

agricultural sector's GDP while employing over 1.48 million people (FAO, 2022). Yet, national demand for fish, estimated at 3.6 million metric tonnes annually, far exceeds local production, creating a supply gap that is exacerbated by climate variability. Artisanal fishers in coastal regions such as Ilaje face declining catches, rising operational costs, and increasing livelihood insecurity, reflecting the close link between climate variability and household welfare (Aderinola et al., 2021).

Studies in Lagos and other coastal areas have documented how fluctuations in rainfall, temperature, and hydrological systems directly affect fish productivity and fisher livelihoods. For example, declining rainfall reduces water levels in rivers and estuaries, disrupting spawning cycles and lowering fish availability, while rising temperatures increase physiological stress in fish populations, reducing survival and reproduction rates (Ezra et al., 2023). These ecological disruptions translate into reduced catches, biodiversity decline, and weakened resilience of fishing communities.

Globally, warming oceans, acidification, and deoxygenation are destabilizing marine ecosystems, reducing productivity, and altering fish distributions (IPCC, 2023). Coastal and inland fisheries in West Africa are particularly at risk due to reduced water flows, saltwater intrusion, and habitat degradation, including mangrove loss, which diminishes breeding and nursery grounds for key species (Lefcheck et al., 2019). Rising water temperatures exacerbate physiological stress in fish, increasing metabolic demands while reducing oxygen availability. This imbalance impairs growth, reproduction, and survival (Little et al., 2020). For example, African catfish (*Clarias gariepinus*) exhibit narrow thermal tolerance ranges, with survival rates declining sharply outside 18.9°C-33.2°C (Kłyszczko et al., 1993). Warmer waters have also been linked to smaller average fish sizes and reduced overall catches, despite faster growth in some species (Brander, 2013).

Hydrological variability further compounds these challenges. Rainfall, land use, and evaporation rates directly influence water systems that sustain fisheries. In Ilaje, heavy rains replenish estuaries, supporting fish breeding, while prolonged dry spells lower water levels, disrupt spawning, and stress fish populations. Seasonal flooding, critical for tropical fish reproduction, is increasingly disrupted, leading to biodiversity loss and reduced catches (Obayemi et al., 2024).

Coastal erosion intensifies these pressures. Satellite analyses reveal shoreline recession in Ilaje at an average rate of 56 meters per year, with some communities experiencing erosion exceeding 400 meters annually (Adagbasaa et al., 2024). Rising sea levels and stronger wave action threaten fishing villages and estuarine ecosystems, accelerating livelihood collapse. Small-scale fisheries, which contribute significantly to Nigeria's blue economy, face declining productivity against national demand. Without adaptive management, these communities risk ecological and socio-economic collapse.

The novelty of this study lies in its localized assessment of climate variability impacts on fisheries and livelihoods in Ilaje LGA, Ondo State. By integrating long-term climatic data (1996-2025) with community-level perceptions and adaptation strategies, the research provides context-specific evidence essential for designing adaptive management policies. Unlike previous studies that focused broadly on national or regional trends, this study emphasizes the lived experiences of artisanal fishers in Ilaje, offering insights into how climate variability disrupts fisheries and livelihoods at the community level. This approach contributes to broader efforts to sustain Nigeria's coastal blue economy and enhance resilience in vulnerable fishing communities.

2 Materials and Methods

2.1 Description of the study area

This research took place in four fishing villages: Ayetoro, Idiogba, Bijimi, and Asumogha within the Ilaje Local Government Area (LGA) of Ondo State, Nigeria. Fishing is the major way people earn a living in these areas, with most families depending on fishing activities for income. The area is geographically located between latitude 6°00'N and 6°30'N, and longitude 4°45'E and 5°45'E, including important fishing villages. The geographical positioning of the study area was established through the determination of its latitude and longitude, as reported