

Seasonal variations in fish catch composition in tropical estuarine systems.

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Introduction

Seasonal variations in fish catch composition are a defining characteristic of tropical estuarine systems, driven by the dynamic interactions between environmental factors and fish population behaviors [1]. Estuaries, where freshwater rivers meet the sea, are highly productive ecosystems that support diverse fish communities. In tropical regions, variations in temperature, salinity, water flow, and nutrient availability fluctuate throughout the year, influencing fish migration patterns, spawning activities, and the availability of target species for fisheries. Understanding these seasonal dynamics is critical for sustainable management and conservation of estuarine resources [2].

The monsoon cycle plays a significant role in shaping fish catch composition in many tropical estuaries. During the rainy season, increased river discharge reduces salinity levels and introduces a surge of nutrients, boosting primary productivity and creating favorable conditions for certain fish species [3]. Estuarine-dependent fish, such as mullet, croakers, and catfish, often dominate catches during this period, benefiting from abundant food resources and expanded nursery areas. Juvenile stages of economically important marine species also utilize estuaries during high-flow seasons, contributing to the diversity and richness of the fishery [4].

In contrast, the dry season, characterized by reduced river flow and higher salinity levels, shifts the composition of fish catches. Marine species that can tolerate higher salinities migrate further into the estuary, increasing their abundance [5]. Prawns, snappers, and sea breams often become more prevalent in the dry season, reflecting the influence of salinity gradients on species distribution. Reduced nutrient inputs during this time typically lead to lower primary productivity, altering the food web structure and the availability of forage fish [6].

Temperature fluctuations, although less pronounced in tropical regions than in temperate zones, still influence fish behavior and catch rates. Warmer temperatures may accelerate fish metabolism, affecting feeding rates and spawning cycles [7]. Some species, such as anchovies and sardines, may show seasonal peaks in abundance associated with specific temperature ranges. The timing of spawning migrations is often synchronized with seasonal cues, ensuring optimal conditions for egg and larval survival [8].

The availability of target species for small-scale and artisanal fishers varies significantly with seasonal changes. In many tropical estuaries, fishing communities depend on a mix of finfish, crustaceans, and mollusks, with catch composition shifting according to species availability. Seasonal patterns also affect fishing methods, with fishers adapting their gear and techniques to target different species. For example, gill nets may be used during peak migration periods, while traps and cast nets are favored for stationary or slow-moving species during other times [9].

Environmental factors such as dissolved oxygen levels, turbidity, and nutrient concentrations further influence seasonal catch patterns. High rainfall and runoff can lead to increased turbidity, which affects fish visibility and feeding behavior. Conversely, clear water conditions during the dry season may favor predatory species that rely on sight to hunt. Changes in dissolved oxygen levels, particularly during periods of stratification or eutrophication, can lead to localized fish kills or reduced fish activity, affecting catch rates and species composition [10].

Conclusion

In conclusion, seasonal variations in fish catch composition in tropical estuarine systems are shaped by a complex interplay of hydrological, salinity, temperature, and productivity changes. These dynamic patterns have significant implications for fisheries management, as they determine the timing and success of fishing efforts. Sustainable management strategies must incorporate an understanding of these seasonal dynamics to ensure the long-term health of estuarine fish populations and the livelihoods of dependent fishing communities. Adaptive regulations, such as seasonal fishing bans or size limits, can help balance exploitation with conservation, preserving the productivity and biodiversity of tropical estuaries for future generations.

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