline tuna fishery, where it is a requirement under the relevant RFMOs (WCPFC and SPRFMO). However, for most other fisheries, the extent of discard reporting remains unclear. Third-party verification of logbook data is carried out in most cases (nine out of 11), though the organisations responsible for verification varies. This may be conducted by coastal state authorities such as AZTI in the Echebastar Indian Ocean purse seine skipjack tuna fishery, to observers such as in SARPC toothfish, port inspectors or RFMO secretariats, who reconcile landings declarations with logbook records.

4.2 Observer and REM Coverage Levels

Table 7 presents key information from the fisheries reviewed, including the fishery location, gear types deployed, observer coverage expressed as a percentage, the metric used to express this coverage, the programme purpose, REM review rate and whether a REM protocol is in place, i.e. is there an official programme in place or is it just being done on an ad-hoc basis. In a number of cases REM was being run as a pilot project, and this is indicated in the table.

The figures for observer coverage are highly subjective, in some cases they will refer to the most recent year, in others they will refer to an average across a number of years. Different metrics are used, and even within a fishery there can be different observation rates depending on the gear type or the particular element of the programme being sampled. The programmes have been broadly divided into whether they are science or compliance based, bearing in mind that observers should not have any powers to enforce at sea, only advise. Most observer programmes can be classified as scientific, for example the CCAMLR toothfish programmes, however the information they collect can be used at a later date for compliance purposes. Compliance programmes are used purely to monitor a fishery's compliance with operations, for example the transhipment programmes, with little or no scientific data being collected, however information from these can also be used for scientific purposes. There is however a grey area between the two, for the purpose of this table the categories have been split between them, except in cases where, for example, a scientific programme specifically mentions compliance elements where it is classed as both.

In most programmes there was more than one UoC, split by gear type, area or species. Where different coverage rates were defined by UoC these were split, and where a single coverage rate was defined for the fishery they were combined as a single unit.

In some fisheries it was not possible to get an accurate figure, with coverage described as ‘low’ or just a number of trips given. In these cases, a figure of 1% was used so the fishery would show up in the analysis and in any mapping carried out.

Figure 1 shows the level of observer coverage by fishery. These have been classified into categories that can be considered as no coverage, low coverage, medium coverage and high coverage. The locations given show the approximate area of the fishery and are for illustrative purposes only. In reality, the fishery will cover a larger area than that shown. It is apparent that the coverage in the Southern Hemisphere is higher than that in the Northern, this is due mainly to the nature of the fisheries, with the Southern Hemisphere programmes operating from fewer and larger vessels. Three of the programmes are managed under CCAMLR, which mandates 100% coverage in all its fisheries.

Figure 2 presents a similar map but for REM coverage. The categories here are divided between those that do and do not use REM and those that have had, or are currently operating, a pilot project.

Table 7. Global Fisheries Monitoring Programs: Observer and REM Coverage, Protocols, and Review Rates.

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
1	North Atlantic albacore artisanal fishery	EEZ / High Seas	Trolling Pole-and-line	2.05 3.28	D	Sc	3 (Pilot)	Certified
2	Cantabrian Sea purse seine anchovy fishery	EEZ	Purse seine	1.3	D	Sc	2.7	Certified
3	Western Asturias Octopus Traps Fishery of Artisanal Cofradias	EEZ	Trap	1.1	D	Sc	No	Certified
4	Venetian Wild Harvested Striped Clam	EEZ	Hydraulic Dredge	0	NA	NA	No	Certified
5	SATHOAN French Mediterranean Bluefin tuna artisanal longline and handline fishery	EEZ	Longline, handline	1.7	T	C	No	Certified
6	FISF Faroe Islands North East Arctic cod, haddock and saithe	EEZ	Demersal rock-hopper trawl	1***	D	C	No	Certified

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
7	Norway North East Arctic cod	EEZ / High Seas	Trawl, longline, gillnet, Danish seine, hook and line	1***	NA	NA	No	Certified
8	ISF Icelandic summer spawning herring trawl and seine	EEZ	Mid-water trawl	0	NA	Sc	No	Certified
9	North Sea brown shrimp	Inshore	Beam trawl	0	NA	NA	No	Certified
10	Scottish Fisheries Sustainable Accreditation Group (SFSAG) Rockall haddock	EEZ / High Seas	Single / twin nephrops trawl, demersal trawl, Danish seine, Pair seine-trawler.	1***	D (without total)	Sc	No	In-transition to MSC
11	Wash brown shrimp	Inshore	Beam trawl	1***	D (without total)	NA	No	Certified
12	Barents Sea cod, haddock and saithe	EEZs	Otter trawl	5 100	D	B	No	Certified
13	Curonian Lagoon perch	Inland	Gillnet	0	NA	NA	No	Suspended

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
14	Australia orange roughy - eastern zone trawl	EEZ	Otter trawl	50	T	Sc	52 (Pilot)	Certified
15	Australia southern bluefin tuna purse seine fishery	EEZ	Purse seine	11.1	Se	B	No	In Assessment
16	Western Australia octopus	EEZ	Traps	0	NA	NA	No	Certified
17	New Zealand hake, hoki, ling and Southern blue whiting	EEZ	Midwater trawl	54.7	Tw	Sc	Yes (Unknown)	Certified
		EEZ	Longline	13.4	Ho	Sc	Yes (Unknown)	
18	Indonesia pole-and-line and handline, skipjack and yellowfin tuna of Western and Central Pacific archipelagic waters	EEZ	Pole and line, handline	2	T	Sc	0.5	Certified
19	Philippine small-scale yellowfin tuna (*Thunnus albacares*) handline fishery	EEZ	Handline	0	NA	NA	No	Certified
20	Vietnam Ben Tre clam hand gathered fishery	Inshore	Hand gathering	0	NA	NA	No	Certified

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
21	Kochi and Miyazaki Offshore Pole and Line Albacore and Skipjack fishery	EEZ / High Seas	Pole and line	0	NA	NA	No	Certified
22	Maruto Suisan rope grown Pacific oyster, Okayama fishery	Inshore	Hand gathering	0	NA	NA	No	Certified
23	Kyowa-Meiho Japan skipjack and yellowfin purse seine fishery	EEZ / High Seas	Purse seine	100	T	Sc	No	Certified
24	Tymlat Karaginsky Bay salmon fishery	Inshore	Trap nets and beach seines	0	NA	NA	No	Certified
25	Bratsk Reservoir perch	Inland	Trap nets	0	NA	NA	No	Suspended
26	Namibia hake trawl and longline fishery	EEZ	Trawl Longline	100 48	T	C	Low (Pilot)	Certified
27	South Africa hake trawl	EEZ	Trawl (offshore) Trawl (inshore)	9 6	D	Sc	23 (Pilot)	Certified
28	Tristan da Cunha rock lobster	EEZ	Traps	100	T	B	No	Certified

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
29	Alaska salmon	EEZ / Inshore	Trolling, gillnets, seine nets, surrounding nets, driftnets and traps	0	NA	NA	Yes (2025/2026)	Certified
30	US West Coast limited entry groundfish trawl	EEZ / Inshore	Otter trawls (Federal)	100	T	B	Pilot	Certified
			Otter trawls (Makah vessels)	40	T	B	No	
31	US Atlantic surf clam and ocean quahog	EEZ	Hydraulic clam dredge	1***	T	B	No	Certified
32	US Gulf of Mexico menhaden	Inshore	Purse seine	0	NA	NA	9.7 (Pilot)	Certified
33	US Atlantic spiny dogfish, winter skate and little skate	EEZ	Gillnet and bottom trawl	15	T	B	No	Certified
		EEZ	Longline	4.3				
34	Maritime Canada inshore lobster trap fishery	Inshore	Baited trap	1	H	Sc	No	Certified
35	Cedar Lake Walleye and Northern Pike Fisheries	Inshore	Bottom set gillnets	0	NA	NA	No	Certified

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
36	Canada Atlantic halibut	EEZ	Demersal longline, demersal trawl, gillnet, handline	0.9	L	Sc	No	Certified
37	Small Pelagics Fishery in Sonora, Gulf of California	EEZ	Purse seine	18.3	T	Sc	No	Certified
38	The Bahamas spiny lobster fishery	EEZ	Free diving and traps	0	NA	NA	No	Certified
39	Suriname Atlantic seabob shrimp	Inshore	'Florida' twin rig demersal shrimp trawl	1***	T (without total)	Sc	No	Suspended
40	Chile Austral hake *(Merluccius australis)* trawl and longline	EEZ	Bottom trawl, midwater trawl	66.5	T	Sc	Yes (Unknown)	Certified
			Longline	100	T	Sc	Yes (Unknown)	
41	Argentine red shrimp *(Pleoticus muelleri)* coastal trawling fishery in waters of Province of Chubut	Inshore	Bottom trawl	15	H	Sc	No	Certified
42	SARPC toothfish	EEZ	Longline	100	T	Sc	No	Certified

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
43	Capsen & Grand Bleu Atlantic Ocean purse seine skipjack and yellowfin tuna fishery	EEZ / High Seas	Purse seine (FAD) Purse seine (FSC)	87 46	Se	Sc	Yes (Unknown)	Certified
44	Eastern Pacific Ocean tropical tuna - purse seine (TUNACONS) fishery	EEZ / High Seas	Purse seine	100	T	C	Unknown	Certified
45	Echebastar Indian Ocean purse seine skipjack tuna	High Seas	Purse seine (FAD) Purse seine (FSC)	100 100	Se	Sc	No	Certified (combined with another assessment)
46	Maldives pole & line skipjack tuna	EEZ	Pole-and-line	1***	NA	Sc	Yes	Certified
47	Chilean Jack mackerel industrial purse seine fishery	EEZ / High Seas	Purse seine	22.3	T	Sc	Yes (Unknown)	Certified
48	Silla WCPO longline tuna fishery	EEZ / High Seas	Longline	1.87	H	Sc	No	Certified
49	ICCAT / IOTC / CCSBT Transhipment Regional Observer Programmes	High Seas	Carrier vessel	100	T	C	No	Not certified

Map ID	Fishery	Area	Gear	Observer Coverage (%)	Metric*	Purpose**	REM Review Rate (%)	MSC Status
50	Aker Biomarine Antarctic krill	High Seas	Midwater trawl	100	D	Sc	5****	Certified
51	ICCAT Regional Observer Programme (ROP) for Bluefin Tuna	EEZs	Purse seine / traps / cages / farms	100	O	C	Pilot	Not certified
52	South Georgia Patagonian toothfish longline	EEZ	Longline	100	T	Sc	Yes (Unknown*****)	Certified

***Metric:** Tw (Tows), D (Days), T (Trips), S (Shots), H (Hauls), L (Landings), H (Hooks), T (Transshipment), O (Operations), Se (Sets).

****Purpose**: Sc (Scientific; indicating a scientific observer and data collection purpose); C (Compliance; indicating the observer purpose of enforcing regulations and monitoring compliance), B (Both; indicating the programme serves both scientific and compliance purposes).

*****:** Low / unknown / unquantifiable observer coverage level but not zero

****: Varies from 5% to 20% depending on whether vessels are undertaking a trial involving a net monitoring cable.

*****: 100% of operations monitored, footage stored but only reviewed if a bird mortality is observed.

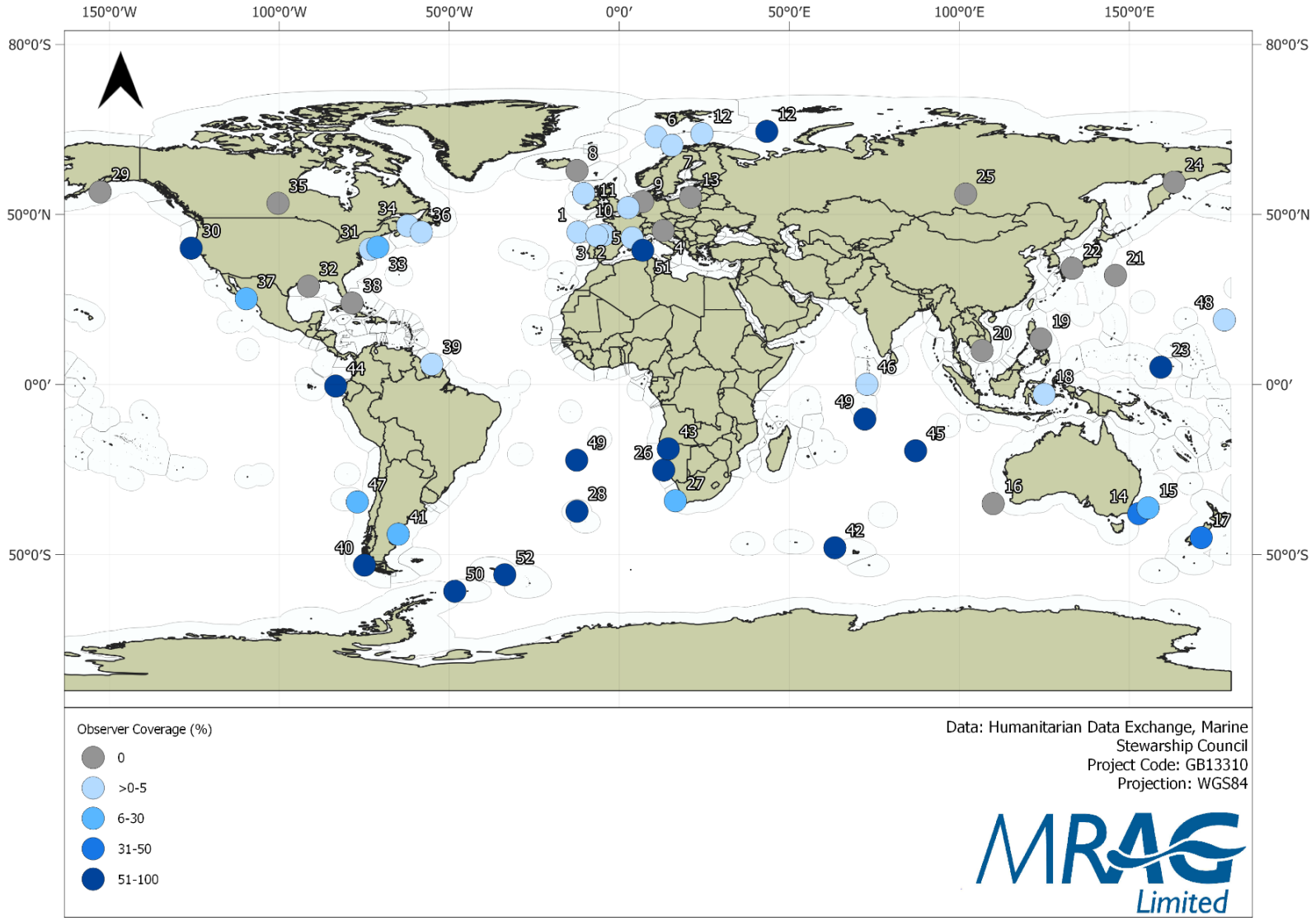

Figure 1. Observer coverage rates (%) across the 53 fisheries.

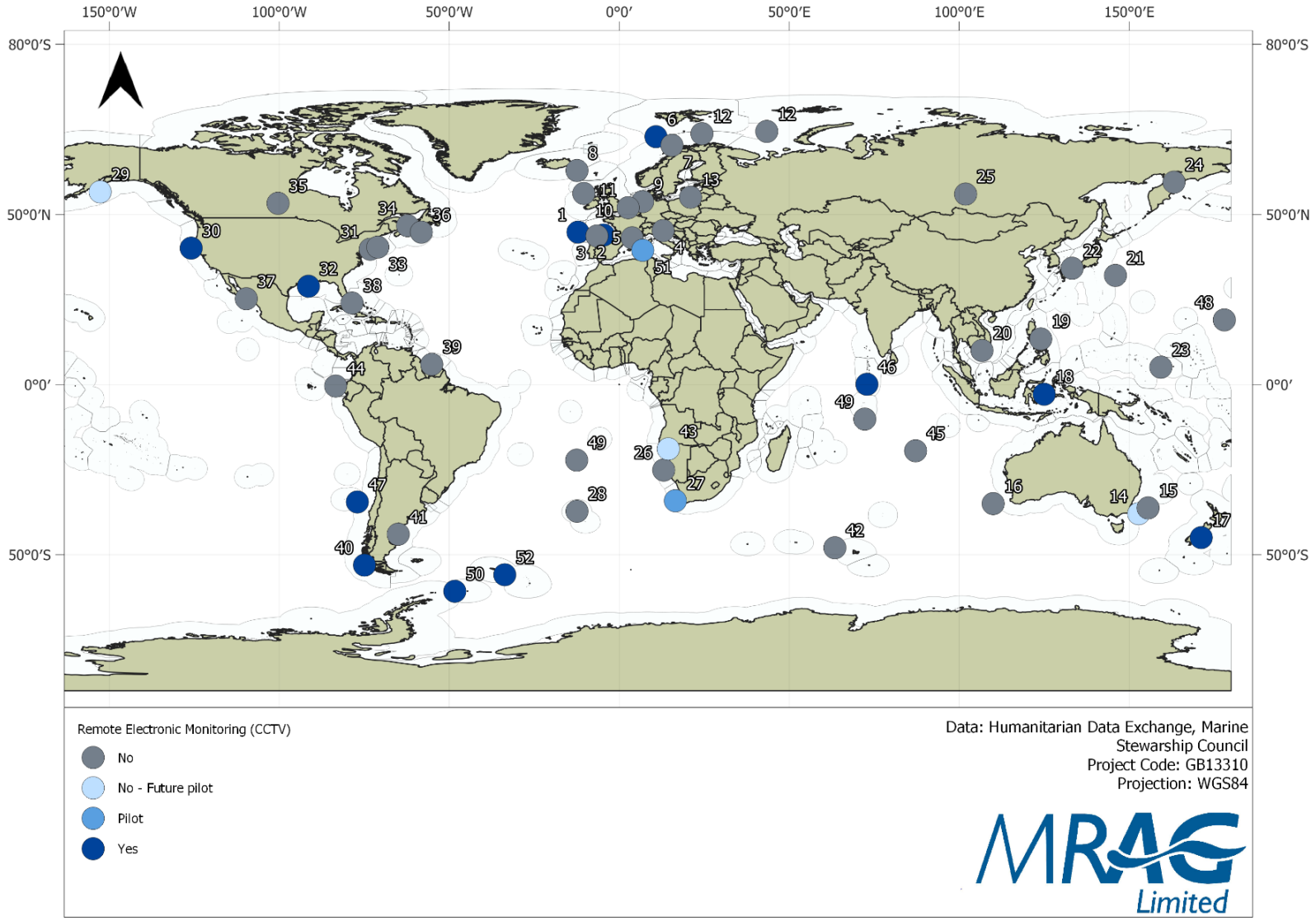

Figure 2. REM usage across the 53 fisheries.

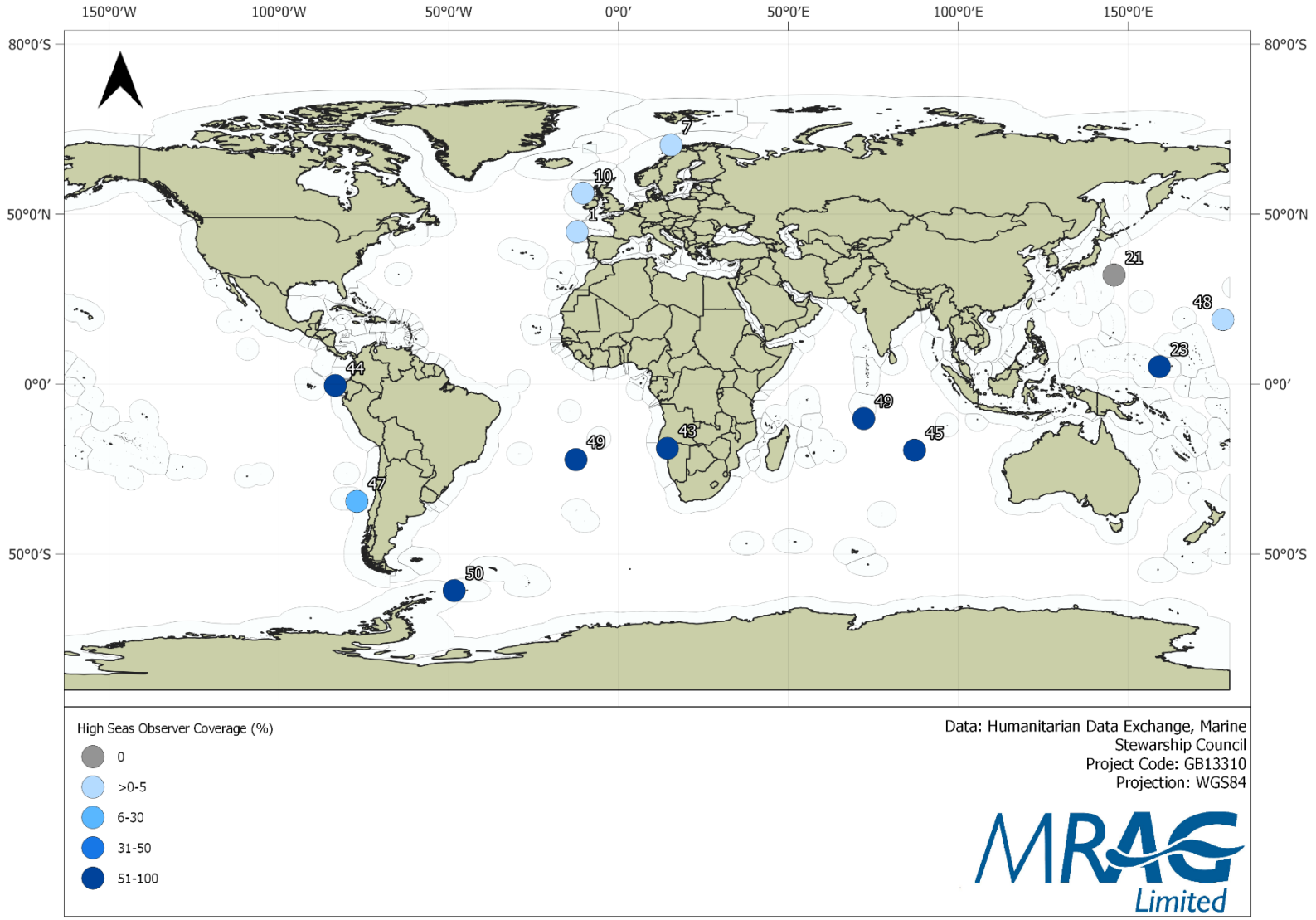

Figure 3. High seas observer coverage rates (%) across the 53 fisheries.

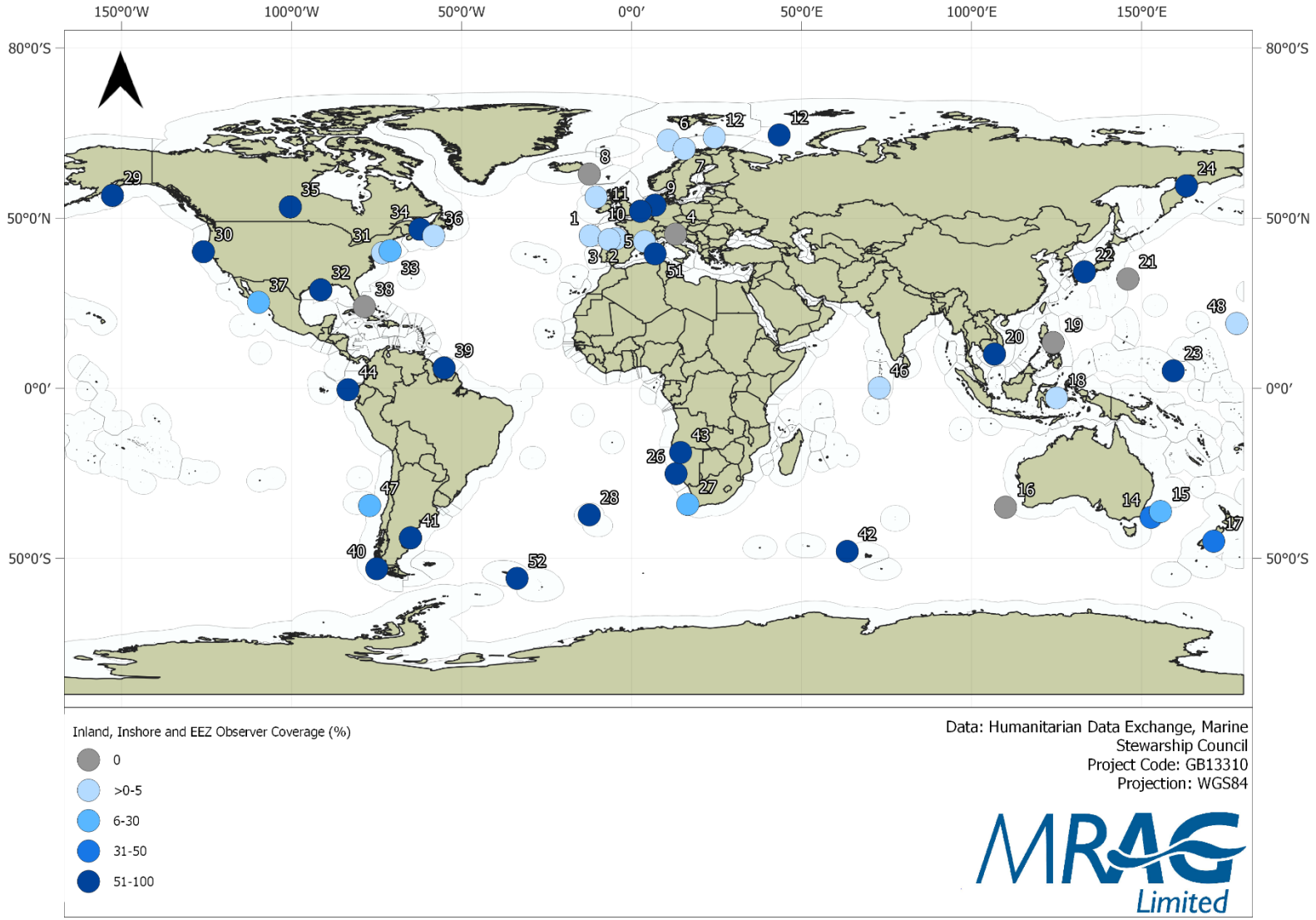

Figure 4. Inland, Inshore and EEZ observer coverage rates (%) across the 53 fisheries.

4.3 Trends and Challenges in monitoring practices

Logbooks

The findings highlight a widespread use of logbooks as a primary data collection tool, with only two fisheries not mentioning logbook use. These were a hand gathering fishery for oysters and an inland freshwater fishery for walleye and northern pike. Requirements are generally well-defined, with a standardised minimum level of reporting, though third-party verification processes can vary. Some fisheries, such as the Australian orange roughy and New Zealand deepwater fisheries, show more robust verification methods, while others provide less clarity on the extent of independent reviews. Because of this, logbooks alone may not always ensure accurate reporting, particularly in fisheries with limited observer coverage or where verification is inconsistent. While some fisheries report that logbooks are reviewed annually or cross-checked against sales notes, there is a lack of clarity and transparency regarding whether all landings undergo a systematic verification, or what the actual review rates are.

Third-party verification methods vary, with the most common being corroboration with sales data/ sales notes, inspections in port by local authorities and governments, review by observers, RFMO review of submitted data, and comparison with VMS records. Less common are reviews for scientific purposes, although this is seen for example in the Vietnam Ben Tre clam hand gathered fishery.

Observer coverage

Observer coverage in fisheries is more variable, with some achieving or even exceeding mandated targets, while others, such as the southern bluefin tuna fishery, have fluctuated in their ability to meet minimum coverage. This is predominantly influenced by fishery scale, environmental risk, and regulatory requirements. Higher levels of coverage are typically found in further offshore, larger-scale fisheries, and/or those with greater environmental risks. Fisheries with higher bycatch risks or frequent interactions with ETP species tend to have more comprehensive monitoring measures in place. This is particularly evident in the Russian sector of the Barents Sea fishery, where extensive observer coverage is in place due to the high environmental risks. Smaller-scale fisheries that operate closer inshore, especially those with lower levels of bycatch or limited ETP species interactions, tend to have lower observer coverage and/or rely more on logbook data. This pattern of increasing observer coverage with distance from shore is illustrated in Figure 5.

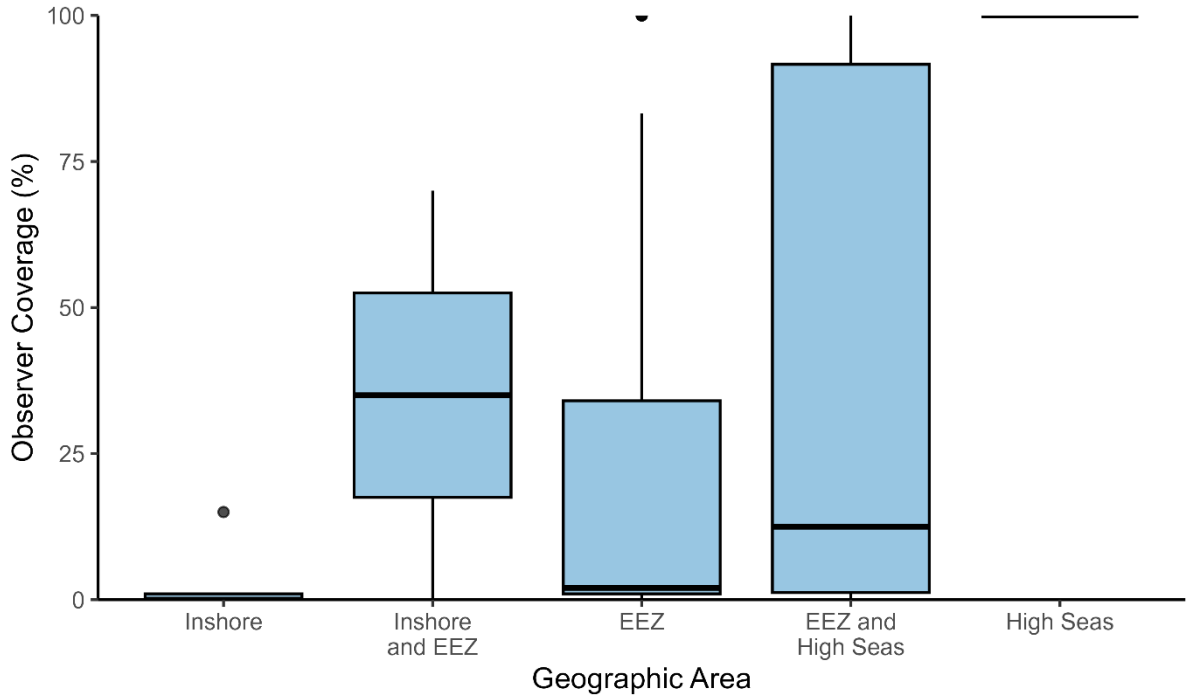

Figure 5. Observer coverage by geographic area (fisheries with no coverage were omitted).

A main challenge identified in this study is the lack of a standardised approach to reporting observer coverage, which leads to difficulties in comparing data across fisheries. Fisheries use different metrics, amongst those commonly reported are observed days, trips, vessels, sets, or hauls, and in some cases, only the total observed days are reported without corresponding information and wider context on total fishing days. Additionally, fisheries may differ in their definition of a set or haul, creating additional inconsistencies. This variation in results creates an inability to standardise and effectively calculate accurate coverage rates, making it difficult to draw cross-fishery comparisons, and therefore, difficulties arise in assessing whether monitoring efforts are sufficiently meeting management and conservation objectives. This is illustrated in Table 8 and Table 9, figures taken from the South African hake fishery (CapMarine, 2024) which show the different rates depending on the metric used and within the programme itself according to the particular task undertaken.

Table 8. Observer coverage in the South African hake trawl fishery showing different rates depending on the metric used.

Sector	Trips	%	Trawls	%	Days	%
Inshore	27	4	464	5	180	6
Offshore	86	6	2339	7	1087	9

Table 9. Observer coverage in the South African hake fishery according to tasks undertaken by the observer.

Sector	Fish	% Trawls	Inverts	% Trawls	Birds	% Trawls	Bycatch	% Trawls
Inshore	121	1	115	1	102	1	35	0.4
Offshore	1315	4	791	2			322	1

Indeed, observer coverage was seen to frequently fall below management authority set requirements, raising concerns about data quality, reliability, and the overall effectiveness of monitoring programmes. In some cases observer coverage has been extremely low, limiting the ability to assess bycatch and ecosystem impacts. These gaps highlight a broader challenge across fisheries of ensuring adequate monitoring. Low or inconsistent observer coverage can undermine the reliability of collected data, particularly in smaller-scale or regionally managed fisheries and raises questions about the effectiveness of current monitoring efforts, particularly in assessing bycatch and ecosystem impacts.

Various constraints and challenges arise around observer coverage. One key logistical challenge is the size of fishing vessels that can impact observer placement, particularly for smaller inshore vessels and longliners that lack the space to accommodate additional crew. This is seen in the Namibian hake fishery, where observer coverage is constrained and limited despite efforts to implement more comprehensive monitoring. Economic limitations are another factor in determining observer programme viability and monitoring effectiveness. The Tristan de Cunha rock lobster fishery, for example, attempts to operate at 100% observer coverage, although cite that this is subject to funding and future licence negotiations. Many of these same small-scale and lower-risk fisheries operate with limited financial resources, and supporting observer coverage becomes challenging.

Transitioning towards REM

The implementation of REM is inconsistent across fisheries. Though some utilise port-based CCTV, such as the Australian orange roughy fishery, few currently have ongoing fully operational REM cameras, and most are yet to adopt onboard REM. There is, however, a notable transition towards electronic monitoring in certain regions, for instance across the fisheries evaluated in Oceania progress is being made, albeit at a gradual pace.

These disparities suggest that although regulatory frameworks are beginning to exist to set bench line monitoring requirements, their effectiveness is based on implementation and resourcing. REM, as observer coverage, is subject to even stronger logistical and financial barriers to widespread implementation. Economic limitations are a significant barrier to effective monitoring in fisheries with constrained financial resources. Small-scale or lower-risk fisheries may lack the budget to support REM systems and therefore its implementation is not a priority. Our results show that the use of REM is more prevalent in large-scale, high-seas fisheries, or those under stricter international regulations, and have therefore been quicker to adopt such practices. Additionally, concerns over crew privacy have also been stated as reasons further delaying their implementation in some fisheries.

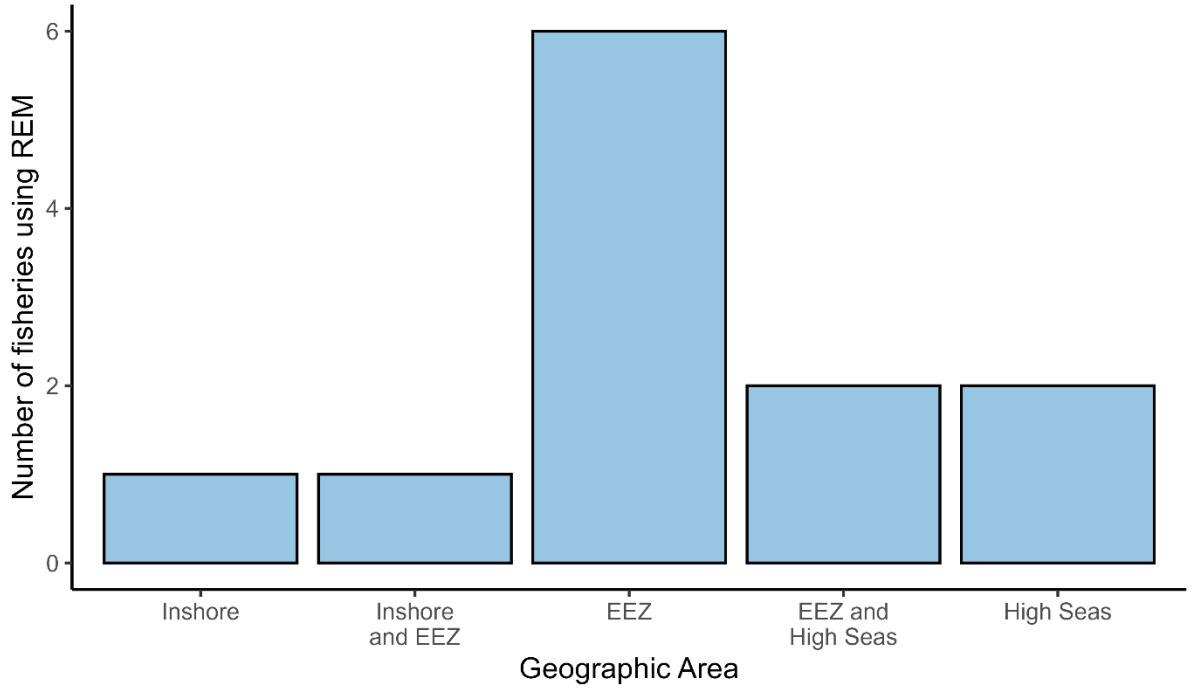

Figure 6. Number of fisheries with REM by geographic area (fisheries with REM pilot trials or no REM coverage were omitted).

Evolving Trends and Challenges in Fishery Monitoring

In a number of fisheries, voluntary and scientifically driven monitoring practices have been implemented successfully. For instance, a best-practice example is the Chilean hake fishery that maintains a high observer coverage rate of 66.5% for trawling and 100% for longline, primarily for scientific purposes. Similarly, the Namibian hake fishery achieves 100% observer coverage in trawl operations, while the longliners reach 48% coverage due to capacity limitations, yet both are to adhere to compliance. These cases highlight the importance of ensuring adequate resource availability and operational capacity, in order for fisheries to align with monitoring goals and meet their objectives.

Our results show that observer coverage is lower in fisheries where scientific monitoring or data collection are the primary objectives of the monitoring programmes, compared to those prioritising compliance enforcement, exemplified by Figure 7**Error! Reference source not found.**. In research-driven programmes with scientific objectives, high observer coverage is not always necessary. Studies show that around 5-20% coverage (depending on the scale of the fishery and the objective of the monitoring) is often sufficient to capture and assess population- and stock-level impacts (Babcock and Pikich, 2003; MRAG, 2021).

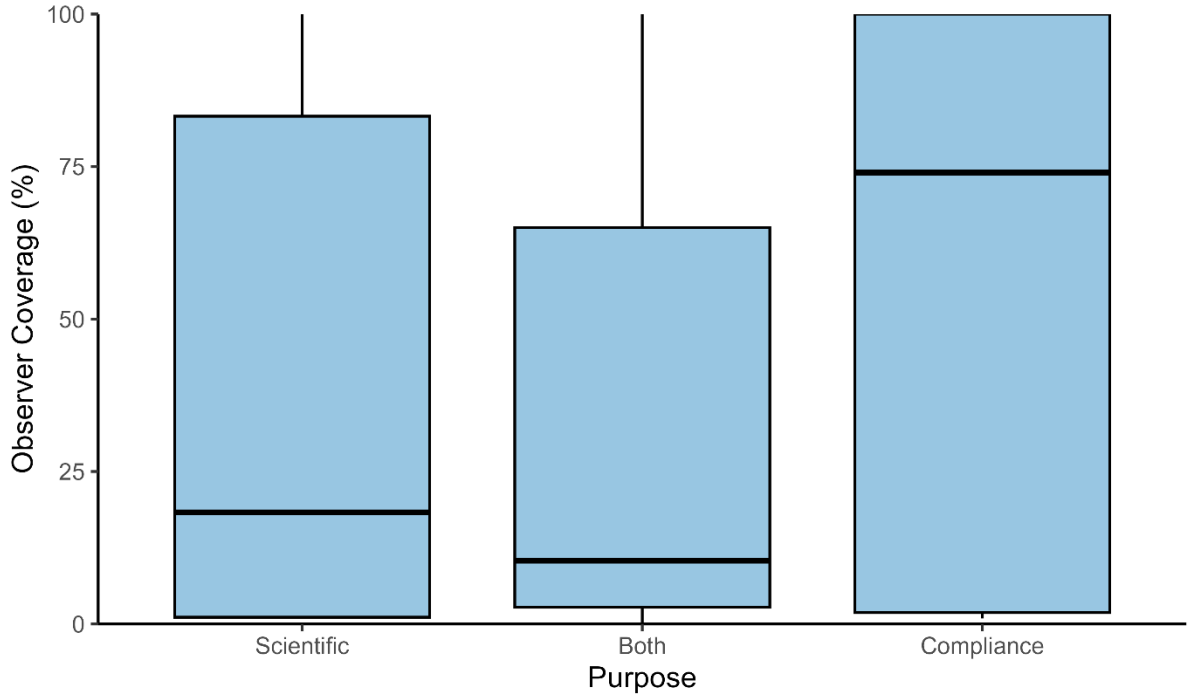

Figure 7. Observer coverage by monitoring programme purpose (fisheries with no observer coverage were omitted).

Regarding REM, coverage and review rates vary widely. The Oceana region shows an increasingly frequent use of REM systems, with some fisheries, such as the Australian orange roughy fishery using port-based CCTV, while others, like the New Zealand deepwater fisheries, are in the process of expanding onboard REM systems. However, most fisheries still lack REM systems, and where it is used, review rates are not consistently standardised across fleets. In total, 13 fisheries were identified as either using or having trialled REM, and, of these, only three reported review rates. Most implementations occur in EEZs or international waters, with only two inshore fisheries currently using REM, and one is still in a trial phase.

Overall, while regulatory frameworks and monitoring practices exist, these examples demonstrate that their effectiveness hinges on implementation quality and resource allocation. Although some regions are showing a clear shift towards electronic monitoring, such as Oceana, the pace of adoption remains slow. This is particularly true in small-scale or lower-risk fisheries where the perceived need for such technologies is lower.

5 Conclusions

Global Trends in Fisheries Monitoring

This study highlights the widespread reliance on logbooks as the primary tool for data collection amongst fisheries globally. Logbooks provide essential information on catch, landings, bycatch and fishing effort as a minimum, however their verification by third parties is inconsistent, with information on the frequency and comprehensiveness of these checks not always made available to the public and are where they are, they are often inconsistently reported. This inconsistent verification raises concerns regarding logbook data reliability.

Observer coverage plays a critical role in monitoring efforts, and they are more frequently deployed for compliance to wider legislation than for scientific data collection. However, observers are not universally implemented. Of the fisheries evaluated in this study, 15 lacked an observer programme. In some instances, this was due to alternative monitoring approaches used instead, such as logbooks, landing declarations, and/or REM, while in others, practical constraints such as funding, logistical limitations and recruitment challenges hindered implementation. Moreover, the method in which observer coverage is reported lacks standardisation, with no universally adopted metric. Observer coverage is frequently reported in terms of trips, sets, or hauls, each with varying definitions, while others provide the number of observed days with no wider context, making cross-fishery comparisons challenging.

REM is emerging as a valuable tool in elect fisheries, particularly where observer coverage is low or where specific monitoring objectives, such as tracking seabird interactions with net cables, require continuous observation not possible for a human to conduct. However, many barriers exist to its implementation and its adoption is therefore slow, with most fisheries relying on more traditional monitoring methods.

These results suggest that while fishery monitoring frameworks exist at both national and regional levels, their implementation and consequential effectiveness varies based on resourcing availability. Many monitoring programs align with existing management requirements (RFMOs), but coverage targets are not always met, and verification process are inconsistently reported. Moreover, comparing fishery scale, well-established monitoring frameworks are more apparent in larger offshore fisheries mandating stricter compliance enforcement, while smaller-scale or inshore fisheries tend to have lower observer coverage rates and much more limited REM use, creating data gaps that can impact sustainability efforts.

Challenges in Widespread Adoption of Observers and REM

Several key challenges were identified that presently hinder the prevalence of observer programmes and REM, true for fisheries worldwide despite geographical differences. Economic limitations are a major barrier, and many small-scale and lower-risk fisheries lack the financial resources to support observer programmes or invest in REM systems. Another constraint is vessel size and onboard facilities that present logistical challenges. Small-scale fisheries tend to lack the physical space required, making on-board monitoring impractical as vessels struggle to accommodate observers. Other programmes may have difficulty recruiting observers and end up with unfilled vacancies. This can be due to restrictions on who can be recruited, such as nationality, level of education or previous experience, or the fact that difficult conditions on the vessel mean individuals will be reluctant to work on them. Related to this are issues of observer safety, either on individual vessels or in the fishery as a whole. While REM could be a possible alternative in such cases, implementation still remains constrained by cost, technical feasibility, and privacy concerns.

Future monitoring efforts must therefore seek a way to balance economic feasibility and logistical constraints, with the need for accurate data collection. There is a clear shift toward electronic monitoring in some regions, and particularly in larger industrial fisheries, but small-scale and inshore fisheries will continue to face these same challenges. To expand REM adoption, it must be cost-effective and adaptable for smaller vessels, possibly through scaled-down systems or partial implementation strategies.

Fisheries management is ever evolving and monitoring practices constantly adapt accordingly, to ensure effective data collection, compliance, and sustainability. While the use of observers and REM is expanding, barriers to widespread adoption persist, and addressing these will be essential to strengthening fisheries monitoring programmes.

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