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EDITED BY

Gohar A. Petrossian,
John Jay College of Criminal Justice,
United States

REVIEWED BY

Marysia Szymkowiak,
National Oceanic and Atmospheric
Administration (NOAA), United States
Fang Yin,
Shanghai Maritime University, China
Conghui Yin,
Shanghai Maritime University, China

*CORRESPONDENCE

Yuru He

✉ yrhe@shou.edu.cn

Jiangfeng Zhu

✉ jfzhu@shou.edu.cn

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Integration of spatial justice into navigating the combat on illegal, unreported and unregulated fishing in ocean and coastal areas

Yuru He^{1*}, Yan Li², Yanan Li^{1,3} and Jiangfeng Zhu^{1,3*}

¹Center for International Compliance of Distant-water Fishery, Shanghai Ocean University, Shanghai, China, ²China Overseas Fishery Association, Beijing, China, ³College of Marine Living Resource Sciences and Management, Shanghai Ocean University, Shanghai, China

As a geographical dimension of justice, spatial justice is characterized by the interplay of social justice and heterogeneous spaces, including the ocean. Despite the generous contribution of ocean to humankind, concerns over aquatic spatial justice are disproportionately lacking. Among the core disruptors of ocean justice, illegal, unreported and unregulated (IUU) fishing imposes a major threat to global fisheries governance. The synthesis of spatial analysis and justice perspective can generate new insights to help understand and potentially address IUU fishing. To examine the spatial (in)justices concerning IUU fishing, we first propose a novel tripartite framework that envisions space as a form of opportunity, society and rights to externalize its socio-environmental implications. Then we integrate productive, distributive and consumptive justices to examine the spatial variations of IUU stakeholders along the fish value chain, and use stakeholder analysis to investigate spatial powers and conflicts regarding both a micro scale of fish communities, and a macro scale of states (coastal state, flag state, port state and market state) and supranational players (regional fisheries management organizations and marine protected areas). It is discovered that certain regions provide greater spatial benefits that stimulate IUU behaviors; IUU misconducts cause spatial differentiation and spatial deprivation that disrupt social orders in fish communities; space can empower stakeholders' inclusive and proper engagement into the place-based management process against IUU fishing. Since the spatialized vision has been increasingly highlighted in marine fisheries management, it is suggested to intervene in the world ocean by leveraging spatial knowledge, managing spatial conflicts and facilitating spatial action, in order to promote spatial justice and better combat IUU fishing globally.

KEYWORDS

spatial justice, IUU fishing, sustainability, RFMOs, fisheries management, stakeholder, fish value chain

Highlights

- Space provides opportunity, and certain regions provide greater spatial benefits that stimulate IUU behaviors.
- Space constructs society, and IUU misconducts cause spatial differentiation and spatial deprivation that disrupt social orders in fish societies.
- Space offers rights, and spatial stakeholders' inclusive and proper engagement into the place-based management process is key to effectively combating IUU fishing and promoting spatial quality.
- Stakeholder analysis was conducted for clarifying state-led justice in sovereign spaces (e.g. coastal state, port state, flag state and market state) and supranational justice (e.g. high seas within or without the jurisdiction of RFMOs) before locating the rights and solutions for better combating IUU fishing globally.

1 Introduction

Merely 13.2 percent of ocean worldwide remains free from human activity (mostly in the Antarctic), and the global commercial fishing area is nearly 4 times that of agricultural land (Kroodsmas et al., 2018). This indicates that aquatic space is much larger than terrestrial space for resource production, providing 17 percent of global animal-source protein for human consumption and assuring the livelihoods of 8 percent of the world's population (FAO, 2022). Considering the generous contribution of ocean to humankind, however, concerns over justice in aquatic space are disproportionately lacking. From "territory space" to "urban planning", the spatial dimension of justice is generally associated with landscapes. Ocean justice, as an undervalued environmental justice concern, deals with the critical intersection of ocean conservation (including fish conservation) and social equity. In fact, the issue of justice arises when man-made equipment such as vessels, nets, diving gears, and dam facilities are constantly encroaching on water territories where fish inhabits. The erosion of aquatic environment may cause irreversible eco-damage to marine ecosystems and further result in economic, social and cultural inequities across amphibious space.

Among those fishing practices, illegal, unreported and unregulated (IUU) fishing is a core disruptor to ocean justice, for it undermines both environmental and social welfare. The universally acknowledged definition of IUU fishing is listed in Article 3 of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported, and Unregulated Fishing (IPOA-IUU), jointly developed by member states of the Food and Agriculture Organization of the United Nations (FAO). According to IPOA-IUU, illegal fishing includes fishing and fishing-related activities conducted in contravention of national, regional and international laws; unreported fishing involves non-reporting, misreporting or under-reporting of information on fishing operations and their catches; unregulated fishing engages

operations by "stateless" vessels, fishing in convention areas of regional fisheries management organizations (RFMOs) by non-party vessels, fishing activities which are not regulated by states and cannot be easily monitored and accounted for, and where there are no applicable measures, fishing activities conducted in a manner inconsistent with state responsibilities for the conservation of living marine resources under international law (FAO, 2001). The three types of fishing activities touch upon the illegal and technical dimensions and are often treated as a whole under specific and operational criteria for the identification and regulation in RFMOs' management practices. IUU fishing imposes a major threat to global fisheries governance. Discussions of various perspectives and forms on combating IUU fishing can be found in multiple international fisheries instruments that stress eco-conservation and sustainability (Kabai, 2012; Serdy, 2017; Payne, 2020). Illegal poach leads to an injustice, as it evades taxes and gets away with catching more fish, depriving the legitimate right of law-abiding vessels operating at the same space. Fishers often elude regulators by flags of convenience, transshipment, under/misreporting, and discarding of low-value catches. Such misconducts violate space ethics, the normative and guiding value order formed in social practices in certain space (Kendal, 2019). From a spatial perspective, countries that offer flags of convenience tend to prioritize fishing production over sustainability. They often have loopholes susceptible to IUU fishing, for instance, document falsification denies accurate and transparent data to a market space.

The economic, social, environmental and cultural impacts of IUU fishing can be felt both along the fish value chain and across aquatic spaces ranging from inshore waters to the high seas (Ma, 2020; Dağtekin et al., 2022). It is estimated that 11-26 million metric tons of fish caught illegally each year (Agnew et al., 2019) leads to an approximate annual economic loss of 10-23 billion US dollars worldwide. Moreover, dishonest fishing vessels bring human rights (Mileski et al., 2020) and security risks (Finnis and Reid-Musson, 2022). IUU-linked piracy, slavery, drug and arms trafficking, and other terrorist and criminal incidents surface from time to time, especially in waters off West Africa. Unbridled increase of fishing effort threatens aquatic biodiversity. While bycatch discard is a waste of fish resources, the damaged bodies of which are later returned to the sea. The fishers at large operate in "heterotopia"¹, which is both an ecological and a cultural space with exotic properties. Instead of plundering vessels for properties, they ravage the seas for fish.

In terms of governance, IUU fishing cannot be judged by a simple standard of ethical values, since the decision-making process for justice is hindered by both epistemic and practical difficulties such as fairness in maritime political demarcation, RFMOs jurisdiction, care for vulnerable countries' interests and concentration of high-value fish. The covert nature of IUU fishing vessels (INTERPOL, 2019) and limited extraterritorial effect of

¹ Heterotopia is a concept elaborated by philosopher Michel Foucault to describe certain cultural, institutional and discursive spaces that are somehow "other": disturbing, intense, incompatible, contradictory or transforming.

domestic fisheries laws further undermine the implementation of existing management measures (Jaleel and Smith, 2023). Analyses on measures against IUU fishing are generally conducted from legal, economic and social perspectives, which entail spatial values that relate to narration and development of ocean welfare and concern various benefits of fish stakeholders. The justification and cost-effectiveness of the UNCLOS approach [responsibilities of flag, coastal and port states (Ma, 2020)], the market approach (trade measures through market states) and the social-capital approach (e.g. community trust (Soto-Oñate and Lemos-Nobre, 2020), labor rights (Kadfak and Linke, 2021), security system (Fajardo, 2022) in improving compliance have been explored and debated. All of these countermeasures are concerned with the interplay of homogeneous or heterogeneous aquatic geographies. Such space constitutes an active force shaping both human and fish life. Albeit recognizing the significance of applying spatial-related tools such as marine spatial planning to coastal regions (Queffelec et al., 2021), high seas (Ardron et al., 2008), and marine protected areas, scarce scholarly attention has been devoted to identifying, assessing and integrating spatial values and preferences tailored for combating IUU fishing. Stakeholders of IUU fishing mainly include fisher, smuggler, transshipper, processor, trader and consumer along the fish value chain, as well as individual or institutional players such as villager, enterprise, government, NGO, etc. They seek different and sometimes conflicting values (opportunities for or against illegal action) from fish-related spaces, and their interaction in a shared space can impose certain impacts on social equity.

In this context, this paper attempts to explore the potential of incorporating spatial values into the fight against IUU fishing, by analyzing the current challenges and proposing possible solutions through the lens of spatial justice. The objective is to promote a more comprehensive understanding of IUU fishing's spatial dimensions, and contribute to the development of more effective, equitable, and sustainable governance strategies for global fisheries.

2 Spatial justice in fisheries

Though a much-contested concept, justice is concerned with a just humankind and a just society featured by fairness in resource allocation (Edor, 2020). Spatial justice entails the fair distribution in space of socially valued resources and the opportunities to access and leverage them (Piras et al., 2021). It is a system thinking of social justice that incorporates the considerations of human rights, equity and democracy in consequential spatiality (Jian et al., 2020). The idea emerged as a result of multiple modern space interventions in the context of urbanization agglomeration (Bassett, 2013). It is mainly targeted at terrestrial issues, exemplified by urban-rural divide, architecture restructuring, natural space destruction and pollution, as well as war and famine in poverty-stricken areas (Bissett et al., 2015). The multifaceted nature of the ocean as a space is later explored for a renewed perspective for understanding and intervening in the global marine environment (Steinberg, 2008). The ethical implication of a space is reflected not only in its physical configuration, but also in various moral relations constructed within it. Approached from a practical perspective,

spatial justice is a struggle towards equitable distribution of resources and opportunities, and fairness in balancing power relations across space (Madanipour et al., 2021). Places that encourage socially just outcomes (Cramme and Diamond, 2009) is central to equitable, sustainable man-nature systems and adaptive management. Despite the introduction of multiple spatial management measures to marine zones (e.g. marine protect areas, large marine ecosystem), the role of justice behind management in fisheries space awaits further exploration.

According to Soja (2010), space is a complex product of mutual relations that incontestably involve human activities. Steinberg (2008) views the ocean as a space saturated with social processes and cultural resonances, not just as an object of political contestation. In a modern society, the spatial discourses of competing fish stakeholders and their behaviors among diversified waters present a typical sample of spatial justice. "Situated within particular histories, spaces, and political-economic processes" (Boucquey, 2017), social groups construct specific narratives toward fish values and fish-use patterns (that may or may not align with any ecological concerns) to defend their own positions and self-interests. For instance, while subsistence fishers highlight the moral violations of industrial vessels voyaging at the same waters to rob their livelihood, commercial enterprises extol the benefits of capturing more fish as a source of sufficient protein and income, and leisure operators appreciate the beauty of angling space as a contributor to physical and mental health. Despite distinctive narrations, human's exploitation of fisheries resources can be uniformly regarded as a process of expanding their living space from land to water, creating an amphibious civilization. Their growing appetite for fish and enhanced ability for fishing have prompted battles over hybrid seascapes. During the process, unjust harvest, unfair distribution, eroded rights, habitat destruction and other space-related moral failures may lead to an entire and long-term damage of the socio-ecological system.

With deep inequalities in the production, distribution and consumption of food (Jacobi et al., 2021), including seafood, the study of justice is crucial to understanding power asymmetries in spaces of key activities along the fish value chain. To be specific, spatial justice for fisheries can be divided into productive justice², distributive justice, and consumptive justice³. Among them, the justice of spatial production plays a decisive role. Fair and equitable engagement in production in each fish territory provides a prerequisite for just distribution and consumption. This is a process of "spatialization of capital" through decomposing "space into exchangeable commodities (Shepard, 2002). The productivity of a space depends on its production level evaluated by factors such as biomass of economic species. Given the conflict between finite fisheries resources and increasing fishing capacity, it is important to figure out how the distribution of fish production benefits and

² Productive justice refers to the legitimacy and rationality of production activities.

³ Likewise, consumptive justice refers to the legitimacy and rationality of consumption activities.

burdens are prioritized and allocated among interest groups to accommodate “competing needs and claims” (Hicks et al., 2022). At the end of the spectrum, consumers can also function as facilitators of spatial justice through sustainable and responsible purchases made individually or by certain groups. Moreover, recreational fishery site is in itself a space to be consumed. In short, spatial justice is a goal, the nature of which is subject to multiple criteria and values that regulate various conflicts of interest and contradictory relations, providing a novel perspective in the process of spatial production, distribution and consumption of fisheries resources.

There are multiple factors causing spatial injustice in fisheries. An important one is constantly accelerated space production, as seafood has become a “value-laden” product that governments, enterprises, fishers and consumers are all pursuing, permeating oceans with class struggles and conflicts of interest. Large motor vessels sail into ocean space for more fish, compromising small-scale fishers’ subsistence. Illegally caught fish is prone to be transhipped from space to space under insufficient supervision. Another contributor is the negative externality of market economy that generally leads to rich-poor consumption divide in the same space. The increasing consumption of seafood to satisfy the rich’s bigger appetite may lead to unequal distributions of benefits and impose socio-ecological injustice in aquatic space (Hicks et al., 2022). Moreover, fisheries governance in many countries (especially underdeveloped countries) is subject to poor coverage of legal and political instruments. Weak government supervision and incomplete legitimate system will disrupt space production, distribution and consumption. It is the government’s responsibility to regulate accessibility for fish resources, establish a just market system for seafood, and facilitate stakeholders’ better participation and cohesion with supporting mechanisms (He et al., 2022).

Given that geography can exert influence on social circumstances (Nordberg, 2021), realizing spatial justice in fisheries requires the place-based coordination of both “could” (represented by efficiency) and “should” (represented by fairness) (He et al., 2021), which means promoting sound development opportunities for aquatic operators and rehabilitation opportunities for fish stocks, while securing the basic rights and interests of legal stakeholders in a particular area. In a socially constructed water space, agglomeration of fishing effort can be equated to economic efficiency, since it is expected to minimize production costs and boost technology spillover (Storper, 2011). But such agglomeration should be steered to accommodate the spatial aspect of socio-ecological sustainability, which requires the regulators to harmonize relevant measures with the characteristics of fish habitat and align stakeholders with a justified vision and narration to encourage implementation. This brings various challenges to the currently fragmented political and legal instruments in different geographies. Combating IUU fishing through place-based measures is attracting more management attention (Canty et al., 2018). In aquatic spaces where fisheries resources represent different values to community stakeholders, it is imperative to figure out how to integrate spatial thinking into navigating just fisheries action and governance. Moreover, since

the introduction of the United Nations Convention on the Law of the Sea (UNCLOS)⁴, the ocean space has been divided into different maritime zones. States’ access to and control of resources and ability to combat IUU fishing, as well as the legal roles of RFMOs to conserve and manage high seas fisheries are clearly regulated. The international framework⁵ with specific provisions and requirements to address IUU fishing, including those with respect to coastal state responsibilities, flag state performance, port state measures and market state measures, lays a good foundation for enhancing spatial justice.

3 Methodology

As a criminal act, illegal, unreported and unregulated fishing contains intricate spatial relationships extending from inland waters to coastal areas and high seas with unjust outcomes. For a potential offender, whether to engage in IUU fishing depends on the opportunity structure available to them within specific geographic locations, including the amount of effort taken to illegally catch and sell economic species, the expected reward of illegal fishing, and the possible risk and consequence of being caught (Petrossian, 2015). Besides providing crime opportunities, space also generates a society by facilitating relational interaction and network between human actors (Crossley, 2018). Once IUU fishing occurs, its costs are often unfairly borne by vulnerable coastal residents, depriving them of aquatic resources and widening power differentials in their communities. Moreover, individual or community access to fisheries space is managed as a form of rights (Domondon et al., 2021). Moving beyond societies, IUU fishing often causes domestic and international disputes across countries and regions. The distribution of rights and responsibilities in fisheries space is a key issue of justice.

In this study, based on the envisioning of spaces as production of opportunities, societies and rights, we put forward three cause-effect-solution hypotheses: (1) Space provides opportunity, and certain regions are crime-prone to IUU behaviors than others; (2) Space constructs society, and IUU misconducts cause spatial differentiation and spatial deprivation that disrupt social orders in fish communities; (3) Space offers rights, and spatial stakeholders’ inclusive and proper engagement into the place-based management process is key to effectively combating IUU fishing and promoting spatial quality. Spatial estimate, detection and market exclusion of IUU catch (opportunities), information sharing among stakeholders (societies), coordinated supervision and enforcement

4 The United Nations Convention of the Law of the Sea. https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

5 Relevant instruments include UNCLOS, FAO Compliance Agreement, UN Fish Stock Agreement, Code of Conduct for Responsible Fisheries, IPOA-IUU, Agreement on Port State Measures, Voluntary Guidelines for Flag State Performance, Voluntary Guidelines for Catch Documentation Schemes, Regional Mechanisms, etc. <https://www.fao.org/iuu-fishing/international-framework/en/>.

across jurisdictions (rights) can jointly work against illegal, unreported and unregulated harvest.

For the first hypothesis, we probe into the spatial variation of IUU behaviors on a global spectrum by assigning productive, distributive and consumptive justices along the fish value chain to analyze different influence factors. IUU misconducts include “illegal”, “unreported” and “unregulated” fishing, so we respectively examine the spatially-relevant factors in the supply chain, which may increase the risk of illegal catch, unreported cases and unregulated incidences, including greater abundance of target species that are attractive to trespassers, and procedures prone to weak supervision and regulation such as transshipment, ports of convenience (POCs) and traceability. In terms of the “attractive” target in fishing production, we employ productive justice to further interpret the CRAVED theft model proposed by Clarke as a crime prevention tool (Eck and Clarke, 2019) and used by Petrossian in fighting against IUU fishing, which explains easy-to-be-stolen product features as “easily concealable, removable, available, valuable, enjoyable and disposable” (Petrossian, 2014). For distributive justice, we analyze the global footprint of vessels’ transshipment by Miller et al, who tracked and mapped transshipping behaviors; and leverage Global Fishing Watch and a Pew Environment Group study to explore spatial layout of POCs (Miller et al., 2018). For consumptive justice, we examine how seafood traceability can facilitate ethical consumers to make justified purchase from place-based information.

To check the second hypothesis, we investigate “how geography exercises particular influence over social circumstances” at a micro scale of fish communities, which highlights the spatial impact on individual players. This part mainly assesses the relationship among place-specific stakeholders concerned with IUU fishing. We combine justice discourse with stakeholder analysis, a tool to study the dynamics of stakeholders in a community or

neighborhood in order to identify key stakeholders of IUU fishing before analyzing their interactions and figuring out their spatial roles, preferences and resources in a table. The consequences of widened spatial differentiation and deprivation are then analyzed with corresponding examples.

To explore the third hypothesis, we examine the roles of and interactions among heterogeneous regions at a macro scale, which highlight the functions of sovereign and supernational spaces in the combat against IUU fishing. Based on mainstream policies and legal documentations, the global geographies with differently assigned rights and responsibilities are divided into two categories: sovereign spaces, including coastal state, port state, flag state and market state; and supernational spaces, such as high seas within or beyond the jurisdiction of RFMOs. Stakeholder analysis is continued in this section for clarifying their relationships, before locating the rights and solutions.

Figure 1 presents a tripartite framework of the above-mentioned three hypotheses and the methodologies proposed with regard to analyzing the spatial justice concerns of IUU fishing.

4 Results and discussion

4.1 Space as opportunity: spatial variation of IUU fishing

Crime is universal, yet spatially concentrated. Environmental criminology critically examines the link between crime and physical location and how our activities are spatially shaped (Brantingham et al., 2017). The end goal is to identify ways that can manipulate attributes of physical environment to reduce opportunities to commit crime at various points in order to promote social justice. By focusing on targets which stimulate criminal actions and

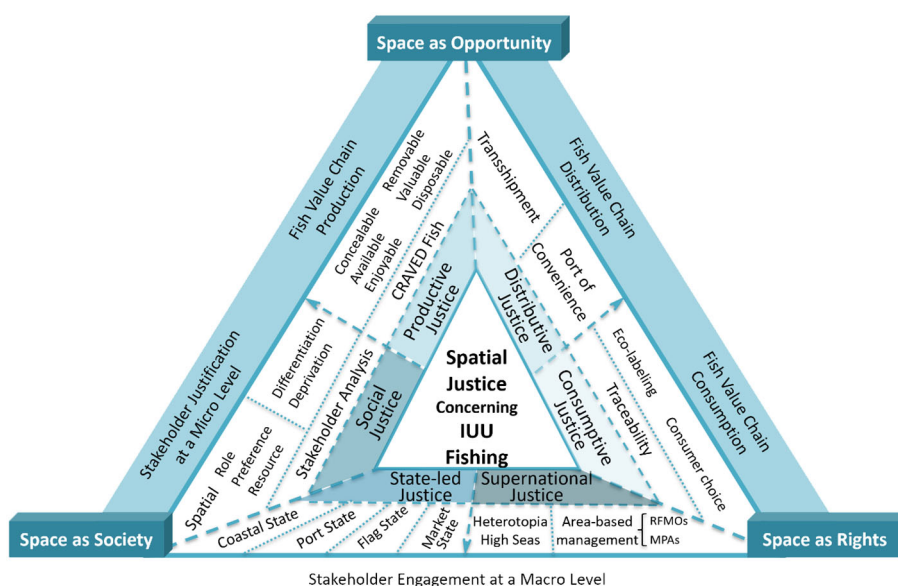


FIGURE 1
Tripartite Framework of Spatial Justice Concerning IUU Fishing.

locations where illegal activities may take place, it provides a place-sensitive perspective on how variables have an influence on crime. As a serious environmental crime, IUU fishing can be embedded into the context of crime and justice analysis.

4.1.1 Productive justice and CRAVED fish

With man's at-sea production, fish space is socially constructed, functioning as an active tool for the benefits of stakeholders in the fisheries sector rather than a passive geographical distribution. Fishing activities not only help guarantee fishers' subsistence, but also construct their way of life. However, injustices may arise in the production process, for instance, "what to produce" (products satisfying unjustified demands, e.g. drugs; products compromising welfare, e.g. counterfeit and shoddy), and "how to produce" (exploitative work practices, e.g. child labor, forced labor; environmentally destructive operation, e.g. overfishing, bycatch). IUU fishing is more concerned with the second aspect – the legitimacy of production means/modes. Water contains fisheries resources, providing not only raw materials and places for fishers to carry out production, but also chances and conditions for trespassers to fish illegally. Chasing after aquatic species, the latter apply destructive production modes to various ocean spaces and bring about "negative externalities" in those crime-prone subsections.

A crime happens when there is an overlapping of activity space of an offender with that of a victim/target (Brantingham et al., 2017). In their decision-making process for "production", offenders make self-interested appraisal between costs and benefits, and take actions towards the greatest perceived utility (Pateroster et al., 2017). IUU fishing is a particular form of theft crime, and specific species are preferred by illegal fishers as ideally useful and suitable targets. Guided by the CRAVED model, a rational fish theft tends to pursue species that are easily Concealable (sold through POCs), Removable (proximity to easy-to-remove positions), Available (species distribution), Valuable (large), Enjoyable (favored by recipes) and Disposable (commercially important – easier to dispose of than those with limited market demand) (Petrossian, 2014). This model well explains why some fish types are more popular than others. All the six factors are concerned with geographical contexts that influence crime occurrences. Offenders perceive such factors as "favorable" conditions for more potential reward and less chance of being caught. Among 567 most overexploited stocks, 306 are at the highest risk of IUU fishing (WWF, 2015). Such stocks are favored by offenders, the distribution of which can be an indicator of their concentrated criminal footprints at sea.

Profit-seeking opportunities provided by CRAVED fish lead to spatial variations in both territorial and international waters. In coastal regions, as Petrossian's investigation into the place-related factors affecting IUU behaviors in 53 major fishing countries have suggested (Petrossian, 2014), there exists a positive correlation between a country's IUU fishing risk and the abundance of CRAVED species inside its waters under national jurisdiction. The northern coasts of Russia adjacent to the Arctic Sea, the Bering Strait, the eastern coasts of China and the Japanese Sea are

areas where internationally attractive species are found to impose the greatest impacts on the degrees of illegal fishing. Based on a WWF report assessing 567 overexploited stocks (WWF, 2015), in broader FAO designated ocean areas, the highest risks (above 80%) of non-tuna stocks for IUU fishing are detected in Western Central Pacific (Area 71), Southeast Pacific (Area 87), Eastern Indian Ocean (Area 57), Northwest Pacific (Area 61), Southwest Atlantic (Area 41), and Western Indian Ocean (Area 51), contributing to a combined 64% of the global catch by volume; while highly migratory tunas aggregate more in the Atlantic, Pacific and Indian Oceans. Derived from the WWF report, Table 1 shows the risk levels of stocks subject to IUU fishing and share of catch volumes in designated FAO Ocean Areas, while Figure 2 further visualizes the estimated percentage of high-risk stocks subject to IUU fishing and their share of global catch by volume in those FAO ocean areas. It can be noted that the highlighted areas (Areas 57, 61, 71, 87) with the highest IUU fishing risks and catch volumes overlap with the spaces where commercially significant species inhabit, for instance, Chub mackerel (Area 57), Largehead hairtail (Areas 61 and 71), and Chilean jack mackerel (Area 87). Petrossian's research and the WWF report respectively show certain spatial correlation between popular species and IUU fishing risks in coastal and high seas regions. With rational offenders calculating potential fish reward and cost during decision-making, IUU fishing crimes tend to be more prevalent in places with a higher concentration of CRAVED stocks. This correlation has also been demonstrated in multiple empirical researches (Sidebottom, 2013; Pires, 2014).

As can be seen, CRAVED stocks are an ideal raw material for IUU producers, and the former's movement can cause the spatial variation of the latter's production activities⁶. Their offense denies legal fishers' equal access to the same production areas and resources, resulting in a spatial form of production injustice. In this case, place-crime connection can provide a clue to direct crackdown interventions to unjust species production. In practical production, local ecological knowledge that combines site-specific understanding and environmental information concerning CRAVED stocks serves as a useful tool to advance management of coastal fisheries, especially in developing countries where data and resources are lacking (Berkström et al., 2019).

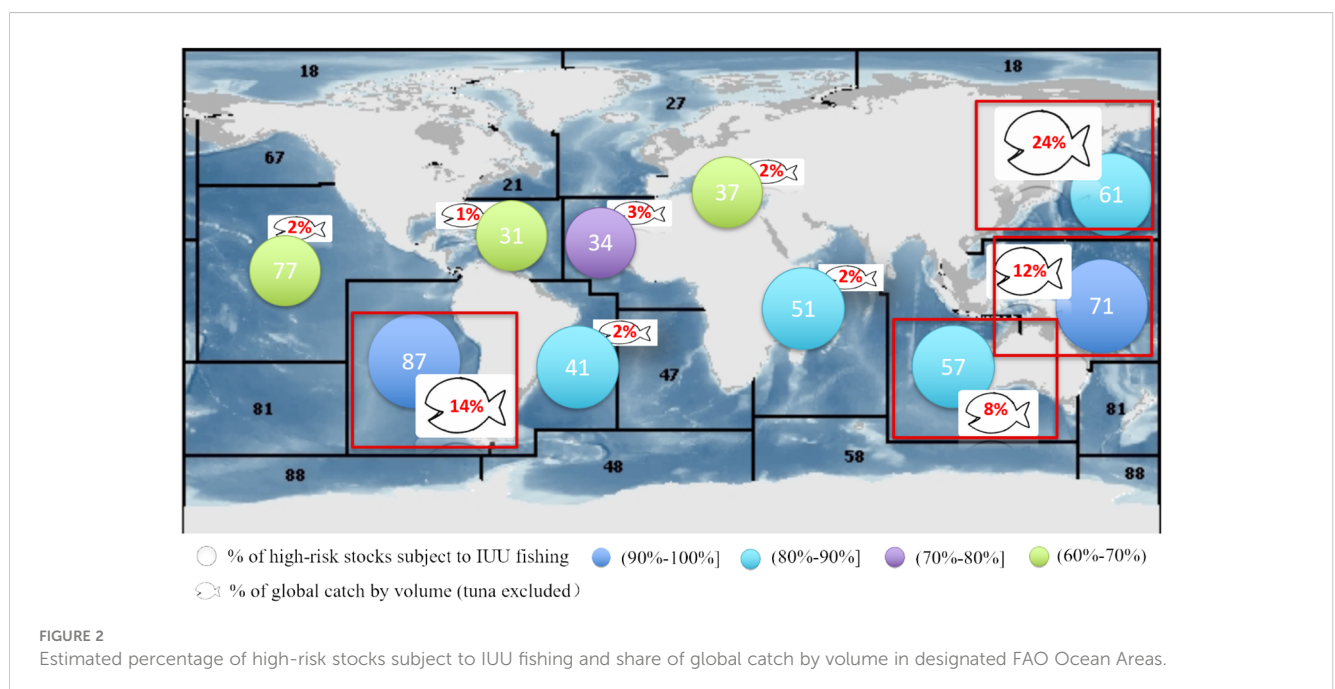
4.1.2 Distributive justice, transshipment and POCs

Seafood is a world's most traded food commodity (Naylor et al., 2021). The limited nature of marine fisheries resources requires proper arrangement of aquatic products among competing interests. The issues of distributive justice are then raised to address conflicting fishing claims and ensure that allocation is fair and equitable. Distributive justice emphasizes the appropriate sharing of benefits and burdens that are morally preferable (Capehart and Milovanovic, 2020). Current studies focus more on the just distribution of fisheries quota and subsidies, yet provide less guidance on the prevalence of maritime transshipment and POCs that may disrupt seafood distribution. Through a spatially

⁶ For sedentary stocks, their geographical presence may indicate the appearance of IUU fishing vessels.

TABLE 1 Risk levels of stocks subject to IUU fishing and share of catch volumes in FAO Ocean Areas.

Ocean Basins	Risk of IUU			No. of IUU Stocks at Risk			% of Catch by Volume (Tuna excluded)
	High	Moderate	Low	High	Moderate	Low	
Northwest Atlantic (FAO Area 21)	0%	46%	54%	0	17	20	2%
Northeast Atlantic (FAO Area 27)	0%	79%	21%	0	22	6	11%
Western Central Atlantic (FAO Area 31)	68%	16%	16%	26	6	6	1%
Eastern Central Atlantic (FAO Area 34)	79%	21%	0%	41	11	0	3%
Mediterranean and Black Sea (FAO Area 37)	66%	34%	0%	29	15	0	2%
Southwest Atlantic (FAO Area 41)	87%	13%	0%	26	4	0	2%
Southeast Atlantic (FAO Area 47)	0%	77%	23%	30	23	7	2%
Southern Atlantic Ocean (FAO Area 48)	0%	100%	0%	0	11	0	0.1%
Western Indian Ocean (FAO Area 51)	87%	0%	13%	34	0	5	4%
Eastern Indian Ocean (FAO Area 57)	88%	12%	0%	45	6	0	8%
Southern Indian Ocean (FAO Area 58)	0%	100%	0%	0	6	0	0.01%
Northwest Pacific (FAO Area 61)	87%	13%	0%	27	4	0	24%
Northeast Pacific (FAO Area 67)	0%	65%	35%	0	15	8	3%
Western Central Pacific (FAO Area 71)	90%	10%	0%	44	5	0	12%
Eastern Central Pacific (FAO Area 77)	67%	24%	9%	14	5	2	2%
Southwest Pacific (FAO Area 81)	0%	61%	39%	0	19	12	0.5%
Southeast Pacific (FAO Area 87)	90%	10%	0%	18	2	0	14%
Southern/Antarctic Pacific (FAO Area 88)	0%	100%	0%	0	3	0	0.0003%



broadened scope, the justice dimensions extend beyond utility, wealth, welfare, etc. And the distribution is not limited to individual or groups, but also includes equal opportunities to get eco-friendly seafood at both national and international levels. In the fish sector, every link of the whole value chain can obscure transparency and affect subsequent results of distribution. It is therefore imperative to identify the spatial variations of those impeding factors stimulating IUU fishing.

While boosting fishing efficiency without compromising product quality, transshipment activities make it difficult to trace the actual source of catch and identify illegally caught fish hidden in the legitimate seafood market. Even well-regulated regions are sometimes reluctant to share relevant data due to its sensitivity. But trackers like Vessel Monitoring System (VMS) provide a legitimate tool to detect vessel behaviors and map distribution injustices along this opaque part of industrial chain. Global Fishing Watch (GFW) is an open-source dataset that traces vessel locations worldwide, which updates various visualizations of vessel-based human activities to show fishing vessel prevalence geographically. It generally displays transshipment incidences in “single-vessel loitering” or “two-vessel encounter” patterns, the former revealing the behavior indicative of a potential encounter event, while the latter showing the actual encounter⁷. According to the latest GFW data, from 2017 to 2022, 100,000 loitering events were detected in 1621 carriers from 66 flag states, while 46,186 encounters were identified in 827 carriers from 45 flag states (Petrossian, 2014). The extensive global footprints of both events were later visualized by Miller et al. (Miller et al., 2018), showing the highest transshipment concentrations in high seas, in the Russian Far East and the Barents Sea, outside the EEZs of South America (such as Argentina, Peru), within the EEZs of African nations, and across the Equatorial Pacific. They are the regions where jurisdiction is less clear (e.g. long-lasting demarcation dispute between Russia and Baltic States) and enforcement measures are less robust (e.g. weak capacities for monitoring and deterring IUU events in Somali) (Boerder et al., 2018). Vessels were found to chase after popular high-sea transboundary species such as tuna, sharks, squids, crustaceans, groundfish and salmon.

Besides transshipment, the source of seafood is further obfuscated by Ports of Convenience before entering into the market and setting out on consumers’ tables. POCs, also known as ports of non-compliance, refer to the ports that fail to implement effective regulation over fishing and fishing-related activities within their jurisdiction. Their weak compliance increases the risk of IUU fish being landed, transshipped, processed and sold at the port space. There were limited public recordings of port visits by IUU-listed vessels. In Pew’s 2010 report, 425 out of the 509 IUU-listed vessel movements were found to 140 ports of 71 countries (PEW, 2015). The access to 10 most visited POCs (11% of total port visits) amounts to 155 visits (43% of total port visits), showing a clear spatial concentration. A country within 1500 nautical miles from

any of these 10 ports is considered to have access to them, the location of which makes it more vulnerable to illegal fishing (Petrossian, 2015). Their greatest repercussions on IUU fishing degree were detected in the Russian Far East, the Barents Sea, Sea of Okhotsk, eastern coasts of China, and Japanese Sea. These ports include Bahia de Manta; Port Cartagena; Port Kaliningrad; Las Palmas; Nouadhibou; Pusan; Rostock; Port Sevastopol; Port Singapore; and Tema (See Figure 3).

It can be noted that transshipment spots and “popular” Ports of Convenience that facilitate IUU fishing are not evenly distributed and can wreck lopsided havoc on both fishing grounds and landing places via diversified routes worldwide. What goes on at sea and in POCs can be dismissed by regulators, which allows ship owners to get away with abusing seafarers’ rights without detection (Chen and Shan, 2017). Relative deprivation, a sense of injustice towards the unfair distribution of fisheries resources or discrepant fishing conditions, may arise among legal fishers who feel betrayed by the system responsible and might therefore object to it. Equal and equitable levels of space opportunity need be promoted in every link of the allocation process, before fisheries resources are properly handed to the end users.

4.1.3 Consumptive justice and traceability

At the end of the fish value chain, ethical consumers, with their basic needs satisfied, can serve as active co-producers by their conscientious purchasing intervention to advocate reasonable, just, moderate and sustainable consumption of seafood. Driven by intrinsic motivation, they reflect on their choice of goods and make valued decisions (Berki-Kiss and Menrad, 2022). They are willing to spend money on what they perceive as greener goods, fishes that are given proper care, produced and transported in sound environment in an eco-friendly manner, and subject to strict quality control. Their rational behaviors go beyond the practical functions of seafood to reach its symbolic meanings and values. Those buyers consume not only goods in market but also, indirectly, the responsible and sustainable process used to produce them. Concerns over the environment, animal welfare, social justice (e.g. unfair trade) and human rights (e.g. fishers’ rights and safety, labor abuse) play an increasingly important role in shaping and shifting consumers’ shopping preferences and habits (Toti et al., 2021). On the other hand, consumers are able to exert influence by making ethical choice to purchase seafood from well-managed producers.

IUU fishing often emerges in a place where there are jurisdictional gaps or “gray areas”. For instance, a research evaluating the unregulated nature of global squid fisheries finds that their extensive fishing effort (149,000 to 251,000 vessel days annually) increased 68% during 2017–2020; and the highly mobile vessels fish in multiple regions, largely (86%) in unregulated areas (Seto et al., 2023). Without proper monitoring, surveillance and control conditions, this space breeds injustice that curtails legal and sustainable effort. Before reaching consumers’ hands, seafood travels far distances from waters to the shelves of market. This spatial movement largely obscures its aquatic backgrounds and allows illegal harvest to flow into the market. Among the global catches, about 20 percent come from IUU fishing, and that figure can be up to 40 percent in certain poorly-managed coastal regions in developing countries (PEW, 2013), disrupting the seafood consumers’ decisions

⁷ According to GFW, “vessel encounter” include locations where two vessels, a carrier and a fishing vessel, were continuously within 500 meters for at least 2 hours, while at least 10 kilometers from a coastal anchorage, based on AIS data. See: <https://globalfishingwatch.org/our-map/>.



FIGURE 3
Flagged port visits of IUU-listed vessels by 10 most visited Ports of Convenience (inspired by Pew and Petrossian).

and perpetuating injustice. Given little or inaccurate information on the supply chain, their ethics-based purchasing may be counter-productive. It is therefore imperative to make whole production stage more transparent and detectable. Eco-labeling, tracking fish from bait to plate, informs consumers about product features, such as sustainable fishing methods. In response to the injustice that could happen in every link in different spaces, eco-certification programs have been introduced by multiple institutions, including Marine Stewardship Council (MSC), NOAA Fisheries, etc. Certified seafood with eco-labels can present its background in a clearer way. Producers can also enjoy price premium or boosted sales if there is an increased demand from consumers (Andersson and Hammerlund, 2023). Traceability in the fish supply chain entails steps like pre-certification, audit and formal certification. Take MSC-approach as an example, through fisheries standard, Chain of Custody standard, measures like improved estimates of illegal catch/bycatch, detection of illegal activities, and market exclusion of illegal/unethical/IUU blacklisted operators and harvest jointly contribute to combatting “illegal” harvest; actions like improved catch estimate of target species, coordinated enforcement across jurisdictions, transshipment of unreported catch at sea, and open information sharing among stakeholders work against “unreported” harvest; while improved stock management, better dispute-resolution management of transboundary/RFMOs stocks, and interoperative chain of custody help close loopholes that facilitate “unregulated” harvest (Longo et al., 2021).

However, there is a high threshold for consumptive justice, especially for consumers in developing countries; and MSC certification and NOAA’s Seafood Inspection Program practiced in developed countries are of a voluntary nature, allowing much room to maneuver. Fishers can choose not to be certified, while consumers can choose more cost-effective products to avoid extra economic burden. How different spaces involved in the fish supply chain can be coordinated for traceability influences the levels of consumptive justice against IUU fishing.

4.2 Space as society: stakeholder justification at a micro scale of fish communities

“Place persists as a constituent element of social life and historical change” (Gieryn, 2000). As an objective reality, a space provides certain societal settings or conditions that influence the behavior of actors within its range (Kim et al., 2012). Fish societies are an ecological environment where stakeholders of the fish value chain assemble to form a special power structure. Areas in the communities are often stratified by power differentials existent in its social hierarchies. Different actors need assorted and identifiable physical spaces to perform activities. In turn, their relationship and events impart specific meaning and identity on such spaces.

IUU fishing constitutes a force that invisibly shapes and conditions the life of people in an afflicted neighborhood, turning some into crime-prone subsections. The paper attempts to examine the impact of IUU misconducts on fish communities via stakeholder analysis.

4.2.1 Stakeholder analysis and IUU fishing

Stakeholder analysis is an approach employed to study the interplay of stakeholders by power and interest within a social environment in order to understand the dynamics existing in a community or a neighborhood (Sousa, 2012). By analyzing the interactions of stakeholders, agencies are empowered to identify, map and measure the rhetoric and rationale of stakeholders used to justify their actions. Stakeholders’ narratives, discourses, and decisions are crucial to show the proposed priorities and representations of justice and the power relations reflected in decision-making at a micro level (Flipo et al., 2023). In a multi-stakeholder context of fisheries community, the initiatives of key players connected with IUU fishing can be identified. And their interplay in a shared space (such as contacts between offenders and victims, transactions of illegal goods) can exert specific social impacts.

Fisheries stakeholders tied by shared traits tend to form a spatially concentrated group. Such homogeneous group gather together as a community for information sharing or collective action. Justice requires a level playing field and mutual trust within the community (Erkkilä-Välimäki et al., 2022). Identifying and interpreting the stakeholder notions of justice contributes to “principled debate” on justice in fisheries, acceptable public policies and targeted management measures (Kahmann et al., 2015). When conducting analysis on the stakeholders, the purpose and time dimensions of interest, the time-frame and the context are issues to be considered (Varvasovszky and Brugha, 2000).

In a broad sense, the stakeholders of IUU fishing include both dishonest actors associated with IUU practices along the fish value chain, and individual or institutional players who support anti-IUU actions for sustainable fisheries. From fishing to purchasing, illegal actors mainly include unruly smugglers, fishers, transshippers, processors and traders. Those trespassers operate at sea, ports, markets and other spaces to extract benefits from fish, while finding ways to elude regulators. To maximize the fishing effort and minimize the costs, ship owners/captains often require longer production hours and provide indecent working conditions that result in labor abuse. Without supervision, neither the quality nor the safety of IUU seafood can be guaranteed. The covertness of their behaviors and their movement from one place to another make them less detectable by governors at various levels. On the other side of the spectrum, positive influencers mainly include governments, NGOs, eco-friendly enterprises, villagers and consumers, who can intervene at different stages with their resources or knowledge to promote a level playing field. Based on existing violations and combatting effort, Table 2 identifies 11 key

actors of IUU fishing, and analyzes their roles, spatial preferences and resources across time.

As shown above, actors seek different values from spatial distribution of resources and opportunities, and make corresponding decisions positive or negative to societal or natural environment. IUU trespassers abuse aquatic resources and human labor in specific locations to facilitate their misconduct; while governments, enterprises, NGOs, villagers, and consumers affected can leverage legal sanctions, industrial/social networks, capital, local ecological knowledge, purchasing behaviors and other viable powers to fight against IUU fishing. Stakeholder analysis provides a tool for policy intervention that requires the intersection of space and social justice, since considering the stakeholders’ spatial preferences in the environmental decision-making process is key to meeting socially and environmentally beneficial goals (Khan et al., 2023).

4.2.2 Spatial differentiation and deprivation

Activities are spatially shaped. Locations and geographies serve as important factors influencing human behaviors. Violent predatory gangs tend to thrive in areas with weakened social control and dominated by the less privileged (Tita et al., 2022). Triggered by lucrative market and inadequate supervision, IUU fishing is likely to occur in spaces where CRAVED stocks, transshippers, POCs are present and available (Petrossian, 2015). Illegal and unregulated offenders appear in spaces with crime-attracting facilities: suitable targets, and the absence of capable guardians. The offenders quickly chase and transfer targeted fish, and make use of easy-to-hide and bordered geographies for their escape. Their actions lead to spatial inequity and social divide by

TABLE 2 Role, spatial preference and resource of IUU fishing stakeholders.

Type	Stakeholder	Role	Spatial preference	Resource
Trespassers along the fish value chain	Smuggler	Transport substances or people in violation of laws	Easy-to-hide and bordered geography	Vessels and weapons
	Fisher	Excessively exploit fisheries resources	Productive fishing ground	Fishing vessels and gears
	Transshipper	Transfer illegal harvest from one vessel to another at an intermediate location	Convenient and less-supervised spot	Refrigerated cargo vessels or carrier vessels
	Processor	Process illegal harvest without quality assurance	Area close to water and traffic route	Processing facilities
	Trader	Facilitate flow of illegal harvest into the market	Big and profitable fish market	Capital and market channel
Positive influencers of hybrid natures	Government	Mobilize administrative and legal measures to combat IUU fishing	Patrolling vessel and landing port	Regulations and legal sanctions
	NGO	Discipline and coordinate industrial players to advocate good conduct	Convenient for relevant work	Industrial and social networks
	Eco-friendly enterprise	Produce high-quality seafood in a sustainable and responsible manner	Eco-friendly coastal area	Capital and social responsibility
	Villager	Perform valued actions through local ecological knowledge and self-governance	Nearby fishing water and villagers’ meeting room	Local ecological knowledge and self-governance
	Consumer	Make ethical choice to buy seafood from well-managed producers	Market shelf that sells certified fish	Money as purchasing power

reducing the well-being of legal practitioners and coastal residents concerned. Their presence squeezes the space of fishing grounds and the productivity of biomass. With bigger sizes and more powerful engines, they invest heavier fishing effort, depriving the opportunities of legal practitioners operating at the same space to obtain high-quality stocks and living. Once juvenile fish is harvested, untargeted species is bycaught, and habitat is ravaged, the aquatic space is deprived of its sustainable livelihood. This deprivation compromises orderly spatial production of limited fisheries resources. The environmental costs of IUU fishing are unfairly borne by vulnerable coastal residents. To evade oversight, the fish offenders often move to places that trigger less spatial exposure to regulators. In some extreme cases (e.g. piracy), they even start a head-to-head confrontation with other actors to expel the latter out of their overlapping space. Relevant action furthers the geographical and social exclusion of the already marginalized gangs.

Given the widened spatial deprivation, regulators need to pay special attention to the affected livelihood of coastal stakeholders and include them in the participatory governance process to better understand their living status and social predicament. During the negotiation process, site-specific ecological knowledge can be practically applied as a valuable source of information to conserve local fish resources and protect their well-being (Joa et al., 2018).

4.3 Space as rights: stakeholder engagement at a macro scale of national and supranational areas

With greater control over the sea, the human claim of maritime rights is extending further seaward (Østhagen, 2020). Though a biologically indivisible ecosystem, the ocean is legally divided into different jurisdictions for better management. At a macro scale globally, UNCLOS divides the ocean space into different maritime zones, the functions of which are clearly regulated. Given the level of control over maritime space, areas under national jurisdiction and areas beyond national jurisdiction are discussed separately.

4.3.1 State-led justice

Space is the physical and mental orientation of our empirical world, and human communities employ space as a coordinate system to delimit their territories, forming the basic political entity with different political ecologies and historical cultures – the state. A state has the actual political power over its society. In modern sense, a state has become more of a geo-political community with the mandate of guaranteeing the peace, security, freedom, and well-being of its citizens. The common good of a state is not a simple addition of individual good, but a competitive “share” of such common “space” among citizens (Gordon, 1991).

Sovereign states bear the main and direct responsibility for safeguarding the justice of the fishery ecological space under their jurisdiction. IUU fishing is an important factor that disturbs the ecological environment in both coastal and inland waters. IUU vessels operating in waters under national jurisdiction try to evade government supervision, bringing great difficulties to policy implementation. It is an injustice to destroy the offshore and

inland environment and hollow out domestic fish resources, which causes a serious blow to both the ecology and the society. The damage to marine ecosystems unduly affects the nationals who make a living from aquatic resources or ecosystem service (e.g. marine tourism). Taking the time-range of overfishing into account, the historical “debts” of certain countries deserves more attention. The complete collapse of large, profitable fisheries such as the Californian sardine fishery (1950s), the Atlanto-Scandian herring fishery (1960s), the Peruvian anchovy fishery (1972), and the Northern cod fishery off the East coast of Canada (1992) (Hauge et al., 2009) took place well before the birth of the idea of “IUU fishing”, but resulted in de facto overfishing or overfished status of relevant stocks. It is therefore important to consider intergenerational equity and sustainability when assessing the impact of fish resource depletion and allocate conservation responsibilities in fisheries space.

Only by adopting strict supervision and conservation measures in time can a government try its best to reduce the loss of fisheries resources within its jurisdiction. According to mainstream policies and legal documentations, coastal state, flag state, port state and market state are the four stakeholders empowered by specific spaces with different roles in combatting IUU fishing.

- (1) **Coastal state.** Due to land vicinity, humans interact with coastal areas significantly more than they do with high seas, exposing coastal spaces to artificial erosion. UNCLOS’s recognition of the EEZs gives coastal states broader rights to exploit ocean areas. The EEZs defined by 200 nautical miles bring one-third of the world’s oceans (more than 37 million square nautical miles) under the jurisdiction of coastal states, which have a greater mandate to combat IUU fishing. Under the EEZ regime, historic fishing rights have come under the jurisdiction of coastal states. In partially overlapping space, such rights remain valid under the international law as a legal assurance that another country has long and continued fishing practices (Polite, 2003), which should not be deemed as “illegal” once recognized by arrangements with relevant coastal states. Moreover, for justified and inclusive assistance, the UN Fish Stocks Agreement⁸ encourage the developed member states to help developing coastal states (e.g. Small Island Developing States) grow their fisheries, increase national tax revenues and improve the quality of life of their people. The healthy and stable development of less developed coastal fisheries can be achieved by training their crew members, and helping them enhance their ability to regulate fisheries. Coastal states are in a good geographical and legal position to uphold spatial justice.

⁸ The Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UN Fish Stocks Agreement). https://www.un.org/Depts/los/convention_agreements/convention_overview_fish_stocks.htm.

- (2) **Flag state.** A fishing vessel sailing on the high seas is subject to the exclusive jurisdiction of its flag state in administrative, technical and social matters. To some extent, a registered vessel can be regarded as a mobile space of its flag state that extends its jurisdictional power to distant waters. The interaction among high seas fishing states is thus expressed through their flagged vessels, a breakthrough of traditional geographic connections. Legally “going global”, a flag state is supposed to join RFMOs that govern the waters their vessels operate in. Once authorized, observers on board can accumulate knowledge by documenting compliance-related information, while inspectors may board fishing vessels on the high seas to check vessel documents and monitor fishing conditions, and the flag state should respond to the knowledge and legitimate call of observers and inspectors. Flag states are encouraged to be committed to exercising monitoring, control and surveillance, through transposing RFMOs relevant conservation measures to domestic regulations in an effort to combat IUU fishing (Gianni and Simpson, 2005). The flagged vessel is not necessarily registered in its country of origin. Rather, vessels flying Flags of Convenience sail under the laws of registered states that need development opportunities yet lack capacities to exercise good control over their activities. Such states need external capacity building support for better compliance. The profitable registration conducted in less developed countries often allows anonymity of ownership and concealment of previous vessel history (Liddick, 2014), leaving offenders a great room to maneuver criminal activities that impair the wellbeing of human and nature. To improve global surveillance, a list of 35 countries that grant FOCs have been identified by The International Transport Workers’ Federation (ITWF). In 2021, Panama (344 million dwt, 16%), Liberia (300 million dwt) and the Marshall Islands (274 million dwt) were the leading flags of registration (UNCTAD, 2023), representing a combined 44% of total global carrying capacity. Although the list includes all types of vessels, not just the ones for fishing, it reflects the FOC states’ general looser control over flagged vessels. The Open Registers shield vessels’ unregulated behaviors that jeopardize the space’s safety, security and environment. Flag states need to exercise effective control over their fishing vessels on the high seas, ensure a “genuine link” with the register ships, and reduce “flags of non-compliance” (Miller and Sumaila, 2014).
- (3) **Port state.** Port states are coastal spaces where fish harvest is unloaded before entering international trade and markets. Unlike less reachable high-seas, a port is a threshold of land and water, facilitating either a warm bed for IUU trespassers through easier transfer of catch from ship to shelf, or better control over IUU catch through refusal of port entry or port services. In this context, it is also a threshold of “evil” and “good”. Injustice mainly arises in Ports of Convenience that turn on the green light for foreign-flagged vessels engaged in IUU fishing to land and

transport their fish. Vessels can easily switch other flags and migrate to a POC with loose law enforcement or poorer capacity for inspection. To deprive their freedom of being “innocent” passers-by, the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA)⁹ has been introduced as the first binding international agreement specifically targeted at IUU fishing, exposing distant-water fishing vessels to the legal and moral oversight of port states when they call at ports. A clear spatial message is sent that illegal harvest is no longer welcome in contracting port states, with promises of immediate inspection and information sharing for enforcement actions. Port state measures are increasingly considered as a sound instrument for compliance, a counterpart of flag state jurisdiction in amphibious space.

- (4) **Market state.** Market space is the spatial scope of commodity circulation and the supply and demand of commodities that form it. Unlike the delimitation of coastal state, flag state and port state, market state is obscure in geographical boundary, allowing more flexible room to maneuver along the fish value chain, but it can use consumers’ knowledge to regulate fish behaviors. The market approach comprises control on the import, export and transfer of fish and fish products, either processed or raw. Importing nations as the intermediary or terminal of the fish market are understood to have greater incentive and power to exercise prohibition of IUU catch from being traded or imported into their territories, as reflected in the IPOA-IUU adopted by FAO. Given the difficulty to identify and trace IUU catch mixed with legal product (Hosch and Blaha, 2017), the current trade measures justified for conservation management generally include the denial of market access by catch documentation schemes (CDSs), import controls or bans against non-cooperating states, as well as IUU fishing-related subsidies. CDSs trace fish from the point of capture through unloading and throughout the supply chain, encompassing “catch certificates, eco-labels, traceability and other measures that disclose information about how fish are harvested” (FAO, 2015). Those measures prove spatially effective for calculating catch import and export and conducting harvest control, but are not cost effective, for they raise high implementation standards (Garcia et al., 2021). Financial assistance and capacity building are needed before implementing the market measures globally.

4.3.2 Supernational justice

4.3.2.1 IUU fishing at high seas as heterotopia

According to French philosopher Michel Foucault, “we live inside a set of relations that delineates sites which are irreducible to

⁹ The Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing. https://www.fao.org/fileadmin/user_upload/legal/docs/037t-e.pdf.

one another and absolutely not superimposable on one another” (Sudradjat, 2012). He describes the hybrid of real and transcendental elements of heterogeneous locations as Other Spaces or “heterotopia”. In his view, the ship at sea implicates a great repository of imagination, the heterotopia par excellence. A fishing vessel is no more than a floating piece of space, “a place without a place that exists by itself, that is closed in on itself and at the same time is given over to the infinity of the sea from port to port” (Sudradjat, 2012). It entrusts itself to the endless sea with the expectation of returning with a full load.

In line with Foucault’s spatial philosophy, the high seas can also be conceived as a vast heterotopia, which is not only an ecological space, but also a cultural space with exotic properties. In order to seek common fisheries resources, a variety of fishing vessels flying flags of different countries set sail from ports in different geographical spaces, and gather together in the same space – the fishing ground. Generally speaking, there is a fixed relationship between fishers and regulators: as long as the vessels are officially registered, legally licensed/reported and subject to proper control, they come under the jurisdiction of the maritime legal system. For each vessel, where, what and how many fish stocks are caught are clearly defined. Its fishing behavior is also constrained by relevant RFMOs (e.g. vessel inspection and boarding, and observer systems). However, not all vessels have their own identities and comply with the relevant laws and regulations. The presence of IUU fishing disrupts the harmonious order of the high sea heterotopia, bringing multiple uncertainties to the governance relationship. Compared with domestic IUU fishing, IUU behaviors beyond national jurisdiction are more complex and harder to control, involving the interactions of multiple countries worldwide.

Although fishing vessels from different regions epitomize the imagination of global space and culture in a symbolic sense, they should not transcend legal boundaries. In recent years, multiple countries and RFMOs have taken active and severe measures to crack down on IUU behaviors. RFMOs from countries and regions such as the US¹⁰, the EU¹¹, New Zealand¹² and Australia¹³, as well as West Asia¹⁴, and the Mediterranean Sea¹⁵ submitted national/regional reports to prevent, deter and eliminate IUU fishing. With the legal and ethical constraints of modernity, the spatial justice of high seas can be reconstructed.

10 See <https://www.fisheries.noaa.gov/international/international-affairs/report-iuu-fishing-bycatch-and-shark-catch>.

11 See <https://op.europa.eu/webpub/eca/special-reports/illegal-fishing-20-2022/en/>.

12 See <https://faolex.fao.org/docs/pdf/nze161857.pdf>.

13 See <https://www.agriculture.gov.au/agriculture-land/fisheries/iuu/plans-of-action>.

14 See https://fcwc-fish.org/wpfd_file/fcwc-regional-plan-of-action-against-iuu-fishing-rpoa-iuu-2.

15 See <https://www.fao.org/gfcm/activities/compliance/decisions/rpoa-iuu/en/>.

4.3.2.2 Area-based management

There is hardly an ocean heterotopia that remains untouched. While no single supranational body can “rule” the Marine Commons, the arrangements of RFMOs and other relevant international organizations have largely covered the major fisheries activities worldwide. The tussle for resources has long extended to the maritime domain, including disputes over traditional fishing rights in historic waters, fishing conflicts between neighboring countries and opposite countries, and jurisdictional conflicts over fisheries resources on the high seas. The areas beyond national jurisdiction (ABNJ) are confronted with such intertwined contradictions as geographical, natural or artificial fragmentation, frictions of interests of multiple subjects, inconsistencies in complicated legal texts, and conflicts in radical and backward conservation views under different economic conditions. The geographical differences resulting in distinct rights and national strengths lead to diverse ethical relations, mainly involving the complex relationship between coastal states and high seas fishing states, as well as between high seas fishing states.

For marine biodiversity, spatial adjustment has been made to regulate fishing order. As governance institutions expand and thicken, ABNJ are transforming into a patchwork of functional territories (Lambach, 2021). The advent of UNCLOS arguably created a greater certainty regarding who has jurisdiction over parts of the sea and to whom marine resources belong, and the crackdown on IUU fishing has further reinforced the tenure nature of the heterotopia sea and the ethical obligations it carries. This kind of legalized expression for the order of high seas is also reflected in the division of high seas space.

On the one hand, RFMOs divide the global high seas into different supranational jurisdictions in the name of conservation. They assign fishing quotas and conservation responsibilities to individual member states based on regional protocols and conventions, in order to develop stable cooperative arrangements for international fish resources. IUU fishing is closely related to the management of a relevant RFMO, including the illegal conducts of vessels flying the flag of party states or cooperating states; the non-report or misreport of activities undertaken in its area of competence; and the unregulated operations of vessels without nationality or flying the flag of a non-party state in its area of application. Once a vessel enters into a given space of such RFMO, its consistency with relevant conservation and management measures is scrutinized, allowing less room to fishing injustice.

On the other hand, as a geographically delimited area designated or regulated to achieve specific conservation purposes, marine protected areas (MPAs) have been gradually established as part of the broader and more stringent zoning management tool. In terms of fisheries, restrictive conservation measures such as fishing moratorium and closure are mainly adopted. MPAs beyond national jurisdiction are non-exclusive in their physical characteristics, for the ocean cannot be “fenced”. Whether fishing activities shall be strictly prohibited in the zoning and management of MPAs is being heatedly discussed. Some argue it is unrealistic to expect a fisheries management method to effectively protect and restore the natural dynamic process of MPAs (Ballantine, 2014), so any form of fishing activities should be prohibited in the subsequent management once such area is designated (Costello, 2015). This statement is questioned and rebutted by a more prudent view: limiting human activities to facilitate conservation without

compromising sustainable use (Sarker and Islam, 2021). Spatially speaking, a one-size-fits-all approach to craftily address IUU fishing falls into the trap of protectionism. Restrictions on human activities in MPAs could be based on reasonable purposes and objectives supported by scientific evidence.

5 Recommendations and conclusion

Space plays a pivotal role in both stimulating and combating IUU fishing. Certain regions provide greater spatial benefits that stimulate IUU behaviors, compromising productive, distributive and consumptive justices. IUU misconducts within fish communities cause disruptive spatial differentiation and spatial deprivation. Nevertheless, space can empower stakeholders' inclusive and proper engagement into the place-based management process against IUU fishing. The spatialized vision has been highlighted in marine fisheries management, such as state-led measures concerning coastal states, flag states, port states, market states, and supranational measures engaging RFMOs and MPAs. Based on stakeholder analysis, the following suggestions are proposed:

First, leveraging stakeholders' spatial knowledge. The "opportunities" provided by space can be used to identify and regulate IUU fishing with varied knowledge. The first is local ecological knowledge. Small-scale fishers depending on a sustained livelihood help provide updated information on species' ecology, and identify fish habitat use, nursery areas and stock migrations where such knowledge is scarce (Begossi et al., 2016). Their observations and hands-on experiences indicate the movement of CRAVED fish and therefore the spaces with a higher possibility of IUU fishing. The second is observers' and inspectors' onboard knowledge. As they set sail, observers and inspectors document information concerning compliance, fishing gear, catch and bycatch and transshipment, facilitating understanding of fished stocks in required places that help spot and prevent IUU fishing. The third is consumers' product knowledge. Consumers' identification and preference of sustainable seafood also help facilitate traceability at the end of the fish value chain.

Second, managing stakeholders' spatial conflicts. The "societies" constructed by space can be used to detect and resolve disputes among fragmented fish communities. Eco-space injustice triggered by spatial differentiation and spatial deprivation in the process of global governance reflects the lack of bridges and converging points in the assorted philosophies and implementations between global eco-space governance and cooperative subjects. It is therefore imperative to guide and construct the common values and regulations in line with the shared and justified interests of humankind (rather than merely the interests of a few countries) to engage broader roles, spatial preferences and resources of IUU stakeholders into the decision-making process, in order to improve productive, distributive and consumptive justices along the fish value chain. At a broader level, the heterogeneous distribution of IUU fishing effort also requires collaboration among fish-related countries such as coastal states, flag states, port states and market states located at different geographies. For better compliance at spatial-temporal scales, fisheries managers are expected to promote ethical and policy consensus among distant-water fisheries entities.

Third, facilitating stakeholder's spatial action. The "rights" offered by space can be used to improve collaborative engagement against IUU fishing. IUU stakeholders can properly and inclusively engage into the place-based management process to promote spatial quality. As previously discussed, justice can be promoted at both national and supranational levels under the UNCLOS framework. Countries fishing in the same or overlapping spaces are of different development and conservation stages, so the differentiated burdens of resource damage and capacity building need to be accommodated. In implementation, the internationally-agreed and authoritative definition of IUU fishing in IPOA-IUU should be respected. Disputes in historic fishing rights and historic waters should be properly addressed to avoid ambiguity in identifying IUU fishing. Besides, coastal state, flag state, port state and market state can use relevant legal and policy instruments to fulfill their respective spatial responsibilities. Collaborative actions against IUU fishing in IUU-prone spaces such as high sea vessels and POCs should be enforced. The fight against IUU fishing involves complicated political, economic and social challenges. A one-size-fits-all approach is neither possible nor feasible. One has to be particularly careful in addressing the injustices caused by IUU perpetrators while avoiding engendering other forms of injustices during the policy making and actual enforcement process. The current research mainly focuses on synthesizing justice theory with spatial analysis concerning IUU fishing, while the implementation and effectiveness of spatial management measures under the justice framework remain to be explored. Specific empirical research or comprehensive case studies on illegal, unreported and unregulated operations would be appropriate for future work to fully understand the role of spatial justice in combatting IUU fishing and promoting sustainable fisheries.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material. Further inquiries can be directed to the corresponding authors.

Author contributions

YH: Conceptualization, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. YL: Data curation, Investigation, Validation, Writing – review & editing. YNL: Data curation, Investigation, Visualization, Writing – review & editing. JZ: Funding acquisition, Supervision, Validation, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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