Industrial Fishing's Hidden Cost: Disrupting the Ocean's Nutrient Balance

Bồ Nông

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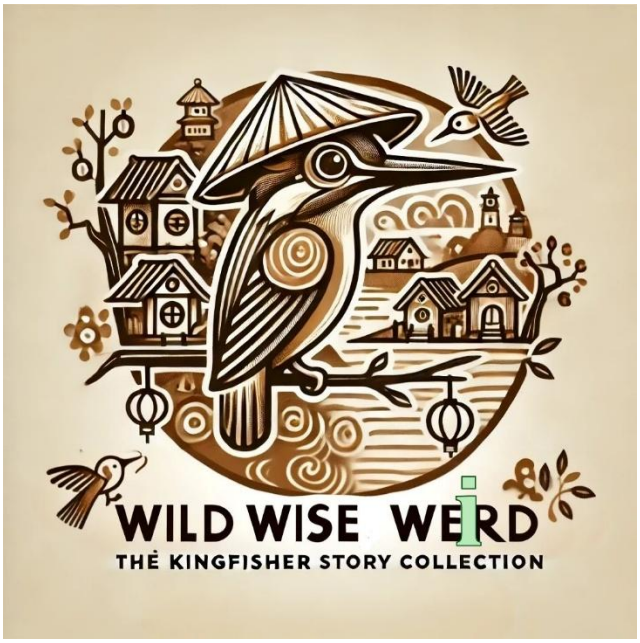

""No, not rods and hooks. They're now using larger nets with smaller mesh, equipped with lights to lure fish at night... These nets allow them to catch every single fish, day and night...," replies Field Sparrow.

Kingfisher is horrified. Market economics combined with the rising demand for fish and beer is such a devastating and dangerous combination. The more he thinks about it, the more worried he becomes, making his head dizzy. After a while, Kingfisher feels so overwhelmed that he falls ill."

In "Bird Village Economics"; *Wild Wise Weird* [1]

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For decades, industrial fishing has been recognized for depleting fish stocks and altering marine food webs [2-4]. However, a recent study by González Ortiz et al. [5] reveals a lesser-known but profound consequence: large-scale disruptions to the ocean's nutrient cycles. By extracting biomass, fisheries are also removing vital nutrients—carbon (C), nitrogen (N), and phosphorus (P)—that are essential to sustaining marine life.

Analyzing data from 1960 to 2018, the researchers estimate that industrial fisheries have removed approximately 431 million tonnes of carbon, 110 million tonnes of nitrogen, and 23 million tonnes of phosphorus from marine ecosystems. This nutrient extraction is most intense in productive coastal zones, particularly within countries' Exclusive Economic Zones (EEZs). Mid-level trophic groups and pelagic species, such as herrings and mackerels, accounted for 62% of these nutrient removals, highlighting the selective and concentrated nature of modern fishing practices.

The loss of these nutrients is not simply a matter of quantity. Elements like phosphorus and nitrogen often limit biological productivity in marine environments [6,7]. While human activities such as agriculture and fossil fuel combustion do introduce nutrients to the ocean, most of these inputs are not readily accessible to marine life. In contrast, marine organisms recycle nutrients, which is essential for maintaining the productivity of ocean ecosystems.

The study also found that the ratios of extracted nutrients (C:N:P) varied across different regions and species, reflecting how fisheries selectively target organisms with distinct nutritional profiles. For instance, fishing in the high seas disproportionately removes large pelagic predators like tunas, which not only store more carbon but also play a crucial role in long-term carbon sequestration when their bodies sink to the ocean floor.

Such selective removal of nutrient-rich species can disrupt food webs, intensify nutrient limitations, and hinder ecosystem recovery. This is especially concerning in areas where both mid-level prey and their top predators are being exploited, potentially leading to cascading ecological effects and diminished marine productivity.

This study underscores the complex interplay between human activity and marine ecosystem functioning. Industrial fisheries are not only altering species populations but also extracting the building blocks of life from the ocean. Recognizing the role of fisheries in nutrient depletion is crucial for designing policies that support both sustainable fish stocks and healthy nutrient cycles. Protecting the ocean's biogeochemical integrity is essential to restoring balance in the nature-human relationship [8,9].

References

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