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International governance of regional fisheries management organization: A comprehensive review

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Abstract

Regional Fisheries Management Organizations (RFMOs) are intergovernmental institutions with legal competence to establish binding conservation and management measures for shared fishery resources, particularly on the high seas and for transboundary (straddling) and highly migratory stocks. Grounded within the framework of the United Nations Convention on the Law of the Sea (UNCLOS) and strengthened by the United Nations Fish Stocks Agreement (UNFSA) RFMOs are responsible for fisheries resources management in areas beyond national jurisdiction (ABNJ). This comprehensive review gives an overview about the functions, types, structure and role of RFMOs. It provides comprehensive insights of the evolution of RFMO, primarily through international treaties such as UNCLOS and the UN Fish Stocks Agreement, and their evolving functions from advisory bodies to “active enforcement agencies”. The study categorizes RFMOs into three major types that is General, Tuna, and Specialized RFMOs based on their scope and mandate, and highlights their geographical distribution across global oceans. The study further examines the institutional structures and decision-making mechanisms of different RFMOs. This study found that despite their significance in fostering international cooperation, they faces major key challenges, including inconsistencies in compliance mechanisms, overlapping jurisdictions, limited mandates, and the persistence of illegal, unreported, and unregulated (IUU) fishing. The review concludes by stressing the necessity of strengthening RFMO capacities and international cooperation to ensure the long-term sustainability of marine resources in high seas areas, aligning management practices with strong monitoring and evaluation framework.

Keywords: Fisheries, International treaty, RFMO, Law, High Sea, Regional Management

1. Introduction

Marine living resources are important sources of natural capital that contribute to food security and social welfare around the world. Approximately 8% of the global population (520 million individuals) are directly or indirectly supported by marine fisheries, with these industries providing an annual value of US \$220-235 billion (Sumaila *et al.*, 2011; Pentz *et al.*, 2018) ^[4, 9]. RFMOs are a subset of regional fishery bodies that possess a management mandate to adopt binding measures for members, providing a formal mechanism for states to coordinate governance of common-property marine living resources across their distributions (including within and beyond national jurisdiction. According to the United Nations Convention on the Law of the Sea (UNCLOS), high seas refer to all parts of the ocean that are not within the jurisdiction of any country, they lie beyond the Exclusive Economic Zone (EEZ) and territorial waters. All countries have the freedom of navigation, overflight, scientific research and fishing (Alencar, 2020) ^[15]. When two or more

states have nationals exploiting the same living resources (e.g., *Tuna*) or different resources in the same area (e.g., one fishing for *shrimp*, another for *cod*) overlapping resources, in these cases, countries are required to enter into negotiations to define and implement effective conservation measures for the resources in question (Durrenberger & Pálsson, 1987) ^[18]. While there is freedom of fishing on the high seas, countries are obligated to conserve and sustainably manage fish stocks in accordance with RFMOs, as stipulated in UNCLOS Articles 117 and 118 (Chang & Sun, 2025) ^[16]. This entails joint efforts to guarantee the sustainable use of these resources, preventing overfishing and adoption of harmful fishing practices (Borg, 2012) ^[17]. Regional cooperation is encouraged through the establishment of sub-regional or regional fisheries organizations specifically RFMOs dedicated to managing these shared resources and responsibilities to protect and manage the living resources of the high seas i.e. the Area Beyond National Jurisdiction (ABNJ), which belong to no single nation (Bell *et al.*, 2019) ^[12]. RFMO are established

through international agreements between countries that share a common interest in managing and conserving fishery resources in a particular region. They have the authority to establish diverse regulations for fisheries management (Rayfuse, 2015) ^[20].

2. UNFSA and RFMOs

The role of Regional Fisheries Management Organizations (RFMOs) has evolved significantly over the past half-century, shifting from primarily research and advisory functions toward greater emphasis on decisionmaking and enforcement. The United Nations Convention on the Law of the Sea (UNCLOS, 1982) provides the foundational legal framework for high-seas fisheries governance by establishing the 200-nautical-mile Exclusive Economic Zone (EEZ) and affirming state obligations for environmental protection and cooperation in the management of shared fish stocks. Building upon this framework, the United Nations Fish Stocks Agreement (UNFSA, 1995) further strengthened and clarified provisions for the conservation and management of straddling and highly migratory fish stocks, addressing gaps related to international cooperation (Nisa, 2014) ^[21]. The agreement also reinforced the role of Regional Fisheries Bodies (RFBs), particularly RFMOs, as key mechanisms for implementing conservation and management measures. By operating under the provisions of the Fish Stocks Agreement, RFMOs were designated as the expected management authorities responsible for establishing these measures on the high seas and ensuring their enforcement through member countries (Udeary, 2011) ^[26]. The UNFSA framework marked a significant step towards enhancing the

regulatory and operational capacities of RFMOs in the realm of high seas fisheries management. Under the UNFSA framework, states are required to cooperate through RFMOs or apply their measures (Article 8), with obligations extending even to non-members (Article 17). Consequently, many RFMOs have been established under the UNFSA framework to ensure the conservation and sustainable management of fisheries resources across high seas, inland waters, and territorial waters (Swan, 2004) ^[14].

Subsequent international instruments, including the FAO Compliance Agreement and the FAO Code of Conduct for Responsible Fisheries, along with their associated International Plans of Action (IPOAs), further strengthened the global fisheries governance framework (Lugten, 2010; Kuruc, 2010) ^[22, 23]. The Food and Agriculture Organization further facilitates international cooperation by providing a platform for governments, non-governmental organizations, industry stakeholders, and scientists to address implementation challenges and share best practices (Citaristi, 2022; Nandan & Lodge, 2005) ^[24, 25]. This Convention has visualized the activities and expanding responsibilities of RFMOs. Simultaneously, it paved the way for the establishment of new organizations equipped with more modern mandates, reflecting the evolving needs of the international fisheries landscape (Cullis-Suzuki, 2009) ^[20]. FAO organizes a platform known as the Regional Fisheries Body Secretariats Network (RSN), currently encompassing 49 international bodies (Ogawa & Reyes, 2021) ^[27]. RSN was established to facilitate exchange of information among RFB secretariats. However, according to Asmundsson (2013), the landscape of RFMO is remarkably heterogeneous.

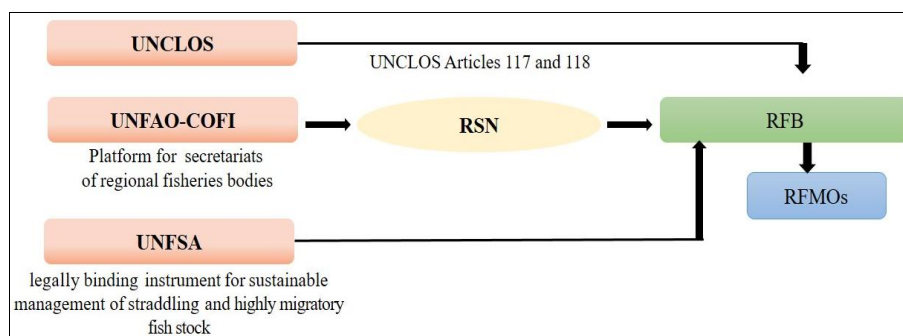
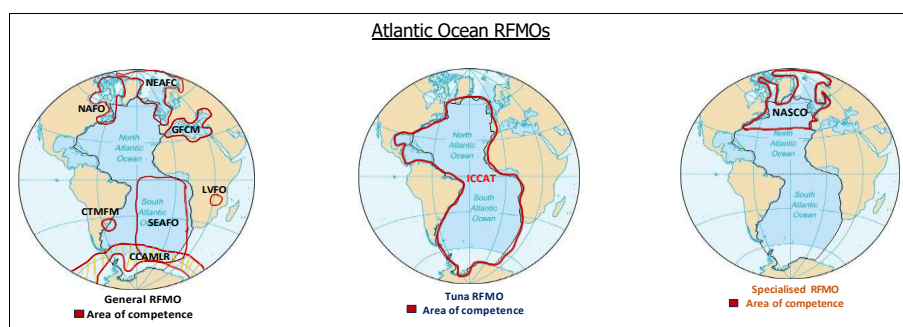


Fig 1: Genesis of RFMO

3. Types of RFMOs

91% of the world's oceans are now covered by RFMOs. Asmundsson (2016) has broadly categorized RFMO into

three types: General RFMOs, Tuna RFMOs, and Specialised RFMOs. Ocean wise major RFMOs are illustrated in figure 2:



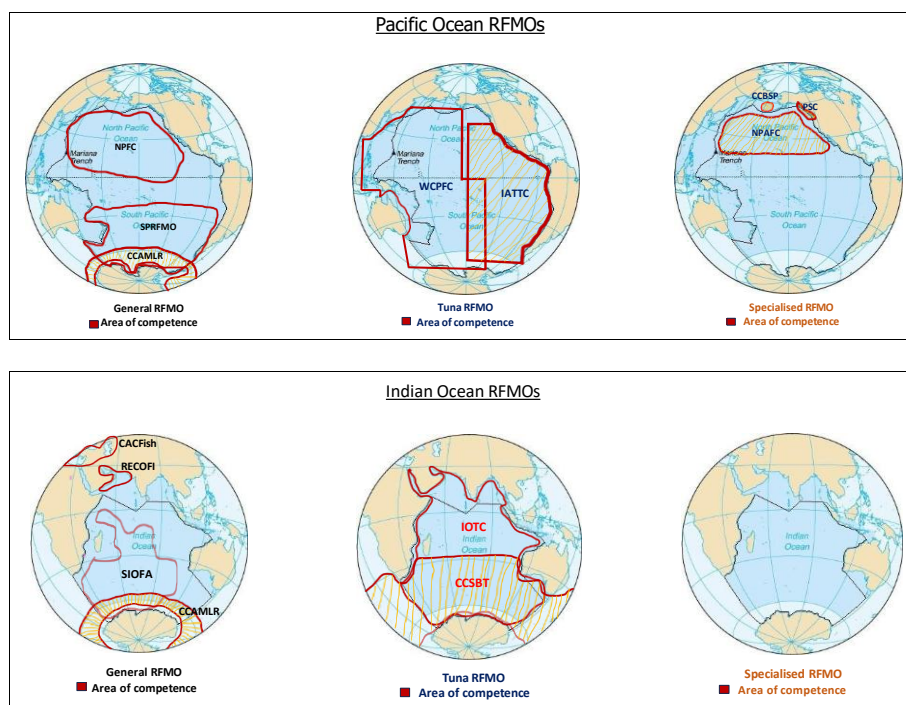


Fig 2: Ocean wise major RFMOs

3.1. General RFMOs

Currently, there are 12 general RFMOs, (refer to Table 1 and Figure 3). General RFMOs possess authority over all fishery resources unless explicitly excluded from their mandate (Molenaar, 2020) [28]. These organizations oversee diverse fishing activities, including bottom, pelagic and benthos-pelagic fishing, utilizing various fishing gear to target a wide range of stocks and species. Some of these functions on both the high seas and areas under territorial waters, while others constitute discrete high seas (ABNJ) stocks. Since the adoption of the UNFSA agreement, there has been a notable increase in the establishment of General RFMOs.

Although some RFMOs have as few as 2 member countries (Argentina-Uruguay Maritime Front Commission) shown in table 1, while, some others have over 25 members (CCAMLR and GFCM), their mandates and functions are

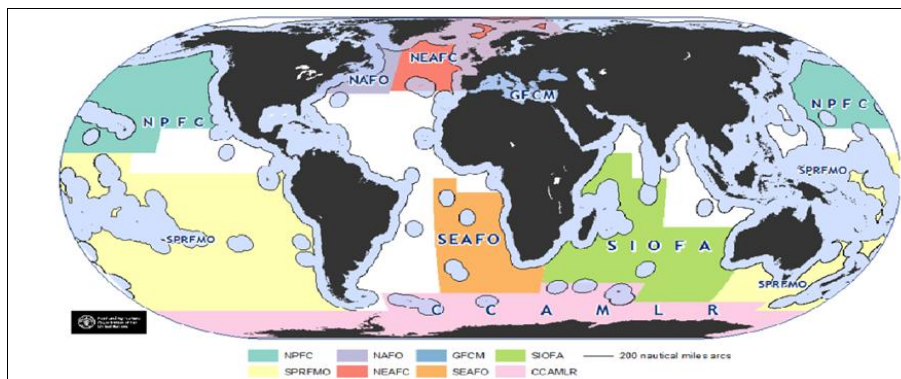
relatively uniform. Joining RFMOs comes with a crucial pledge, it includes share vital fishery data, respect established rules, and contribute funds for scientific assessments. The work of RFMOs with fewer members is no less important than those with more, as they manage either shared resources within a country's borders or fisheries across regions. RFMOs with larger memberships tackle even more complex oceans and ecosystems. This responsibility attracts global fishing giants like the US, Japan, and the EU, who are members of multiple general RFMOs. EU, for example, is a member of eight RFMOs (European Commission, 2023) [33]. The roles of RFMOs are evolving beyond management. It holds jurisdiction over a diverse marine ecosystem, covering "all fish, molluscs, crustaceans, and other marine species caught by fishing vessels within the Convention Area.

Table 1: List of General RFMOs

RFMOs	Year of Establishment	RFMO type	Area of competence/jurisdiction	No. of Member countries
General Fisheries Commission for the Mediterranean (GFCM)	1949	Generic (aquaculture included)	ABNJ, EEZ, territorial waters. (marine waters of the Mediterranean and the Black Sea)	24
North-East Atlantic Fisheries Commission (NEAFC)	1959	Generic	ABNJ, EEZ (Northeast Atlantic and Arctic Oceans, 42°W - 50°E)	06
Commission for the Argentina-Uruguay Maritime Front (CTMFM)	1973	Generic	EEZ (Argentinean-Uruguayan Common Fishing Zone)	02 (Argentina, Uruguay)
Northwest Atlantic Fisheries Organization (NAFO)	1978	Generic	ABNJ, EEZ (Northwest Atlantic, west of 42°W)	13
Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	1982	Generic	ABNJ, EEZ (Southern Ocean, south of sub-polar Front)	25
Lake Victoria Fisheries Organization (LVFO)	1994	Generic (aquaculture included)	Inland waters (Lake Victoria)	04
Regional Commission for Fisheries (RECOFI)	1999	Generic (aquaculture included)	EEZ (Ras Dhabat Ali in (16° 39'N, 53° 3'30"E to Ras Al-Fasteh in (25° 04'N, 61° 25'E)	08

South East Atlantic Fisheries Organization (SEAFO)	2001	Generic	ABNJ (South-east Atlantic, east of 20°W)	07
South Indian Ocean Fisheries Agreement (SIOFA)	2006	Generic	ABNJ(South Indian Ocean, south of 10°S)	10
Central Asian and Caucasus Regional Fisheries and Aquaculture Commission (CACFish)	2009	Generic (aquaculture included)	Inland waters (areas within the territorial boundaries of the States of Central Asia)	05
South Pacific Regional Fisheries Management Organization (SPRFMO)	2010	Generic	ABNJ (South Pacific, south of 0°N)	15
North Pacific Fisheries Commission (NPFC)	2013	Generic	ABNJ (North Pacific, north of 10°N)	08

ABNJ- Area Beyond National Jurisdiction, EEZ-Exclusive Economic Zone



Source: FAO, 2016

Fig 3: General RFMOs

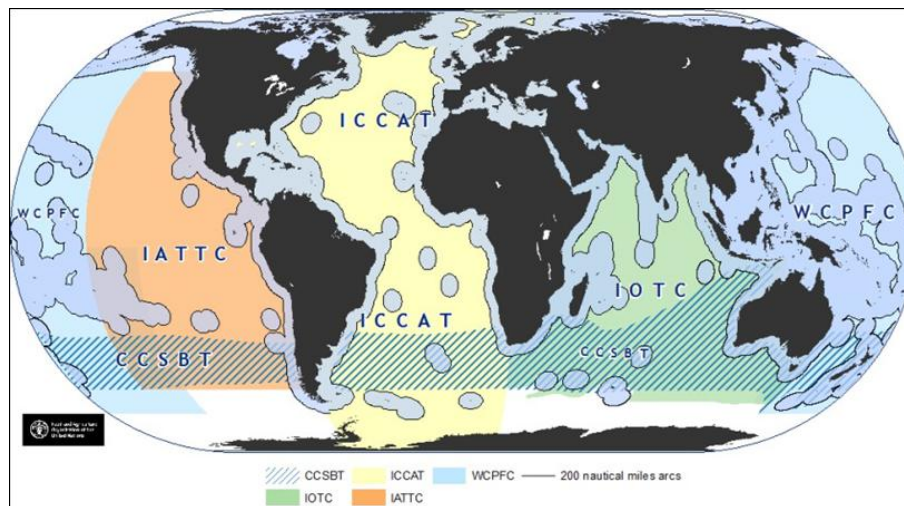
3.2. Tuna RFMOs

Recognizing the unique nature of tuna fisheries across the globe, specific RFMOs have been established to manage these highly migratory species. Unlike General RFMOs with their comprehensive scope, *Tuna* RFMOs have a narrower focus, targeting "*Tunas and Tuna-like species*", "highly migratory fish stocks", or similar phrases enshrined in their governing agreements (FAO, 2020) [35]. There are five RFMOs, (refer to table 2 and figure 4). The first one is the Inter-American Tropical Tuna Commission (IATTC), established at 1949 through a bilateral convention between the United States and Costa Rica, and currently has 21 member countries. Followed by, the International Commission for the Conservation of Atlantic Tuna (ICCAT), which boasts a maximum of 52 member countries. The Indian Ocean Tuna Commission (IOTC),

formed in 1993, has 31 member countries and focuses on the conservation and management of migratory tuna species in and out of the Indian Ocean. The Commission for the Conservation of Southern Bluefin Tuna (CCSBT), established in 1994 with six member countries, operates without geographical limits of competence under the Convention for the Conservation of Endangered Southern Bluefin Tuna (Hsu, 2018) [1]. Lastly, the Western and Central Pacific Fisheries Commission (WCPFC) formed in 2004. This organization has adopted various binding measures for the conservation of not only tuna species but also other non-targeted species such as *sharks* (since 2006), *seabirds* (since 2007), *sea turtles* (since 2008), and *cetaceans* (since 2011) (WCPFC, 2026) [1]. These shows the growing roles from major tuna to other conservatory species.

Table 2: List of Tuna RFMOs

RFMOs	Year of Establishment	RFMO type	Area of competence/jurisdiction	No. of Member countries
Inter-American Tropical Tuna Commission (IATTC)	1949	Tuna	ABNJ, EEZ, territorial waters (Pacific Ocean bounded by the coastline of North, Central, and South America)	21
International Commission for the Conservation of Atlantic Tunas (ICCAT)	1966	Tuna	ABNJ, EEZ (All waters of the Atlantic Ocean)	52
Indian Ocean Tuna Commission (IOTC)	1993	Tuna	ABNJ, EEZ, territorial waters (Indian ocean 30°E to 20°E)	31
Commission for the Conservation of Southern Bluefin Tuna (CCSBT)	1994	Tuna	ABNJ, EEZ(over all national waters and the high seas, where southern bluefin tuna are found)	06
Western and Central Pacific Fisheries Commission (WCPFC)	2004	Tuna	ABNJ, EEZ (Pacific Ocean bounded to the south and to the east by a line drawn from the south coast of Australia)	26



Source: FAO, 2016

Fig 4: Tuna RFMOs

3.3. Specialized RFMOs

Similar to *Tuna* and general RFMOs, Specialized RFMOs distinguish themselves by possessing a narrower legal mandate. This focused mandate concerns specific types of fisheries or species expressly stipulated within their founding agreements and names. There are six Specialized RFMOs, as outlined in Table 3. The International Pacific Halibut Commission (IPHC), established 1923 through a convention between Canada and the United States of America. As the name indicates, its primary goal is the development and management of “Pacific *halibut* stocks”. The International Whaling Commission (IWC), founded in 1948 under the “International Convention for the Regulation of Whaling” in 1946, has a global mandate to conserve world “*whale* stocks” with a total 87 member countries.

Both the North Atlantic Salmon Conservation Organization (NASCO), established 1983 and the Pacific Salmon Commission (PSC), 1985 a “bilateral treaty” work together for the conservation of *salmon* species. Next, The North Pacific Anadromous Fish Commission (NPAFC), with five member countries, established in 1992 under the “Convention for the Conservation of Anadromous Stocks” (Salmon and Trout) in the North Pacific Ocean. Lastly related to anadromous fish is the Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP), formed in 1994 under the “Convention on the Conservation and Management of Pollock Resources” in the Central Bering Sea.

ABNJ- Area Beyond National Jurisdiction, EEZ-Exclusive Economic Zone

Table 3 List of Specialized RFMOs

RFMOs	Year of Establishment	RFMO type	Area of competence/jurisdiction	No. of Member countries
International Pacific Halibut Commission (IPHC)	1923	Specific	ABNJ, EEZ(Northern Pacific Ocean)	02 (Canada, United States of America)
International Whaling Commission (IWC)			ABNJ, EEZ, territorial	
	1948	Specific	waters (Global waters)	87
North Atlantic Salmon Conservation Organization (NASCO)	1983	Species	ABNJ, EEZ (Atlantic Ocean north of 36°N)	07
Pacific Salmon Commission (PSC)	1985	Species	Coastal waters, inland waters(Yukon River southward to the Northwest United States)	02 (Canada, United States of America)
North Pacific Anadromous Fish Commission (NPAFC)	1993	Species	ABNJ (North Pacific Ocean and its adjacent seas)	05 (Canada, Japan, Korea,Russian Federation, United States of America)
Convention on the Conservation and Management of the Pollock Resources in the Central Bering Sea (CCBSP)	1994	Species	AHNJ,(high seas area of the Bering Sea beyond 200nautical miles (North Pacific Ocean)	06

4. Institutional Structure of RFMOs

The typical structure of RFMOs comprises a “Governing Body” or “Commission Body,” composed of member states. This body is responsible for making decisions regarding the management of fish stock within its jurisdiction (FAO, 2018; Lodge *et al.*, 2007). Additionally, there is a scientific advisory committee tasked with supplying scientific

evidence on various issues and a technical advisory committee proposing technical measures under subsidiary bodies to provide suggestions on the commission body through a secretariat which facilitate the decision-making process (Hilborn *et al.*, 2020) ^[38]. Furthermore, the structure includes various subsidiary bodies, such as technical working groups. These groups focus on specific fish stocks,

management tools, or research areas. Their function may be permanent or temporary determined by the research purpose at hand. These subsidiary bodies play a crucial role in enhancing the efficiency and effectiveness of the RFMO's overall functioning (Lodge *et al.*, 2007) ^[39].

Sometimes the situation arises when a specific fish population migrates across regions governed by different RFMOs or when the geographic scopes of two RFMOs intersect. The resulting uncertainties have the potential to weaken the efficacy of management measures. Initiatives are in progress to enhance coordination between RFMOs in addressing these challenges. Over time, certain RFMOs have worked to develop strategies aimed at enhancing innovations to their decisions. One inventive method is the

implementation of catch documentation systems. These systems enable managers to trace the origin of each fish back to the capturing vessel, ensuring that the catch was obtained legally, although their widespread adoption is not yet prevalent. Additionally, compliance is pursued through the monitoring of vessels within specific regions. Despite each RFMO maintaining a roster of authorized vessels, there is a lack of consistency in registration procedures and vessel information contributing to Illegal, Unreported and Unregulated (IUU) fishing at high sea. Compounding the issue, numerous vessels are registered with multiple RFMOs, irrespective of their current fishing location. A standardized list of registered and legal vessels is necessary for clarity.

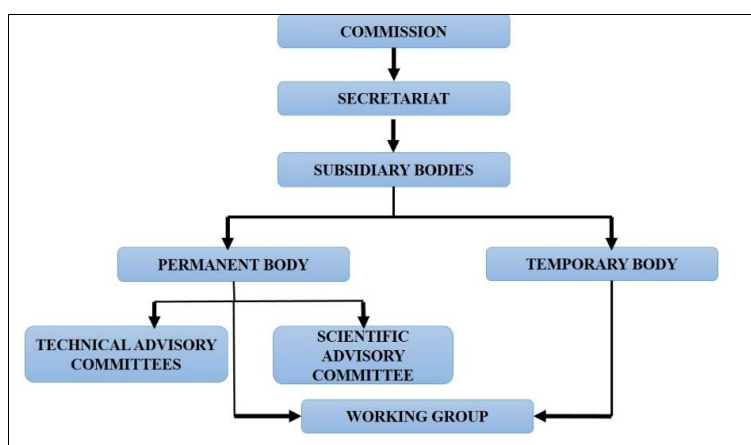


Fig 5: Institutional Structure of RFMO

5. Functions of RFMOs

According to Asmundsson (2016) RFMO is a sub-set of Regional Fisheries Bodies (RFBs). Under this context RFMO is defined as an inter-governmental organization meeting two criteria. Firstly, it must have the authority under international law to implement legally binding conservation and management measures related to fisheries. Secondly, the legal authority that extends to an area of competence should encompass a portion of the high seas. However, according to Asmundsson (2013), the landscape

of RFMO is remarkably heterogeneous, some concentrating on inland fisheries, others on coastal fisheries, and still others focusing on the high seas. Additionally, certain RFMO prioritize the development of domestic fisheries sectors, while others emphasize fostering cooperation between countries on fisheries issues. RFMO functions are best understood in table 4 as an integrated cycle: science → decision-making → implementation → monitoring/compliance → adaptation.

Table 4: This table summarizes the main functions performed by Regional Fisheries Management Organizations and the management instruments they typically use. It is useful as a compact reference linking RFMO mandates to practical governance tools and source-backed evidence.

RFMO role/function	Typical instruments and tools	Key evidence sources
Science and scientific advice	RFMO Central to their function is science and scientific advice, which includes Stock assessments; fish catch target and limit reference points; ecosystem and risk assessments; data standards and verification protocols with scientific committees for maximum sustainable resource yield.	Hsu 2018; Li 2025; Pentz <i>et al.</i> 2018 ^[1, 2, 4]
Conservation and management measures minimize bycatch and ecosystem-based management	RFMO implement a range of regulatory instruments including Total Allowable Catch (TACs) and quotas for highly migratory species, harvest limits, gear restrictions, mesh-size rules, closed seasons, closed areas, effort controls, and rebuilding measures to ensure compatibility between EEZs and the high seas. They also minimize bycatch through conservation and management measures (CMMs) and safe-handling rules, using observer data to monitor non-target species and conduct ecological risk assessments. It protect vulnerable marine ecosystems (VMEs) through area closures and marine protected areas (MPAs). This function promote precautionary and ecosystem-based approaches for sustainable fisheries management. These measures are complemented by compatibility goals (aligning high-seas rules with EEZ management for the same stocks) and by expanding attention to non-target species to prevent broader ecosystem harm.	Hsu 2018; Li 2025 Gilman <i>et al.</i> 2014; Pentz <i>et al.</i> 2018; Elliott <i>et al.</i> 2023 ^[1, 2, 3, 4, 7]
Allocation of fishing	RFMO Distribute fishing rights among members through quota allocation and regulate access to fisheries for members and non-member. It facilitate participatory decision-making. This function ensure equitable	Hsu 2018 ^[1]

opportunities	resource distribution results in balancing interests of member states. It promote compliance with agreed allocations.	
Monitoring, control, and surveillance (MCS)	RFMO monitors fishing activities through Vessel Monitoring Systems (VMS) and satellite tracking. They implement boarding and inspection schemes, including at-sea inspections, to ensure compliance with regulations. It facilitate remote electronic monitoring (REM) to collect real-time data on fishing operations. This function strengthen surveillance mechanisms and improve transparency in fisheries management.	Hsu 2018; Li 2025; Ewell <i>et al.</i> 2020 ^[1, 2, 6]
Law enforcement and Compliance to ensure Transparency and data sharing	RFMO ensure conservation measures through compliance committees and annual compliance reviews while supporting flag-state implementation and monitoring the application of agreed regulations. They follow up on sanctions and track enforcement actions taken by member states, while promoting transparency through public compliance reporting and periodic performance reviews. It also ensure timely reporting of catch and effort data, facilitate exchange of observer and compliance information, and disseminate fishing operation data through public summaries and research-grade datasets where available. This function strengthen accountability and transparency among members.	Li 2025; Hsu 2018; Gilman <i>et al.</i> 2014; Ewell <i>et al.</i> 2020 ^[2, 1, 3, 6]
IUU fishing prevention and deterrence	RFMO combat IUU fishing through vessel blacklists and authorization requirements. They implement port state measures and coordinated inspections to regulate fishing activities. It control transshipment operations and, in some cases, apply market and trade restrictions (Tuna RFMO). This function strengthen enforcement and discourage illegal fishing practices.	Li 2025; Hsu 2018; Pentz <i>et al.</i> 2018 ^[2, 1, 4]
Dispute resolution and decision processes	RFMO facilitate decision-making through consensus, majority, or supermajority voting procedures. They provide mechanisms for objection or opt-out by member states and review conservation measures periodically. It conduct annual commission meetings supported by subsidiary committees for effective governance. This function ensure coordination, transparency, and resolution of disputes among members.	Hsu 2018 ^[1]
Capacity building and cooperation	RFMO promote capacity building through technical assistance and scientific collaboration among member states. They support developing members and facilitate accession and cooperation by non-members. It encourage harmonization of policies and measures across RFMOs. This function strengthen cooperation and enhance overall fisheries governance.	Li 2025; Hsu 2018 ^[2, 1]

Guided by UNFSA principles, they utilize the best available scientific information, precautionary approaches, and reference points to evaluate stock status and formulate measures. They allocate fishing opportunities among member states through TAC distribution and access limitations, a process often shaped by political negotiations and consensus-based decision-making (Hsu, 2018) ^[1]. To ensure compliance, RFMOs establish MCS systems, including VMS, observer programmes, and inspection schemes, although enforcement remains largely dependent on flag states Hsu 2018; Li 2025. Observer programmes provide critical data on bycatch and onboard practices, while emerging Remote Electronic Monitoring (REM) ^[1, 2] systems offer cost-effective complementary tools despite governance challenges (Ewell *et al.* 2020) ^[6]. RFMOs also conduct compliance reviews and implement enforcement measures such as vessel authorization, IUU vessel lists, port state measures, and, in some cases, trade restrictions, although effectiveness depends significantly on member state cooperation and implementation.

6. Why RFMOs are important?

6.1. Ecological necessity: shared and mobile stocks

Stock mobility across EEZs and the high seas makes unilateral management insufficient. Transboundary and highly migratory species require coordinated measures; otherwise, effort displacement, competitive overfishing, and free-riding can undermine sustainability. RFMO ensure equitable utilization of resources (Pentz *et al.*, 2018; Hsu 2018) ^[1, 4]

6.2. Institutional necessity: governance beyond national jurisdiction

On the high seas, RFMOs are “responsible for ensuring the conservation and optimal use of marine living resources,” and high-seas fisheries contribute substantial economic value. (Pentz *et al.*, 2018) ^[4].

6.3. Enforcement necessity: scaling compliance tools to a hard-to-police domain

High-seas enforcement is structurally difficult therefore, RFMOs’ capacity to coordinate MCS, compliance reviews, port-state measures, and IUU information sharing is central to deterring illegal practices and to closing gaps created by limited at-sea jurisdiction. (Pentz *et al.*, 2018; Li 2025) ^[2, 4].

7. Performance constraints: why effectiveness varies

RFMO performance is highly variable and is shaped more through political and less by the existence of policy frameworks which is the major constrain (Pentz *et al.*, 2018; Hsu 2018) ^[1, 4]. It has been observed that RFMOs still have major weaknesses in managing bycatch and ecosystem impacts, with only limited progress made toward ecosystem-based fisheries management (EBFM). Earlier, RFMOs mainly focused on managing target fish stocks, but now there is a growing shift toward managing the entire ecosystem. However, more than two-thirds of RFMO managed fisheries do not have proper observer coverage, and research-level observer data which are openly available. In addition, only about one-third of bycatch issues are addressed through binding measures, and nearly 80% of these measures lack clear performance standards, making it difficult to evaluate their effectiveness and ensure accountability (Pentz *et al.*, 2018; Hsu 2018) ^[4, 1].

Major constraints that alter RFMOs effectiveness are listed below

- Limited delegation of power and political will which results in delays decision making and implementation.
- Weak agreement among flag states on combined Decision-making rules and objection procedures undermine reduces the effectiveness of binding measures.
- Weak enforcement at national and regional levels and dependence on flag-state control reduce management effectiveness.

- Lack of Transparency and monitoring constrain the compliance assessment and enforcement outcomes.

8. Emerging challenges and future directions

RFMO with emerging climate change and political dispute, faces compliance issues related to policy implementation.

8.1 Climate change and distribution shifts

Climate change poses challenges to RFMOs by altering ocean conditions, including ocean acidification, sea-level rise, temperature rise, fish stock distribution shift, upwelling of nutrients. These changing conditions shifts productivity and distributions of stocks, complicating static member flag state aquatic resource catch quota allocation arrangements (FAO, 2020; IPCC, 2019; Elegbede *et al.*, 2026) ^[41]. To address these challenges it is recommended to add climate-oriented performance monitoring and evaluation systems, expand MPAs, and political analysis that strengthen decision processes. These measures will lead to a future ready decision making policy framework (Gaines *et al.*, 2018) ^[42].

8.2 Biodiversity beyond national jurisdiction (BBNJ) interactions

The emerging BBNJ framework that are potentially supporting high-seas conservation in parallel with RFMOs, though practical interaction depends on how well they work together. These emerging frameworks should have clear roles and mandates that should not overlap with the functioning of RFMO. Coordinated and collaborative approaches will result in increasing effective implementation of policy and management (Wright *et al.*, 2018; Lodge *et al.*, 2007) ^[39, 43]. Recommended Best Practices for Regional Fisheries Management Organizations: Report of an independent panel to develop a model for improved governance by Regional Fisheries Management Organizations. Chatham House.) ^[39].

Across studies, commonly suggested reforms to improve RFMO effectiveness include improving monitoring and compliance systems (such as REM and observer programmes), increasing transparency in compliance and enforcement reporting, updating older RFMO mandates to follow precautionary climate adaptive ecosystembased approaches, and using independent performance reviews to which can improve accountability (FAO, 2018; OECD, 2017).

9. Conclusion

RFMOs are fundamental to the institutional framework by FAO that manage transboundary and high-seas fisheries. They provide a central platform through which flag states operationalize their legal duties to cooperate, translate scientific evidence into binding measures, allocate fishing opportunities, and coordinate monitoring and compliance in a domain where enforcement is difficult. Study indicates that their core tools which includes CMMs, allocation decisions, and MCS systems are well established, but their effectiveness is often altered by flag state through complex decision-making procedures, transparency deficits, and insufficient monitoring coverage. Our review assessment identifies significant gaps, particularly in ecosystem/bycatch governance and in the availability and quality and

availability of observer data. These challenges may become more intensified under climate change impacts. Therefore, it is suggested for RFMOs for transition toward more adaptive, transparent, and performance-evaluable governance supported with strong monitoring and ecosystem protections that will ideally complement broader high-seas biodiversity governance frameworks.

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