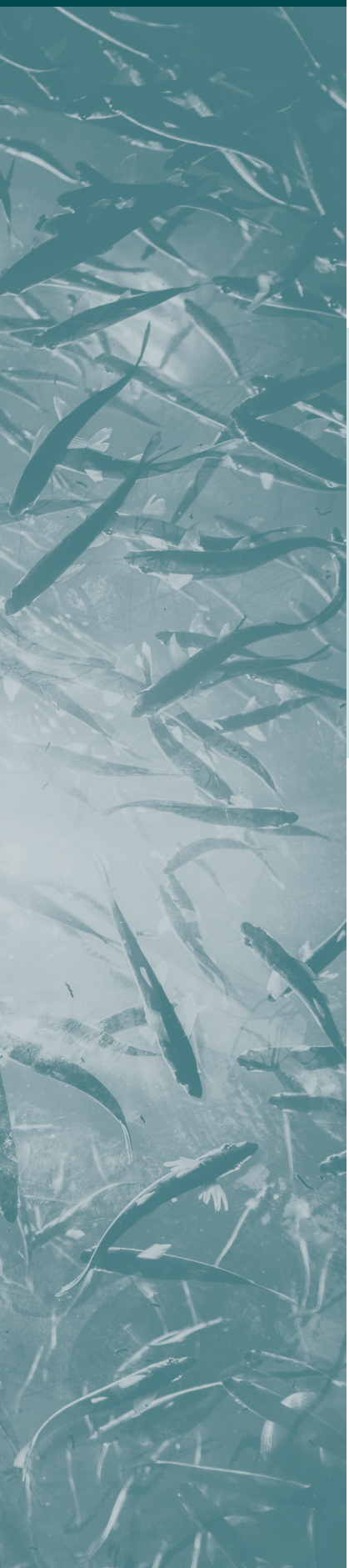
Future Fisheries Management Issue Brief



Indian Fisheries in the Context of WTO Regulations

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SUMMARY The fishing industry grapples with challenges such as declining marine-fish production due to industrial fishing, subsidies leading to overfishing, and illegal fishing. The WTO's 2022 Agreement aims to tackle these issues but must not inadvertently impact small-scale fisheries in India and other developing nations. Small-scale fishing, crucial for poverty alleviation, faces declining catches. Overfishing from subsidies, especially by major international actors such as China, the European Union, and the United States, severely impacts marine resources, leading to collapsed fisheries and unemployment hitting India's small-scale fishers and coastal communities especially hard. Illegal, unreported, and unregulated (IUU) fishing, estimated at 26 million metric tons per year, cripples livelihoods and compromises national security. IUU fishing remains a pressing issue and will require global cooperation and technical assistance for developing countries to protect marine resources and livelihoods.

India's approach to its fishing sector has been based on an endeavour to live up to the expectation and spirit of "Vishwa Guru" as envisioned by Mr. Narendra Modi, the prime minister of India. While it is true that the Indian government's fishing subsidies are barely sufficient to sustain poor Indian fishers, India recognizes the importance to act as the global leader it aspires to be and to take a stance at the next World Trade Organization (WTO) Ministerial Conference against certain countries' fishery subsidies and overfishing—actions that may lead to depletion of limited fish resources available for the rest of the world, including India. In this paper, we (1) discuss fishing-sector challenges and outline the WTO's response to those challenges, most notably its 12th Ministerial Conference (MC12) in 2022 and the Geneva Package (Agreement) and (2) make a case for extending technical assistance to India and other developing countries that practice small-scale livelihood fishing.

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FISHING-SECTOR CHALLENGES AND WTO RESPONSE

Fishing-sector challenges that have led to declining marine-fish production in recent decades are mostly attributed to rampant industrial fishing and include declining catches; large fishery subsidies that lead to overfishing; and illegal, unreported, and unregulated (IUU) fishing. After several attempts to address these issues, in 2022 the WTO adopted the Agreement at the MC12. While the Agreement curbs global IUU fishing and other extravagances involving ocean wealth, it has put small-scale livelihood fisheries in India and other developing countries in a difficult situation.

The first challenge is small-scale livelihood fishing, which has seen a steep decline in catches in recent years. Indian Ocean–rim countries have always dominated catch amounts in the Indian Ocean. There has been a 300 percent growth in small-scale catches from 1.9×10^6 metric tons (or Mg) per year in 1950 to 6.5×10^6 metric tons per year by 2018, while industrial catches that rose steadily in the early 1960s reached a plateau at approximately 8.5×10^6 metric tons per year since the late 1990s. There has also been a significant decline in unreported catches, which have fallen from 45 percent to 25 percent of total catches. Total fishing effort (TFE) and catch per unit effort (CPUE), however, have been moving inversely: From 1950 to 2010, TFE, driven by the industrial sector, increased by a factor of 30 from 0.4×10^9 to 11×10^9 kW days, while overall CPUE declined 78 percent, with steeper declines in small-scale catches (more than 80 percent since 1950) than in the industrial sector (65 percent from its 1981 peak).[1] These small-scale artisanal and subsistence fisheries are spearheading poverty alleviation and food- and nutritional-security programs in the Indian Ocean region;[2] they are also some of the poorest communities in the world.[3]

Overfishing attributed to fishing subsidies by some countries poses a second challenge to the global marine-fish stock. The United Nation's Food and Agriculture Organization (FAO) has estimated that since the 1970s, exploitation of marine-fish stocks beyond sustainable levels is at 35 percent and growing.[4] Significant over-capitalization by first-world fishing fleets has resulted in declining global fish productivity that has seriously incapacitated the sustainability of marine resources and has led to the collapse of local fisheries, unemployment, and loss of livelihood and food and nutritional security in less-developed countries.[5] Certain leaders of fisheries subsidies have been recognized (1) to contribute significantly to the buildup of excessive fishing capacity, (2) to incentivize unsustainable levels of fishing, and (3) to contribute to the depletion of fish stocks by reducing the cost of fishing operations or enhancing revenues.[6] Recent global estimates of subsidies to the fisheries sector are put at about $35.4 billion in 2018, of which about $22.2 billion was provided in a form that enhances fishing capacity.[7] The top five subsidizers are China, the European Union (EU), the United States, South Korea, and Japan.[8]

The third challenge—and first priority—in this discussion involves issues of IUU fishing in the Indian exclusive economic zone (EEZ). In January 2021, several fora including the All Kerala Fishing Boats Operators Association and the All India Purse Seine Association expressed grave concern over the presence of 10 Chinese trawlers in the Arabian Sea, each with a capacity to haul more than 500 metric tons of fish. These fisher organizations' concerns were also moored in the low capacity of Indian boats, which can haul only 10 metric tons of fish per trip. Grave concerns were expressed that these vessels could also be targeting petroleum hydrate resources from the sea bottom, which could be holding reserves to last more than 300 years.[9]

Against this background, IUU fishing is quantified at 26 million metric tons of fish per year.[10] IUU fishing not only cripples livelihoods, food, and economic and social security but also compromises national security. The Chinese distant-water fleet systematically and continuously violates the EEZs of several countries, jeopardizing those countries' national security.[11] The trespassing vessels do not keep their automatic identification systems activated continuously; their crews are disguised as civilian fishers but actually belong to maritime military.[12]

One way to help eliminate IUU fishing is the so-called carding system adopted by the EU in 2008. The EU issues yellow cards as warnings to non-European countries whose measures fall short of preventing IUU. Imports are banned from countries found to repeatedly transgress into IUU fishing. Vietnam, Thailand, Cambodia, the Philippines, and Taiwan have been issued yellow cards. So far neither China nor any other developed nation practicing industrial fishing in the high seas has been issued a yellow card.

In light of the growing exploitation of marine-fish stocks, beginning in 2001 at the Doha Round of talks, the WTO Negotiating Group on Rules began to pay close attention to fisheries subsidies as one of the factors behind overfishing. No impact was made, however, either at the Doha Round or in the WTO Trade Facilitation Agreement (TFA) concluded in 2013 in Bali, Indonesia. Progress was finally codified in 2022, when on June 17, the MC12 of the WTO adopted the Agreement on Fisheries known as the Geneva Package (Agreement)—said to be only the second WTO agreement since the organization's inception and projected as a major step forward for ocean sustainability. The Agreement's recommendations target prohibition of distant-water fishing fleets of developed countries and abolition of subsidies that support IUU fishing and sustain widespread depletion of global fish stocks. The Agreement is being hailed as a historic achievement fulfilling the first Sustainable Development Goal (SDG) as fully met. Ratification by two-thirds will bring the agreement into effect. Of the 164 WTO member nations only 10 have ratified the Agreement to date.[13] The members also agreed to continue negotiations on outstanding issues, such as overfishing and overcapacity, with the objective of making strong recommendations during the next conference, MC13, for provisions that would further enhance the rule of the Agreement.

Recently, trade experts in India—including the National Fishworkers Forum, the National Platform for Small Scale Fish Workers All India Fishers and Fish Workers Federation, and the All India Union of Forest Working People—have called for talks for a comprehensive pact to include (1) rules for industrial fishing nations under Article 5 pertaining to overcapacity and overfishing and (2) rejection of the fisheries subsidies agreement.[14]

THE CASE FOR THE EXTENSION OF TECHNICAL ASSISTANCE

India has a coastline of 8,118 kilometers with an EEZ of more than 2.02 million square kilometers and a continental shelf covering 0.53 million square kilometers. Fisheries play a vital role in the country's food availability, nutritional security, and livelihood.[15] Seafood from India delivers as much as 21 percent of export earnings from agricultural commodities. As far as governance responsibilities are concerned in the legal and constitutional sense, state governments govern waters inside the 12-nautical-mile

(22-kilometer) territorial limit, while the Government of India has jurisdiction over the waters beyond the 12 nautical miles (22 kilometers) up to the end of the EEZ 200 nautical miles (370 kilometers) from the shore. The marine fisheries sector hosts 2.06 million fishers of whom 1.23 million are women. About 1.21 million fishers work full time, 0.49 million part time, 0.078 occasionally, and 0.20 million for an unspecified amount. Moreover, 0.064 million workers are deep-sea marine fishers.[16]

India offers only about $300 million of subsidies per year to the small-scale Indian fisheries, which pales in comparison to the massive annual fishery subsidies of $7.3 billion by China, $3.8 billion by the EU, and $3.4 billion by the United States. India's subsidies add up to only $15 per Indian fisher per year, while, for example, subsidies by Denmark, Sweden, and the Netherlands total $42,000, $65,000 and $75,000, respectively.[17] Indian fishery subsidies provide real-time assistance to fishers to engage in livelihood fishing for their families. Stopping this assistance could push millions of fisher families into poverty.

Below we discuss various steps India has taken over the years to mitigate overfishing and curb IUU fishing in support of sustainable global fishing. We discuss India's traditional value system of fishing, several steps India has taken domestically to curb unsustainable fishing—including imposition of an annual seasonal fishing ban, establishment of a fisheries department, enactment of several laws to curb IUU, bycatch control, and development of fisheries insurance and financing products—as well as proactive measures by India to address the challenges in several global fora, including the recently concluded G20 New Delhi meeting.

1. Traditional Value-System Fishing

In India, the catch-effort ratio has seen a constant decline over recent decades. Though overall catches have increased, so has the active fisher population; thus, the increase of catches has become disproportionate to the active fisher population. The per-capita catch per fisher has declined from 3.0 metric tons in 1980 to 2.3 metric tons in 2019. This pales in comparison with major fishing nations in Europe such as Norway, where 11,000 fishers catch 2.76 metric megatons (Mt) (2018) with a per-capita yield of 250 metric tons per year and with a fishing-fleet strength of 5,982 and 92 percent of the boats less than 15 meters long.[18]

About 67.3 percent of Indian fisher families are impoverished. The Indian EEZ hosts a potential marine-fishery resource of about 3.921 million metric tons, but fishing activity in this area is restricted to the 0–80 meters depth zone. Near-shore water fisheries have reached optimum yield levels. Only 37 percent of the fishing vessels, or 59,000, are mechanized.[19] The rest are non-motorized crafts consisting of catamarans, dhonis, *machwa* and *masula* boats, dug-out canoes, and plank-built boats. About 63 percent of traditional fishers have always been governed by their traditional value systems and have practiced subsistence fishing exclusively through the ages.[20]

The elimination of subsidies and the argument for extension of technical aassistance to comply with the WTO regulations can be very easily discerned in efforts to improve the living standards, employment,

and income of the Indian fishers. The Government of India has taken several direct and indirect steps in this direction.

2. The Annual Seasonal Fishing Ban in India

Beginning with the state of Kerala in 1988, an annual seasonal fishing ban (SFB) on mechanized vessels was progressively adopted by all Indian states in their territorial waters (within 22 kilometers), and in 2015 the central government established a 61-day annual seasonal fishing ban (SFB) on all mechanized and motorized vessels in India's EEZ. This fishing ban in the EEZ—beyond the territorial waters of both the east and west coasts—is strictly adhered to. Since 1998 the annual fishing ban on the east coast has been imposed from April 15 to June 14 (61 days) and on the west coast from June 1 to July 31 (61 days). This important and strategic conservation measure has protected fish stocks and helped relieve pressure on the marine environment. It is also reported that the ban has helped provide a social buffer for traditional fishers and a safeguard for marginalized fish workers.[21]

A study found that the increase in biomass due to SFB ranged from 5 to 9 percent. The net social benefit was also positive in all the coastal states of India and was estimated to range from INR 110 million in Andhra Pradesh to INR 280 million in Tamil Nadu (tables 1 and 2). Based on the performance of the annual SFB in terms of net societal benefits, the states were ranked in the following order: Tamil Nadu, Kerala, Gujarat, Karnataka, and Andhra Pradesh.[22] In addition to the annual SFB, other regulations India has been implementing include minimum/maximum legal size at capture, mesh size, boat licensing, motorized boat operation, boat number maximums, catch quota, no-take zones, certification, and an

Table 1. Incremental economic benefit due to annual seasonal fishing ban in India

PARAMETERS	KERALA	KARNATAKA	GUJARAT	ANDHRA PRADESH	TAMIL NADU
Catch (t*) in 45–60 days (no fishing ban)	49,344	35,900	35,523	22,265	67,015
Catch (t) in 45–60 days (with fishing ban)	53,785	39,131	38,720	24,046	72,377
Catch increment during ban period (t)	4,441	3,231	3,197	1,781	5,361
Increment rate (%)	9	9	9	8	8
Value of incremental catch estimated at landing-center price (lakhs†)	2,729	1,701	2,129	1,266	2,809
Value of incremental catch estimated at retail market price (lakhs)	4,053	3,781	2,897	1,980	4,620

Source: R. Narayanakumar et al.,"Economic Valuation of Net Social Benefit of Seasonal Fishing Ban in Selected Maritime States of India," *Indian Journal of Fisheries* 64, no. 3 (2017): 85–92.
* t represents metric tons
† 10 lakhs = 1 million Indian rupees (INR)

Table 2. Estimated net social benefit due to annual SFB in India			
STATE	INCREMENTAL BENEFIT (LAKHS*)	TRANSACTION COST (LAKHS)†	NET SOCIAL BENEFIT (LAKHS)
Andhra Pradesh	1,266	168.58	1,097.42
Tamil Nadu	2,809	12.99‡	2,796.01
Kerala	2,729	248.14	2,480.86
Karnataka	1,701	10.92‡	1,690.08
Gujarat	2,129	17.24‡	2,111.76

Source: Narayanakumar, "Economic Valuation," 2017.
* At landing-center level estimate
† Transaction cost refers to the costs involved in implementation and enforcement of management measures or acts or legislation. This includes the expenditure incurred by the government in implementing any regulation.
‡ In these states, enforcement of SFB is taken care by the Coast Guard, whose salary is apportioned as costs of enforcement.

ecosystem approach to fisheries management. India has been proactively working towards a sustainable and vibrant blue economy for decades.

3. India's Department of Fisheries Policy Scheme

Earnest implementation of the annual SFB has proved to be a step in the right direction. In 2020 India's Department of Fisheries established a policy scheme, known as the Pradhan Mantri Matsya Sampada Yojana (PMMSY), which is entirely focused on the comprehensive development of the country's fisheries sector. Special budget allocations have been made for development, conversion of motorized vessels into mechanized ones, and improving efficiency for optimal deep-sea fishing. The department facilitates fishers' access to technological support for fishing via satellite-enabled fish location. Proper housing, education, and health care for fishers and their families are also being progressively implemented under specially designed government programs. The long-term impacts of these measures are expected to stabilize coastal fishing communities in terms of employment, income, and social status.

4. Countering IUU Fishing

India has taken an active role in utilizing legal measures on both the domestic and international fronts to curb unsustainable fishing. Due to inappropriate conduct by foreign vessels, in 2017 India revoked letters of permit (LoP) it had issued to foreign vessels for fishing in the Indian EEZ.[23] Major issues that led to this cancelation included foreign vessels' misuse and manipulation of vessel registration, undervaluation of vessels, transfer of ownership of vessels, payoffs to Indian shell companies, the sale of Indian fish in the international market, and shipment of fish on high seas to avoid proper assessment of quantity and species.[24] The Government of India has not yet reassessed its stand on LoP or related treaties.

Then in 2019 India introduced the Marine Fisheries Regulation and Management Bill aimed at curbing IUU fishing. The bill would allow for impounding and fining foreign vessels caught fishing in the Indian

EEZ.[25] In addition, the bill would impose regulations on foreign vessel transit in the EEZ and criminal penalties for violations.

The government's responses to IUU issues raised by the Indian parliament later that year included the following:

1. Authorization of the Indian Coast Guard under the Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981... to prevent IUU fishing by foreign fishing vessels in Indian waters
2. Regulation, monitoring, control, and surveillance by agencies of Maritime States/Union Territories (UTs) under their respective Marine Fishing Regulation Acts (MFRAs) for preventing IUU fishing
3. Implementation of ReALCraft, a web-based regime for mandatory registration of fishing vessels under the 1958 Merchant Shipping Act and licensing of fishing vessels under the respective MFRAs
4. Issuance of biometric identity cards to marine fishers
5. Notification of the National Policy on Marine Fisheries (2017), that provides guidance for prevention, deterrence and eliminating IUU fishing in Indian waters
6. Issuance of guidelines from time to time for regulation of Indian fishing vessels in EEZ

Other adopted measures on the domestic front include acts of the Government of India; the National Fisheries Policy (2020); the Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act (1976); and the Maritime Zones of India (Regulation of Foreign Vessels) Act (1981). These have empowered agencies such as the Indian Coast Guard to act swiftly against IUU fishing. Even the Marine Fisheries Regulation and Management Bill 2019, which was reworked and introduced in its new form in 2021, has gone further in empowering the Indian Coast Guard:

> The Coast Guard has now the authority to visit board, search and seize any vessel, or arrest any person or seize any artificial island or any floating or moored object or any underwater object including any maritime property involved or suspected to be used in the commission of any offence . . . within the maritime zone[s] of India.[26]

On the international front, India became a party to the United Nations Convention on the Law of the Sea (UNCLOS) in 1995. India is also a member of the three regional multilateral organizations with a specific focus on IUU fishing, namely, the Bay of Bengal Program, the Indian Ocean Tuna Commission, and the Indian Ocean Rim Association. Nevertheless, India also needs to join the FAO-backed Agreement on Port State Measures to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated (IUU) Fishing (PSMA).

Despite these best efforts, Indian fishers have reported seeing foreign vessels in the Indian EEZ during the fish-breeding season.[27] The negligible subsidies that support Indian marine fishers should

be viewed only as a small compensation for lost catches caused by IUU and damage to the fishing ecosystem.

5. The Chennai High-Level Principles

With India holding the G20 presidency in 2023, the forum's Environment and Climate Ministers Meeting took place in Chennai, India, on July 28, 2023. Here again, India's focus on hastening improvement in local marine ecosystem for sustainable fisheries is evident.

Participants drafted the Chennai High-Level Principles for a Sustainable and Blue/Ocean-based Economy, subsequently adopted by G20 members, to be implemented voluntarily "based on national circumstances and priorities."[28] "Blue economy" refers to advocating sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems.

The document prioritizes ocean health by addressing marine pollution such as plastics, air pollutants, and other harmful substances; halting and reversing biodiversity loss; and conserving coastal and marine ecosystems. It also promotes social or inter-generational equity and gender equality in ocean-based economy strategies; promotes the use of Marine Spatial Planning, which will bring together multiple stakeholders across all linked fields to make informed and coordinated decisions on the sustainable use of marine resources; leverages science, technology, and innovation in creating a sustainable ocean-based economy; recognizes, protects, and utilizes indigenous and traditional knowledge; establishes and implements ocean-based economy monitoring and evaluation mechanisms; and strengthens international cooperation to deal with shared maritime challenges and enhance ocean finance.[29] The document also addresses unsustainable exploitation and illegal activities that affect the marine environment.

The principles also acknowledge and address the links between ocean and climate, including opportunities for climate-change mitigation and adaptation through sustainable ocean-based actions such as protection, sustainable use, and restoration of coastal and marine ecosystems; harnessing full potential of sources of low and zero greenhouse-gas emission; and research on safe and effective use of carbon dioxide removal and sequestration from the ocean.

6. Bycatch Control

Fishery bycatch, along with overfishing, significantly affects non-target resources, biodiversity, ecosystem function, and habitat, thereby challenging the ability to devise sustainable management and conservation plans to maintain a healthy ecosystem. With its development of bycatch distribution maps, India has taken yet another step to improve the livelihood of Indian fishers and minimize the desired transition period. These maps were developed by the Indian Council of Agricultural Research (ICAR)–Central Marine Fisheries Research Institute (CMFRI) to proactively aid in the implementation of spatial-management measures such as designation of the no-fishing zone and conservation networks. The use of spatial decision-making in coastal and offshore waters complements traditional

fisheries-management measures such as bycatch excluder devices, mesh size, and effort control to enhance fishery sustainability.

7. Fisheries Insurance and Finance

Fisheries insurance has been receiving substantial attention in India lately.[30] This corresponds to efforts to mitigate fishing risks with insurance coverage and credit solutions for small-scale fishers—including technology-based support. The Government of India is working with insurance agencies to actively design various products that would lower the insurance premium rates. Technology-based insurance plans, such as weather-index based products, are also being formulated. The overall progress of insurance coverage for fisheries has improved over the years and is expected to boost fishing efficiency and produce a positive socio-economic impact for fishers.

The national reach of institutional financial instruments has also advanced by leaps and bounds. India leads the world in its digital banking technology, in addition to its efforts to reach the underbanked and unbanked through several financial products and institutions including post-office banking, non-banking financial companies (NBFC), and other solutions. Kisan (Farmer/Fisher) credit cards have made substantial inroads in strengthening the financial independence of fishing—and farming—communities. These are significant achievements for a country of 1.4 billion people.

CONCLUSIONS

Overfishing is a global problem and India has been struggling under its impact. Overfishing and IUU fishing by large-scale foreign vessels in and around India's EEZ has had particularly adverse impacts on India's fishers and coastal communities. The catch-to-effort ratio has been declining, especially for artisanal Indian fishers, who play a leading role in food and nutritional security, poverty alleviation, and export earnings. Direct interventions by the Government of India, such as the seasonal marine-fishing ban, the National Marine Fisheries Policy, various acts deterring overfishing, and the PMMSY program, have played a significant role in the country's contributions to marine-life conservation, sustainability, and management. In addition, the technology and research support provided by the Indian National Centre for Ocean Information Services, the Indian Council of Agricultural Research–Central Marine Fisheries Institute, and similar institutions have also helped alleviate some of the challenges facing India's marine-fisheries sector. Indian policymakers continue striving to ensure financial sustainability of their fishers and insure them against adversities by employing innovative approaches and cooperating and aligning with global communities, such as FAO's PSMA. Further, the recently concluded G20 New Delhi Leaders Declaration of September 9, 2023, has committed to conserving, protecting, restoring, and sustainably using the world's oceans and marine ecosystem and reiterated a commitment to end IUU fishing and other destructive fishing methods in accordance with international law. Despite these efforts, IUU fishing by factory ships in and in close proximity to the Indian EEZ remain a big bone of contention to be severely condemned and hopefully addressed by the WTO.

ABOUT THE AUTHORS

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ABOUT THE SERIES

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DISCLAIMER

Views expressed in this paper are strictly personal and do not reflect in any way the views of the Government of India and the various organizations cited in the text.

NOTES

1. Dirk Zeller et al., "Trends in Indian Ocean Marine Fisheries Since 1950: Synthesis of Reconstructed Catch and Effort Data," *Marine and Freshwater Research* 74, no. 4 (2023): 301–19.
2. Dirk Zeller et al., "Synthesis of Underreported Small-Scale Fisheries Catch in Pacific Island Waters," *Coral Reefs* 34, no. 1 (2015): 25–39; Daniel Pauly and Dirk Zeller, "Catch Reconstructions Reveal that Global Marine Fisheries Catches Are Higher Than Reported and Declining," *Nature Communications* 7 (January 2016); Christopher D. Golden, et al., "Nutrition: Fall in Fish Catch Threatens Human Health," *Nature* 534 (June 2016): 317–20; Sarah Taylor et al., "Measurement and Implications of Marine Food Security in the Western Indian Ocean: An Impending Crisis?" *Food Security* 11, no. 6 (2019): 1395–1415; and Gabriel M.S. Vianna, Dirk Zeller, and Daniel Pauly, "Fisheries and Policy Implications for Human Nutrition," *Current Environmental Health Reports* 7, no. 3 (2020): 161–9.

3. Rudy van der Elst et al., "Fish, Fishers and Fisheries of the Western Indian Ocean: Their Diversity and Status. A Preliminary Assessment," *Philosophical Transactions of the Royal Society of London Series A. Mathematical, Physical and Engineering Sciences* 363, no. 1826 (2005), 263–84; Cassandra De Young ed., "Review of the State of World Marine Capture Fisheries Management: Indian Ocean" (FAO Fisheries Technical Paper No. 488, Rome: Food and Agriculture Organization of the United Nations, 2006).
4. Food and Agriculture Organization of the United Nations, *Illegal, Unreported and Unregulated (IUU) Fishing* (Rome: Food and Agriculture Organization of the United Nations, 2022).
5. Ragnar Arnason, Kieran Kelleher, and Rolf Willmann, *The Sunken Billions: The Economic Justification for Fisheries Reform*, Environment and Sustainable Development (Washington DC: World Bank, 2009); Ragnar Arnason, Mimako Kobayashi, and Charlotte de Fontaubert, *The Sunken Billions Revisited: Progress and Challenges in Global Marine Fisheries*, Environment and Sustainable Development (Washington, DC: World Bank, 2017); and Yannick Rousseau et al., "Evolution of Global Marine Fishing Fleets and the Response of Fished Resources," *PNAS* 116, no. 25 (May 2019): 12238–43.
6. Roger Martini and James Innes, "Relative Effects of Fisheries Support Policies," *OECD Food, Agriculture and Fisheries Papers*, no. 115 (Paris: Organisation for Economic Co-operation and Development, 2018).
7. U. Rashid Sumaila et al., "Updated Estimates and Analysis of Global Fisheries Subsidies," *Marine Policy* 109 (November 2019): 103695.
8. Daniel J. Skerritt and U. Rashid Sumaila, "Assessing the Spatial Burden of Harmful Fisheries Subsidies—Final Report" (Oceana, Fisheries and Economic Research Unit, February 2021), 22.
9. M. Krishnan and Badri Narayanan Gopalakrishnan, "India Must Support Its Fisher Folk," *The Hindu Business Line*, September 26, 2022.
10. Food and Agriculture Organization of the United Nations, *The State of World Fisheries and Aquaculture 2020. Sustainability in Action* (Rome: Food and Agriculture Organization of the United Nations, 2020).
11. David Tickler et al., "Far from Home: Distance Patterns of Global Fishing Fleets," *Science Advances* 4, no. 8 (August 1, 2018).
12. Gregory B. Poling, "A Brittle Status Quo in the South China Sea" in *Maritime Issues and Regional Order in the Indo-Pacific*, ed. L. Buszynski and D.T. Hai, Palgrave Studies in Maritime Politics and Security (London: Palgrave Macmillan, 2021).
13. Press Trust of India, "Civil Society, Trade Experts Urge India Not to Ratify WTO's Agreement On Fisheries Subsidies," *The Economic Times*, July 24, 2023.
14. Press Trust of India, "Civil Society," 2023.
15. E. Vivekanandan, "Impacts of Climate Change on Coastal and Marine Ecosystems" in *Winter School on Climate Change Impacts and Resilient Options for Indian Marine Fisheries* (Kochi: ICAR Central Marine Fisheries Research Institute, November 2018): 8–29.
16. Government of India, *Handbook of Fisheries Statistics, Department of Fisheries, Animal Husbandry and Dairying* (New Delhi: Government of India, 2022).
17. Press Trust of India, "Blocking Subsidy to India's Fishermen to Affect Millions of Fishers, Their Families," *Outlook*, June 13, 2022.
18. Trade and Agriculture Directorate Fisheries Committee, *Review of Fisheries 2022* (Paris: Organisation for Economic Co-operation and Development, January 27, 2023).
19. Even these are all individually owned, and there is no presence of large corporations in these activities.
20. Associated News India, "WTO Fishing Subsidies: Indian Fishing Community Protest Against Proposed Cut," *Mint*, June 13, 2022.
21. Jaini Mahima, "India's Fisheries: Past, Present and Future," *India Development Review*, July 2, 2020.
22. R. Narayanakumar et al., "Economic Valuation of Net Social Benefit of Seasonal Fishing Ban in Selected Maritime States of India," *Indian Journal of Fisheries* 64, no. 3 (2017): 85–92.

23. Foreign vessels were given permission to fish in the Indian EEZ based on Government of India order F.No. 21002/12/2011-FY(Ind) dated November 12, 2014. The Government of India subsequently repealed this order on January 30, 2017, due to infringements by foreign vessels.
24. Shrivastava Kumar Sambav, "How Foreign Vessels Exploit India's Loopholes in Fishing Laws," *Down to Earth*, March 14, 2012; Rajesh K.M., *Fisheries Legislation in India* (Mangalore: Central Marine Fisheries Research Institute 2013); P.S.B.R. James, "Deep Sea Fishing in the Exclusive Economic Zone of India—Resources, Performance and New Approaches to Development," in *Marine Biology*, ed. S.A.H. Abidi and V. C. Srivastava (India: The National Academy of Sciences, 2014): 100–23; Sohini Bose, "Finding Solutions to Fishermen Transgressions in the India-Bangladesh Maritime Space" (ORF Occasional Paper No. 331, Observer Research Foundation, September 2021).
25. Marine Fisheries Regulation and Management (MFRM) Bill 2019, Department of Fisheries, Government of India.
26. Marine Fisheries Regulation and Management (MFRM) Bill 2021, Department of Fisheries, Government of India.
27. "Coast Guard, Navy Must Prevent Foreign Fishing Vessels: Fishermen," *Outlook*, April 18, 2020,.
28. Jayashree Nandi, "At G20 Meet, Consensus on Nine Principles of 'Blue Economy'," *Hindustan Times*, July 29, 2023.
29. International Institute for Sustainable Development, "G20 Ministers Recommit to Paris Agreement, Agree on Blue Economy Principles," *SDG Knowledge Hub*, August 9, 2023.
30. Shinoj Parappurathu, "Marine Fisheries Insurance in India: Opportunities and Challenges," in *Winter School on Mariculture Technologies for Income Multiplication, Employment, Livelihood and Empowerment* (Kochi: ICAR-Central Marine Fisheries Research Institute, 2023): 359-64.