

Unveiling the Treasury of Southern India: The Wadge Bank and Its Fisheries Resources

Manabjyoti Barman¹ | Sagar Ronad¹ | Zaheer Abass*² | Shnneha K Kalita³ | Vipul Singh Badguzar¹

¹ICAR-Central Institute of Fisheries Education, Panch Marg, off Yari Road, Andheri (West), Mumbai-400061 Maharashtra.

²Faculty of Fisheries, Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, Shalimar, Srinagar, J&K UT, 190006

³Department of Fisheries, Govt. of Assam

Correspondence

Zaheer Abass, Faculty of Fisheries, Sher-e-Kashmir University of Agricultural Science and Technology of Kashmir, Shalimar, Srinagar, J&K UT, 190006

Email: zaheerfrmphd31@gmail.com

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The authors assert that the manuscript was developed without any commercial or financial associations that could be interpreted as a potential conflict of interest.

Authors Contribution

All listed authors have contributed significantly, directly, and intellectually to the work and have endorsed it for publication.

Abstract

The Wadge Bank stands out for its distinctive marine ecosystem and rich fishing grounds. Covering approximately 4,000 square miles, its continental shelf slopes gently from the coast before plunging into abyssal depths. The seabed exhibits diverse features, ranging from coarse sand to flat rock formations, occasionally interspersed with rough patches and pinnacle rocks. Despite its complexity, the area is a hotspot for fishing, with abundant fish food organisms supporting a diverse ecosystem. The area's rich biodiversity includes over 400 species of fishes, dominated by bony fishes like Serranidae and cartilaginous fishes. Fishing practices in Wadge Bank date back to the early 20th century, with commercial operations gradually developing despite challenges such as inefficient engines and wartime disruptions. Wadge Bank offers significant fishing potential, and sustainable management, and further research is needed to ensure its long-term viability.

KEYWORDS

Wadge Bank, Continental shelf, Hotspot, Sustainable Management

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INTRODUCTION

India is among the mega-diverse countries known for their immense biodiversity, despite covering just 2.4% of the world's landmass (Venkataraman, 2012). India supports unique and immense aquatic diversity. India ranks as the third-largest producer of fish and second in aquaculture production globally. The aquatic biodiversity of India accounts for 11.72% of the total global biodiversity. Froese and Pauly (2024) reported a total of 2666 fish species from the country, out of which 1710 are marine water species. India possesses vast marine water resources, including an extensive coastline stretching 8129 kilometers, an Exclusive Economic Zone (EEZ) spanning 2.02 million square kilometers, a continental shelf covering 0.50 million square kilometers, and an inshore area of 0.18 million square kilometers with depths less than 50 meters. India's coastline is segmented into four distinct regions: the North East coast, South East coast, South West coast, and North West coast. Each region is distinguished by unique features such as turbulent seas and sandy shores, all of which make significant contributions to India's overall production. Along the coastline, various ecosystems have been identified since historic times, out of which Wadge Bank, Mudflat, Coastal lagoon, Mangrove areas, and Coral reef covers are prominent ones. In this synthesis, we will discuss on the characteristics, and fishery resources of Wadge Bank, which is situated in the southern tip of India. The "Wadge Bank" is a gently sloping underwater plateau located roughly 55 to 65 kilometers off the coast of India's Cape Comorin (Rao et al., 1988). The continental shelf in this area slopes gradientally, dropping from 10 fathoms along the shore to 50 fathoms before diving to incredibly deep depths. The area of Wadge Bank is roughly 4,000 square miles. The western part of the bank has an average depth of 36 fathoms, whereas the eastern part of the bank is shallow and flat with an average depth of 22 fathoms. It is a marine environment with a rich abundance of fish food organisms. At Wadge Bank, three oceans converge, making it one of the most productive coastal areas globally. The region experiences seasonal fluctuations in water current patterns, contributing to its dynamic ecosystem.

CHARACTERISTICS OF WADGE BANK

Bottom Characteristics

According to the survey carried out by S. S. "Lila" in 1921, 1922, and 1923, the bottom varies slightly in nature (Malpas, 1926). The seabed is marked by rough yellow sand overlaying a flat rocky base extending to a depth of 30 fathoms. There are areas of flat rock mixed in with firm, clean sand at a depth of thirty fathoms down to the continental shelf's edge. There are some relatively small extents of muddy areas. In both deep and shallow water, there are a few rocky areas with pinnacle rocks. Even though they are not charted, fishing skippers are aware of their positions and can avoid them. The ground was rougher back then, with a lot of sea fans (Gorgonids) and sponges that made it difficult for trawling and handling the catches, but these have been gradually eliminated. These days, the majority of the bank's unfished areas are where we can find them.

Meteorology

The meteorology of Wadge Bank is extremely complex. It experiences the influence of northeast monsoon winds from early November until late April and southwest monsoon winds from early May to the end of October. The weather is generally calm during the northeast monsoon, but the occasional strong winds result in the worst fishing conditions of the year. March and the first half of April are especially pleasant months for Wadge Bank with warm weather.

The southwest Monsoon winds exhibit greater strength and consistency on average. With a broader expanse of the Open Ocean to gather momentum, the SW monsoon can stir up substantial seas. During this period, the longest spells of unfavorable fishing weather occur, often forcing trawlers to seek shelter. According to Captains Mitchell and Ellen, Wadge Bank weather generally offers more favorable conditions for fishing compared to European waters, albeit with a significant presence of nearly adverse weather. Winds on the Wadge Bank originate from two directions only and visibility is generally good due to the lack of fog and is characterized by the absence of blizzards and "icing" naturally.

Hydrography

Similar to meteorology, the hydrographic conditions of the Wadge Bank is intricate. The Wadge Bank acts as a focal point where ocean currents either converge or diverge along the western coast of India and the western areas of the Gulf of Mannar. According to Captain Mitchell's report, the average current speeds at this location are approximately 1.5 knots. Wind patterns on the bank disrupt these currents, which potentially cause turbulent cross-seas. They are most likely the result of developments occurring far away, possibly in the Bay of Bengal or the Arabian Sea. Mariners have observed water masses of varying hues as they enter and depart fishing areas, usually in an easterly direction. These seemingly endless walls of water can be of any color from milky or opaque brown to pure blue.

The presence of these water masses significantly impacts fishing success. Although skippers possess a basic understanding of the interrelationships between water masses and an improved understanding of current patterns, tidal systems, general hydrography, and their impact on trawl fishing would enhance fishing operations. Rao et al., (1988) reported that during the South West monsoon, the surface water temperature in this area ranges from 26.4° to 28°, and the salinity from 34.3 to 35.1 ppt.

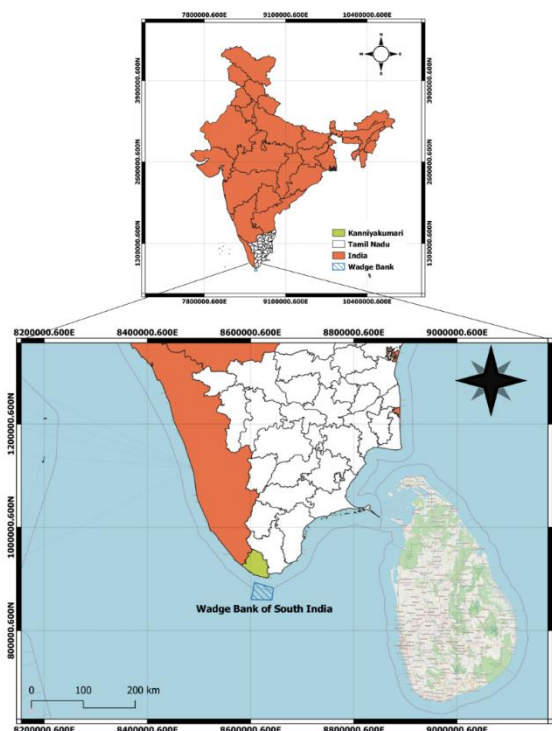


Fig 1: Map showing the position of Wadge Bank (Prepared using Q-GIS)

HISTORY OF FISHING PRACTICES IN WADGE BANK

Fishing has been practiced in Wadge Bank since 1907. With great difficulty, Captain Cribb conducted the first Wadge Bank trawling operations in 1907 aboard the trawler "Violet." Good catches were acquired despite the operation's inefficiency caused by inefficient engines (Malpas, 1926). The Government of Ceylon conducted the following operation from 1920 to 1923 using the trawler "Lilla". During 1928 and 1930, the Madras Government conducted a comprehensive survey along the southern shores of India, spanning from Madras in the east to Mangalore in the west, utilizing the trawler "Lady Goschen" (Gravely, 1929; Raj, 1933). Ceylon Fisheries Limited, a private enterprise, started the first commercial trawling operation along Wadge Bank. Two coal-burning steam trawlers, namely 'Tongkol' (in operation during 1928 and 1929) and 'BulBul' (active from 1928 to 1935), were utilized during this period. From 1936 until 1945, however, there was no trawling. To alleviate Ceylon's protein food scarcity, the government of Ceylon began trawling in 1944 using the stern trawler "Raglan Castle" (Amirthalingam and De Zylva, 1947). Operation period Raglan Castle was 1945-1951. From 1947 to 1948, The Lanka Deep Sea Fishing firm operated the coal-burning steam trawler "Aringa." The Department of Fisheries of Ceylon bought the steam trawler "Braconglen" (De Zylva, 1953) in September 1950. It started fishing on the Wadge Bank in July 1951 and has been there ever since. Another steam trawler, called "Maple Leaf," was given to the Ceylonese government by the Government of Canada in 1933 and has been in service ever since. Sivalingam and Medcof (1957) documented that during that period, these final two vessels were the sole fishing craft operating in the vicinity of the Wadge Bank.

FISHERY RESOURCES OF WADGE BANK

The Wadge Bank area is associated with both the west and east coasts of India, encompassing portions of each. According to Mendis (1965), demersal resources from Wadge Bank and Pedro Bank could yield 8400 tonnes (t) and 450 t respectively. Moreover, surveys conducted as part of the Pelagic Fisheries Project indicate a standing demersal stock of 73,000 tons, with catches from the Wadge Bank area exhibiting a high density of 67 kilograms per hour. Karuppasamy (2016) conducted a biodiversity study along the Wadge Bank of Southern India, identifying 425 fish species. Colachel Landing Center exhibited the highest species richness (414 species), followed by Chinnamuttom (392 species) and Vizhinjam (286 species). Among the 20 orders recorded, Perciformes constituted 60% of the species, followed by Tetraodontiformes (6.6%). The Serranidae family had the highest species representation with a huge species number of 30. Tetraodontidae, Engraulidae, and Labridae families were recorded with 8 species each. Cynoglosidae and Bothidae each had 7 species, while four families had 6 species each. Six families contained 5 species each, 13 families had 4 species each, 11 families had 3 species each, 12 families had 2 species each, and 30 families had 1 species each.

Colachel landing centre had the highest species richness, with 414 species belonging to 94 families. The landing center represented 38 percent of the total species observed. Throughout all the three landing centers, the family Carangidae, Serranidae, and Lutjanidae were prominent.

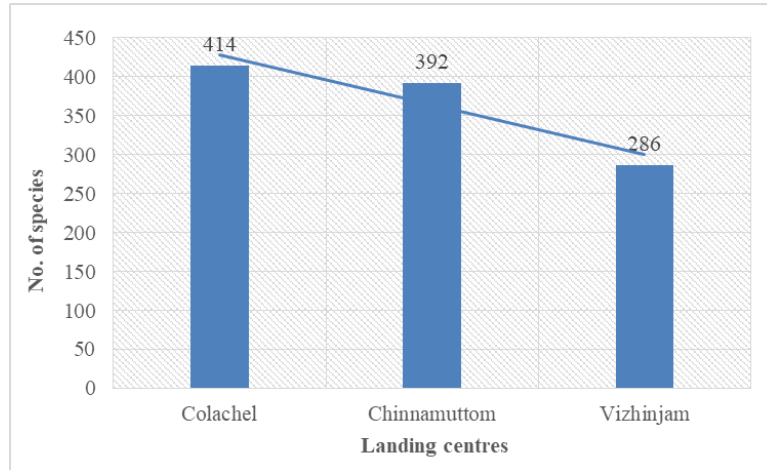


Fig 2: Graphical representation of total no. of species landed across the 3 landing centers (Data source: Karuppasamy (2016))

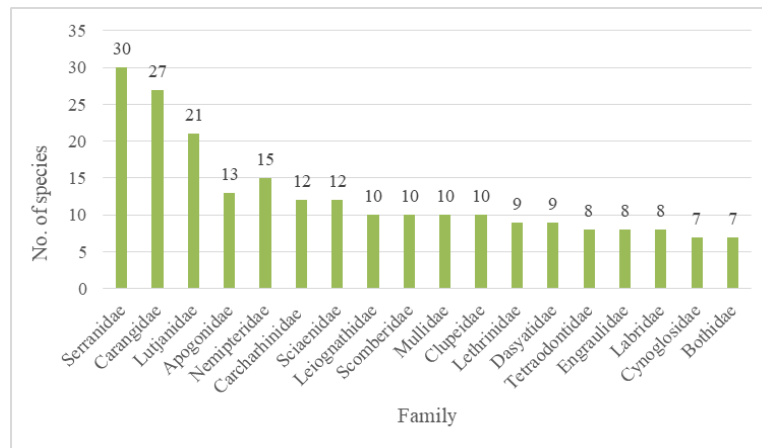


Fig 3: Graphical representation of no. of species per family along Wadge Bank (Data source: Karuppasamy (2016))

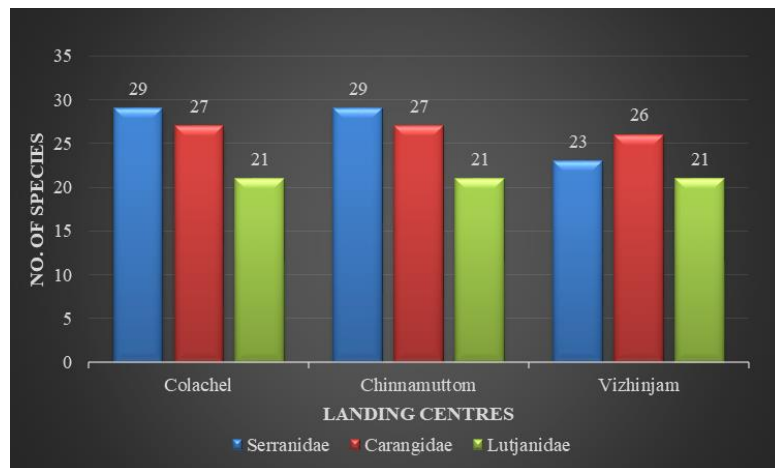


Fig 4: Graphical representation of family contributing maximum no. of species across the 3 landing centres (Data source: Karuppasamy (2016))

PLANKTONIC RESOURCES OF WADGE BANK

Wadge Bank is a fertile ground with a huge resource of planktonic foraminifera. Rao et al. (1988) reported that the density of planktonic foraminifera from this region varies from 66,133 to 12,75,294 specimens per 1000 m³ in the surface haul, whereas it is 13,401 to 144,961 specimens per 1000 m³ in the vertical hauls. The higher number of planktonic foraminifera in the surface haul suggests a high phosphate count from the water. The surface waters of Wadge Bank consistently exhibit phosphate levels surpassing 0.5 µg/L, as reported by Rao et al. (1988).

The widespread upwelling in the Wadge bank area is indicated by the existence of *G. bulloides* and *N. dutertrei*. These species favor upwelling-induced relatively chilly waters. In addition to these indicator species, the study also observed the following species: *Globigerina callida*, *G. falconensis*, *G. aequilateralis*, *Hastigeri napelagica*, *Orbulina universa*, *G. menardii*, and *G. glutinata*. These species are typically found in upwelling locations (Rao et al., 2018). Large numbers of plankton, particularly *Noctiluca*, suddenly appeared in the surface layers from Wadge Bank, as reported by Sivalingam and Medcof in 1957. However, the species involved and the reasons for their rapid arrivals and disappearances remain unknown.

RELATIVE PRODUCTIVITY OF WADGE BANK

Chidambaram (1952) investigated the productivity of India's coastal waters by analyzing trawling records from multiple sources. These included data from a survey cruise carried out by the "Lady Goschen" in 1902, 12 commercial fishing trips conducted by the "Taiyo Marti No. 17" from Bombay between November 1951 and May 1952, as well as survey cruises and commercial operations undertaken by the "Raglan Castle" from Colombo, Ceylon, during the period from 1945 to 1947. The study reported that an average catch of 141 pounds per hour of actual trawling by "Lady Goschen's" from the Wadge Bank which was about 25% of the catches realized by Ceylon trawlers i.e. 550 pounds per hour of actual trawling at the study period.

For a rough comparison, Chidambaram (1952) has considered some assumptions. Based on the assumptions, the study concluded that certain areas i.e. off Calicut and Cochin are just as fertile as Wadge Bank, while other areas such as the Mangalore area, are significantly more fruitful. As per the published account, the "Taiyo Maru No. 17" is assessed to possess similar efficiency levels to those of the vessels "Braconglen" and "Maple Leaf." The average daily voyage from the port in 1951 and 1952 resulted in landings of 10,676 pounds from Bombay waters. The average daily weight of "Braconglen's" and "Maple Leaf's" 1954. The landings from the Wadge Bank to Colombo totaled approximately 10,000 and 8,500 pounds, respectively. From the observed landings, the study could judge the Bombay water as somewhat richer than the Wadge Bank.

CONCLUSION

Although the Wadge Bank is thought to be a productive fishing area with a good proportion of high-quality fish, fishing for Sri Lanka and certain other nations has not proven to be highly profitable. From May through October, there are plenty of fishing chances available on the excellent fishing ground known as the Wadge Bank. Vessels must endure wind gusts up to Beaufort 5°. To efficiently utilize its resources, a variety of fishing techniques can be used, including line fishing in rocky areas, squid jigging, and pelagic trawling. Research on fishing vessels and equipment is necessary, as are oceanographic

studies on the reasons for fish migration and the regions from which larger carangid fish migrate. Before introducing a significant number of vessels, any decline in the economic catch rate needs to be monitored closely.

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How to cite this article: Barman M, Ronad S, Abass Z, Kalita SK and Badguzar VS. Unveiling the Treasury of Southern India: The Wadge Bank and Its Fisheries Resources. *Chron Aquat Sci.* 2024;1(11):50-56