University of Southampton

Improving resilience among small-scale fisheries

Coping and adaptive strategies in response to climate change, resource changes and sudden shocks

Image: Mohammed Jabir, ICAR Central Institute of Fisheries Technology.

Background and Context

Biodiversity loss and climate change are the defining crises of our time (IPBES, 2022; IPCC, 2022). The ocean regulates climate, supports biodiversity, and provides substantial societal benefit through a myriad of ecosystem services (Talukder et al., 2022). Access to sustainable and healthy food is linked, directly or indirectly, to all Sustainable Development Goals (Willett et al., 2019) and fish has been identified as one of the most important sources to combat malnutrition in the world (Hicks et al., 2019; Vianna et al., 2020). The vital importance of improving ocean health for people and nature is well-recognised in the United Nations Sustainable Development Goals 5, 10, 12 and 14, Convention on Biological Diversity, and in the current Decades of Ocean Science and Ecosystem Restoration.

Small-scale fisheries are a vital part of the marine wild capture industry, contributing at least 40% of global fish catches and employing approximately 60 million people across the value chain (FAO et al., 2023). The small-scale fishing sector sustains livelihoods for coastal communities – men and women, with fishing, processing, and marketing contributing to employment, income, nutrition, and cultural identity (FAO et al., 2023). Yet the oceans and viability of marine fisheries are under threat from rapid declines in biodiversity and intensifying human impacts (IPBES, 2022), increasingly unsustainable and unequitable fisheries (FAO, 2022), and climate change (Talukder et al., 2022). Degraded or altered coastal and marine ecosystems can change fish behaviour and location and decrease their abundance. This, in turn, can affect fishing catches with resultant impacts on the wellbeing of coastal communities reliant on fish (Damasio et al., 2020; de la Puente et al., 2022).

Fishing communities will inevitably need to adapt to the local effects of climate change, which are increasingly visible and aggravated by other anthropogenic stressors. It is critical to gain insight into adaptation strategies that have already been adopted in small-scale fisheries and the economic, social, cultural, psychological, and technological resources needed to implement these strategies. Such knowledge will inform community decisions about how they might develop adaptive capacities to climate change, resource changes, and sudden systemic shocks and improve their resilience.

About the study

Research findings and key recommendations are based on the project 'Food, Gender, Enterprise: leveraging interdisciplinarity for sustainable small-scale fisheries'. Small-scale fishing communities in Kerala, India are experiencing increasing climatic events, declining catches, biodiversity loss, and the lingering effects of COVID-19.

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Key findings

Coping and adaptive strategies adopted by small-scale fisher communities.

Through a review of scientific literature, we identified two types of adaptation strategies - coping and adaptive - that fisher communities employed around the world to reduce local vulnerability and improve resilience.

Coping strategies = immediate, short-term responses to change/crisis

Adaptive strategies = long-term sustained courses of action to respond to change

Two-thirds of the strategies adopted by fishers were coping strategies to minimize vulnerability (Figure 1). All, except two of the coping strategies were initiated by fishers themselves. The two coping strategies initiated by non-fishers included government support in response to COVID-19 and to fishing resource decline, and the use of new communications technology to mitigate the impacts of climate change.

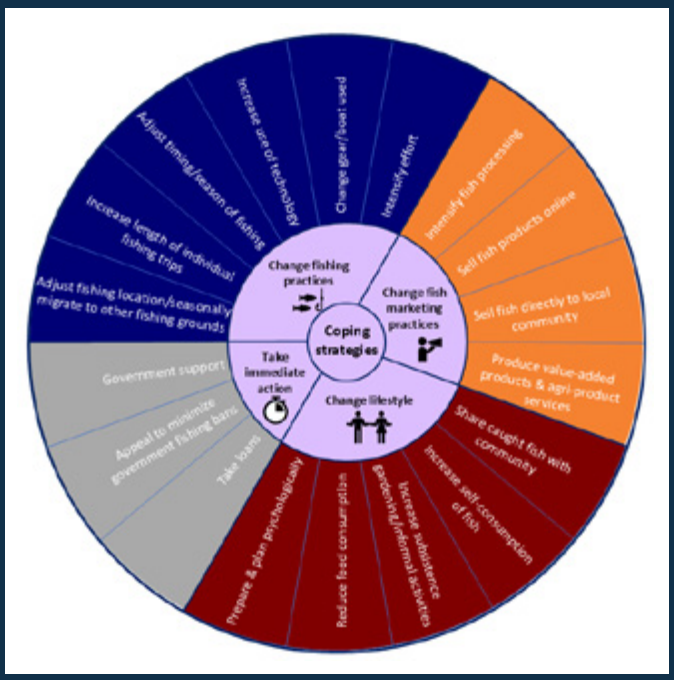

Figure 1: Coping strategies employed by fisher communities documented within literature reviewed.

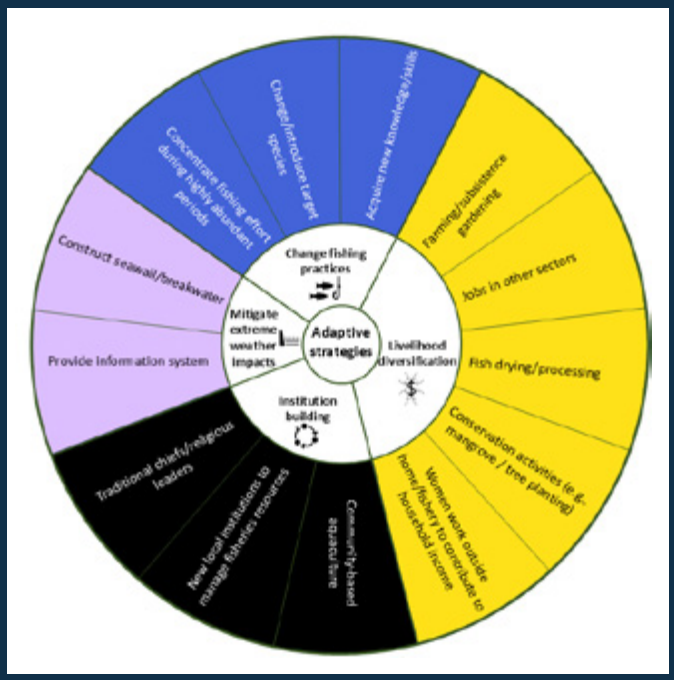

Figure 2: Adaptive strategies employed by fisher communities documented within literature reviewed.

One-third of strategies adopted by fishers we categorised as adaptive strategies (Figure 2). Most were initiated by fishers, but forty-one percent of these strategies were supported by actors outside of the fishing community. Additionally, adaptive strategies that required significant investments (whether social, financial and/or technological), such as the provision of information systems and development of community-based aquaculture, were initiated by actors beyond the fishing communities.

The diversity of strategies that can be employed (Figures 1 & 2) illustrate the dynamic nature of marine and coastal social-ecological systems and highlight that a one-size-fits-all approach is unlikely to transpose to all communities. Moreover, the ecological impact of strategies also needs consideration as some strategies, such as changing fishing practices or community-based aquaculture can themselves worsen the state of marine life. What is also noteworthy is that few scientific studies reported strategies that targeted whole communities: most examined only fisher men rather than those involved in fish processing such as fisher women.

Conditions that facilitate or limit adoption of specific strategies

Fishers initiated most coping strategies themselves; adaptive strategies were more likely to rely on external actors. Specific conditions that facilitate or prevent adoption of coping and adaptive strategies are listed in Tables 1 & 2.

Table 1: Coping Strategies

Strategy type	Impetus for adopting strategy	Initiated by fishers	Facilitated by institutional actors	Facilitating conditions	Limiting conditions
TAKE IMMEDIATE ACTIONS					
Appeals to minimise government fishing bans	Climate & Resource decline	Yes		Legal help from fishing societies.	Lack of legal help and/or political influence.
Take loans	COVID-19 & Resource decline	Yes		Existence of individuals or organisations who provide social security/ insurance in times of uncertainty.	Unfavourable credit schemes; Unequal patron-fisher relations that lead to maladaptive strategies for sustainability.
Government support	COVID-19 & Resource decline		Yes	Effective government support (relief, insurance) & enforcement of fishing zones..	Distrust of authorities; Lack of regulation of illegal commercial fishing.
CHANGING FISHING PRACTICES					
Intensify effort	COVID-19 & Resource decline	Yes		Social & family networks; Occupational pride.	Limited assets; Poverty; Competition over declining resources.
Changing gear/ boat used	Climate change, Resource decline & COIVD-19	Yes		Effective government support, social & family networks; Occupational pride, age; Access to capital/informal credit schemes, existence of local infrastructure; Education; Openness to change.	Competition over declining resources; Limited assets, poverty, lack of infrastructure; Lack of education; Lack of openness to change.
Increasing use of technology	Climate change		Yes	Financial capital to purchase of GPS, VHS, radio, etc.	Inequitable distribution of benefits of new technology among fishers.
Adjusting timing/ season of fishing		Yes		Participation in fisher's groups to maximise catch; Accurate climate/ weather information to ensure safety.	Lack of education; Older age.
Adjusting fishing location/seasonal migration to other fishing grounds	Climate change, Resource decline & COVID-19	Yes		Perceptions on securing a good catch; Social & family networks; Occupational pride.	Unwilling to travel longer distance; Poverty; Competition over declining resources.

Strategy type	Impetus for adopting strategy	Initiated by fishers	Facilitated by institutional actors	Facilitating conditions	Limiting conditions
Increasing length of individual fishing trips	COVID-19	Yes		Social & family networks; Occupational pride.	Limited assets, poverty; Competition over declining resources.
CHANGING LIFESTYLE					
Reduce food consumption	COVID-19 & climate change	Yes		Social & family networks; Occupational pride.	Pervasive poverty.
Increase self-consumption of fish	COVID-19	Yes		Community quarantines during the pandemic.	Rely on existing natural (fish) capital.
Increasing subsistence gardening/ informal activities	COVID-19 & Climate change	Yes		Poverty; Low education levels.	Rely on existing natural capital; Rely on existing social networks.
Prepare & plan psychologically	Climate change	Yes		Risk & experience of extreme climate events, local knowledge; Existence of social networks and fishing cooperatives.	Inaccurate weather information; Increased frequency of extreme weather events; Conflictual social networks.
Share caught fish with community	COVID-19	Yes		Strong/new social networks.	Weakened social networks; Reduced fish catch.
CHANGING FISH MARKETING PRACTICES					
Sell fish directly to local community	COVID-19	Yes		Strong social networks, local urban/tourist markets; Government money transfers.	Rely on existing natural capital; Government money transfers not reaching all fishers.
Produce value-added products & agri-product services	COVID-19	Yes		Openness to change; Capacity to acquire new knowledge/ skills; Mobilize social networks	Rely on existing social networks; Rely on existing knowledge/skills; Limited financial capital
Sell fish products online	COVID-19	Yes		Openness to change; Capacity to acquire new knowledge/ skills; Mobilize social networks.	Rely on existing social networks; Rely on existing knowledge/skills; Limited financial capital.
Intensify fish processing	COVID-19	Yes		Openness to change; Capacity to acquire new knowledge/ skills; Mobilize social networks.	Rely on existing social networks; Rely on existing knowledge/skills; Limited financial capital.

Table 2: Adaptive strategies

Strategy type	Impetus for adopting strategy	Initiated by fishers	Facilitated by institutional actors	Facilitating conditions	Limiting conditions
CHANGING FISHING PRACTICES					
Changing/ introduce target species	Climate change, Resource decline & COVID-19	Yes	Yes	Active role of government/fisheries ministry & aid agencies, presence of informal markets and noneconomic distribution networks important for resource sharing.	Conflict with commercial fishers; lack of ridge to reef spatial planning; Lack of fishing capital (boat ownership)
Concentrate fishing effort during highly abundant periods	Climate change & resource decline	Yes		Existence of natural capital.	Increased duration of extreme weather; Weak radio signals create barrier to correct information.
Acquire new knowledge/skills	Climate change & COVID-19	Yes		Openness to change; Mobilize financial capital from social networks to acquire new knowledge/skills; Absorb new knowledge/skills; Possessions of unique worldviews.	Rely on existing Social networks; Limited financial capitals.
LIVELIHOOD DIVERSIFICATION					
Farming/ subsistence gardening	COVID-19 & Resource decline	Yes	Yes	High level of openness to change; Social & organizational support networks; Household assets; Use of diverse kinds of knowledge; Land availability.	Lack of land ownership; land shortage; Poverty.
Jobs in other sectors	Resource decline & COVID-19	Yes	Yes	Educational level; Existence of alternative skills; Existence of opportunities from marine-based industries or other sectors; Willingness to diversify occupations.	High income from fishing despite climate events; Low education; Lack of financial capital; Fishers' pride.
Fish drying/ processing	Resource decline & COVID-19	Yes	Yes	Risk & extreme climate events; Low fishing incomes; Formal/ institutional support.	Lack of access to fish markets; High income from fishing despite climate events; Lack of technical skills.

Strategy type	Impetus for adopting strategy	Initiated by fishers	Facilitated by institutional actors	Facilitating conditions	Limiting conditions
Conservation activities (e.g., mangrove planting, tree planting)	Climate change	Yes	Yes	Perceptions & understanding impact of climate change; Damage to fishing tools from high waves and storms.	Weak coordination of different approaches at institutional level.
Women work outside home/ fishery to contribute to household income	Climate change & resource decline	Yes	Yes	Availability of alternative livelihoods; Low income from fishing.	Not specified.
MITIGATE EXTREME WEATHER IMPACTS					
Constructing seawall, breakwater	Climate change	Yes		Social networks to build sea walls; Perception that seawalls may stabilize the fish ecosystem.	Lack of political influence and government strategy to develop/build mitigation measures.
Provide information system	Climate change		Yes	Experience of floods and other impacts of climate change on individual health.	Weak coordination of different approaches at institutional level and/ or collective action.
INSTITUTION BUILDING					
Traditional chiefs/ religious leaders	Climate change, Resource decline	Yes		Established social networks based on trust to provide education on climate change and develop adaptive strategies.	Not specified.
New local institutions to manage fisheries resources	Climate change, Resource decline	Yes	Yes	Effective sharing of information about vulnerabilities and adaptation strategies.	Lack of collective action/ social networks.
Community based aquaculture	Resource decline		Yes	Integration of existing customary institutions, involvement of both genders and all communities within protected area. Governance mechanisms must link national, local and community levels.	Perceptions about personal characteristics, institutional barriers; Economic asset requirements.

Our findings underscored the relative importance of two social factors that influenced whether specific strategies were adopted or not: social organisation (formal and informal social networks between individuals, communities, and institutions) and assets. The analysis points to the importance of established informal or formal networks , or the ability to mobilise new networks in facilitating adoption of various adaptation strategies. The presence of, or access to new financial, technological, informational, and education resources at individual and community levels can also support the adoption of specific coping and adaptive strategies. However, it is not enough to have access to social networks or assets and have ability to mobilise these; fishers must also have capacity to be flexible and opportunities for learning. Additionally, individuals must have agency; be willing and able to draw on networks and resources to make small or large adaptations to actively shape their futures.

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Find out more

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