Do the indigenous knowledge systems of marine fishers increase their resilience in the face of climate change and risks? Observations from tsunami-hit fishing villages of South India.

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Introduction

Anthropogenic climate change and its resultant consequences have become a compelling reality. In the future, it is most likely that climate change will have catastrophic effects on communities worldwide that rely on natural resources.

India, being one of the most densely populated countries globally, has the second-highest number of people residing in the low-elevation coastal zone. Approximately 6% of India's population resides in low-elevation coastal zones, and they are particularly vulnerable to the detrimental effects of cyclones and floods (McGranahan et al., 2007).

Hundreds of small-scale fishing communities of India relying on marine fishing as their primary source of income.

The centuries-old Pattinavar marine fishing communities of South India are particularly vulnerable to climate change impacts, as well as coastal hazards and risks arising from climate variability.

Pattinavars are not only vulnerable to climate change but also serve as custodians of their indigenous knowledge systems. They possess a strong understanding and experience of climate change and its effects. Discussing their indigenous knowledge systems and their perceptions of climate change offers valuable insights on climate change, fisher resilience, and ocean sustainability.

Research location
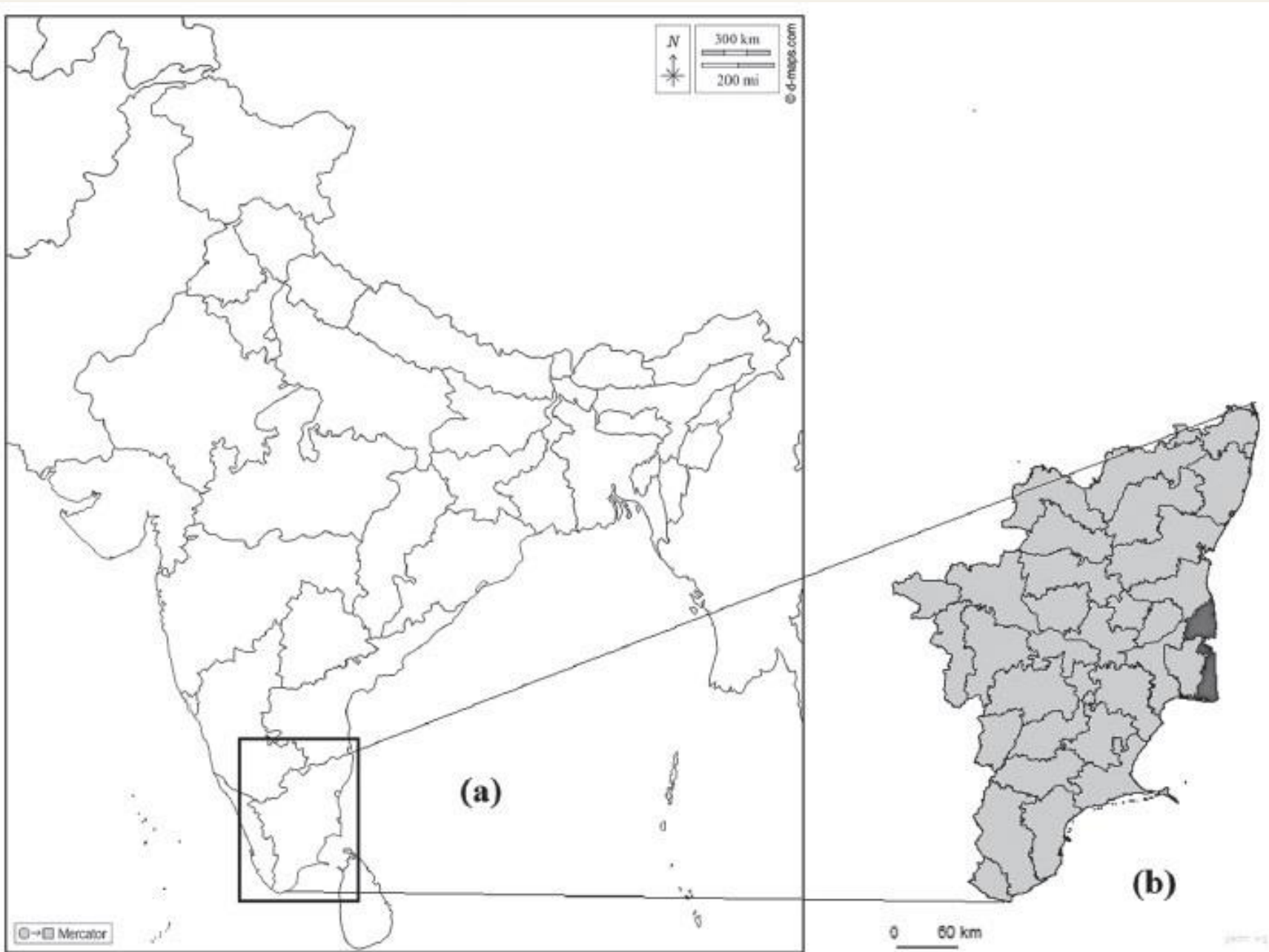
Locating the research region. (a) India (Tamil Nadu is highlighted) (b) Tamil Nadu (Nagapattinam district is highlighted). Maps only for illustrative purposes. Not to scale. Source: (a) https://d-maps.com/; (b) https://gadm.org

Tamil Nadu is a southern state in India with a coastline of 1076 km, making it the second-longest coastline in India after Gujarat. It has 14 coastal districts and 608 marine fishing villages.

Tamil Nadu is home to around one million marine fisherfolk; a large proportion of them are traditional fishers. In Tamil Nadu, the fishing villages of Coromandel Coast of Tamil Nadu are highly vulnerable to climate change effects and coastal disasters, and they were severely impacted by the 2004 Indian Ocean Tsunami disaster.

Indigenous knowledge systems of Pattinavars

The Pattinavars are one of the main traditional marine fishing communities in Tamil Nadu. They have a long history of living along the entire Coromandel Coast of Tamil land, from Pulicat Lake in the north to Point Calimere in the south.

Tamil fishing villages were governed by a complex system of culturally entrenched traditions, founded on a tacit code of customary laws that strictly ran along lines of caste and gender. This is very strong in the case of southeastern coastal Tamil Nadu, where this study was conducted.

Pattinavar fishermen have traditional names/community lingo to demonstrate winds, sea currents, and seasons in Tamil. Prior to embarking on fishing trips, they take into consideration the velocity and orientation of winds and sea currents, as well as near-term forecasts regarding fish abundance.

What do Pattinavar indigenous knowledge systems offer?

In India, there has been an increasing focus on the indigenous knowledge systems of resource-dependent communities, including marine fishers (Suyasaaradha, 2005; Santha, 2008; Swathi Lekshmi et al., 2013), focusing on the local ecological knowledge of small-scale marine fishers.

The indigenous knowledge systems of Pattinavar marine fishers serve as a supplement for assessing the vulnerability of communities and regions to climate change in various epistemic frames—not just in this Coromandel Coast of Tamil Nadu but also in different regions of Tamil Nadu and other coastal states of India.

How was this study conducted?

A pilot survey was conducted in nine fishing villages located in the Nagapattinam district of Tamil Nadu.

Building on the findings of the pilot survey and an extensive literature review, key informants were consulted, and seven fishing villages of Coromandel Coast of Tamil Nadu were identified for the study.

The study villages are homogeneous single-caste (Pattinavar) fishing villages, and most fishing households rely heavily on nearshore small-scale marine fishing and local ecological knowledge (indigenous knowledge) systems for their livelihoods.

A large proportion of respondents possess 25–30 years of fishing experience, and they are senior fishermen. They were identified by adopting purposive and snowball sampling methods.

Field Snaps & Selected Questions

Share the different traditional names (community lingo) of the sea currents, wind patterns, and seasons.

How do you find out the timings, directions, and fish shoals when you are in the sea?

What is the significance of wind patterns in detecting the fish shoals and determining the fish caught on a typical fishing day?

Explain the connection between changes in climate patterns and fish catch. What are the climate variables that affect the fish availability and catch? List and rank the variables according to their influence.

Explain the effects of the climate events that have occurred over the past three to four decades and point out how they have changed the fish-catching patterns over the years.

Elaborate on the effects of the 2004 Indian Ocean Tsunami disaster on weather and climate patterns and fishing livelihoods.

(Selected data collection questions. Source from: Madhanagopal & Pattanaik, 2020; Madhanagopal, 2023)

Indigenous knowledge (LEK) of Pattinavar fishers

Signs of high and low fish catch/fish shoals	During the new moon period (*Amavasai:* in Tamil), more fish catches are obtained. During the full period (*Pournami:* in Tamil), fewer fish catches are obtained
	Flocks of birds hover on the seawater indicate the fish shoals
	Coastal upwelling is an indication of good fish catch
	Dark blue patches, the presence of frequent bubbles and ripples on the sea water indicate the fish shoals
	The presence of fishy odor at sea denotes substantial fish catch, whereas the bad odor at sea denotes the less concentration of fish in the particular fishing ground
	The presence of muddy water indicates the substantial concentration of fish shoals, whereas the clear white water suggests the less fish availability at the fishing grounds
Signs of weather extremes including heavy rain-falls/cyclones	Sea water remains very calm
	Dark clouds are seen in the horizon
	Sudden increase/upsurge of the speed and intensity of sea currents
	Abnormal behavior of the animals (mainly dogs) and birds
	Foaming of water at the sea shore is an indication of the impending cyclone

Illustration of fishermen's local ecological (indigenous) knowledge. (Source: Madhanagopal & Pattanaik, 2020; Madhanagopal, 2023. Publications given below)
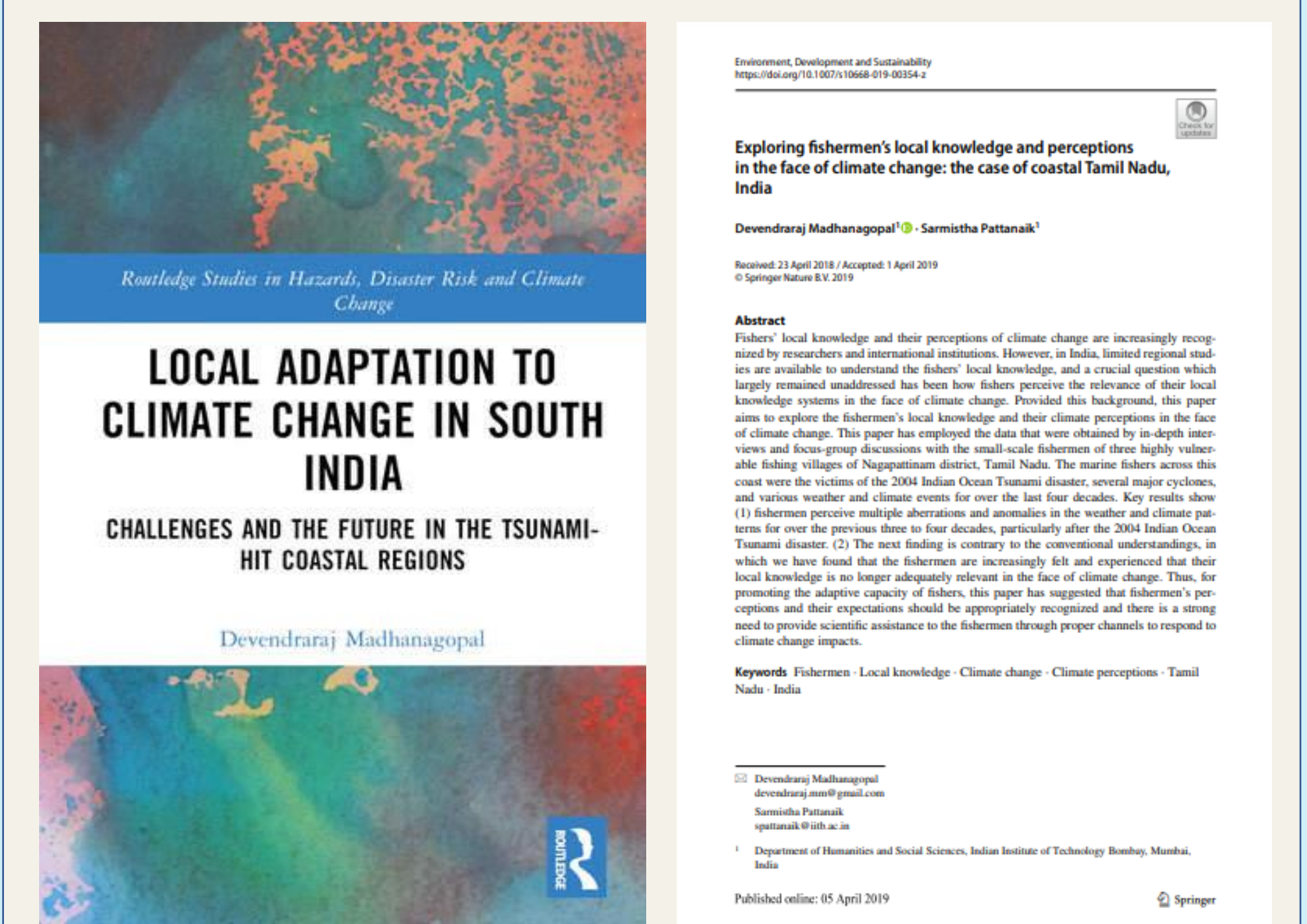
Indigenous knowledge systems and fishers' resilience

The traditional knowledge systems of Pattinavar fishers are becoming less relevant among Pattinavar fishers in the face of climate change, particularly after the 2004 Tsunami.

Advancements in technology and the widespread use of mass media among fishermen have significantly reduced the probability of casualties arising from climate disasters, although climate change still poses a range of livelihood challenges and life-risky threats to Pattinavar fishermen.

In the past few decades, they have recognized the need for scientific updates and weather and navigation instruments, particularly in the aftermath of the tsunami.

In summary, indigenous knowledge systems of fishers, including their understanding of oceanographic variables and marine ecosystems, may not be entirely adequate for addressing the present and impending challenges of climate change. However, it may be applicable to enhancing their resilience only in specific contexts.

Selected references

- McGranahan, G., Balk, D., & Anderson, B. (2007). The rising tide: Assessing the risks of climate change and human settlements in low elevation coastal zones. Environment and Urbanization, 19(1), 17–37.
- Suyasaaradha, S. (2005). Puducherry vattara meenavargalin thozhil aaar arivugal. Unpublished Ph.D. thesis. Puducherry University, Pudhucherry, India. Accessed 04 February 2017 from Shodhganga database.
- Santha, S. (2008). Local ecological knowledge and fisheries management: a study among riverine fishing communities in Kerala, India. Local Environment, 13(5), 423–435.
- Swathi Lekshmi, P. S., Dineshbabu, A. P., Purushottama, G. B., Thomas, S., Sasikumar, G., Rohit, P., Vivekanandan, E., & Zacharia, P. U. (2013). Indigenous Technical Knowledge (ITKs') of Indian Marine fishermen with reference to climate change. Central Marine Fisheries Research Institute, Kochi.
- d-maps. (n.d.). Map of India – Boundaries, states.
- GADM (The Database of Global Administrative Areas). (n.d.). GADM maps and data. https://gadm.org/