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Dragging the Seafloor: What Trawl Fishing Does to the Life Beneath the Waves

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Bottom trawling is the workhorse of the world's demersal fisheries, responsible for roughly a quarter of all wild-caught fish and, along India's coast, for more than half of the total marine landings. The same net and heavy gear that make it so productive also drag across the seabed, scraping, ploughing and stirring up the community of animals and plants that live there. This article looks at what happens to bottom-dwelling fauna and flora when a trawl passes overhead: the direct crushing and burial of slow-growing invertebrates, the slower unravelling of sediment chemistry and buried carbon, and the knock-on effects on the fish that depend on the seabed for food. Drawing on global research and studies from India's west coast, it explains why some habitats bounce back within months while others carry the scars for decades, and what practical steps- larger mesh, seasonal closures, and gear modification can soften the impact without shutting the fishery down.

Keywords: Bottom trawling, benthic fauna, seabed flora, sediment disturbance, marine biodiversity, sustainable fishing

Introduction: A Net Built for the Seabed

Walk along any major fishing harbour on India's west coast at dawn and the catch on the deck tells only half the story. For every basket of prawn, croaker or pomfret that trawlers bring in, a net has spent the previous hours dragging steel-shod boards and a weighted footrope across the seafloor, several metres below the boats. Bottom trawling is, by design, a method that fishes the seabed rather than the water column above it, and that design choice is precisely what makes it both so productive and so disruptive. Globally, bottom trawls land close to a quarter of the world's wild marine catch; in India, trawlers alone account for over half of total marine fish production, making the gear the backbone of the country's fisheries economy. But the seafloor is not an empty fishing ground waiting to be swept. It is a living habitat, carpeted in places by sponges, soft corals, seagrass meadows and thick mats of burrowing worms, clams and brittle stars, whose slow, patient work of feeding, burrowing and decomposing organic matter keeps coastal waters productive in the first place. This article traces what happens to that community, the fauna and flora that live on and in the seabed, when a trawl passes over it, and what the accumulating evidence from India and abroad suggests about living with a fishing method the world is not about to give up.

How a Trawl Touches the Bottom

A bottom trawl is kept open and pinned to the seafloor by a pair of heavy otter boards or, in beam trawls, a rigid beam, with a weighted ground rope and, in gear targeting flatfish and prawns, tickler chains that bounce along the bottom to startle buried animals into the net's path. Depending on the gear and the type of seabed, this hardware can plough into the sediment anywhere from a few centimetres to over thirty centimetres deep. Every pass turns over a strip of seafloor several metres wide, mixing surface sediment with material from below, flattening burrows and mounds built by resident animals, and throwing a plume of fine mud and silt into the water that can drift and settle over areas well outside the actual trawl track. Because trawling is repeated many times over a season on the same productive grounds, sometimes ten or more times a year in a single patch of seabed, the seafloor rarely gets long enough between tows to fully reset before the next one arrives.

Impact on Bottom Fauna

The most immediate casualties of a trawl are the animals living on or just under the sediment surface: sea stars, sea urchins, sea cucumbers, sponges, soft corals, bivalves, crabs and the dense beds of polychaete worms that form the base of many benthic food webs. Studies from the North Sea and elsewhere show that bottom trawling reduces the biomass, diversity and average body size of these communities, and that some groups suffer disproportionately: brittle stars, sea urchins and other echinoderms, along with slow-growing, fragile, long-lived species such as sponges and soft corals, are hit hardest, while small, fast-reproducing worms are comparatively better able to bounce back. Repeated trawling over years has been linked to a gradual shift in the makeup of the seabed community itself, away from large, long-lived, structurally complex animals and toward smaller, short-lived opportunists that can recolonise quickly but do less to stabilise sediment or support other species. Recovery times vary enormously with habitat and gear: soft, sandy grounds dominated by hardy worms may show signs of recovery within months of trawling stopping, while gravel beds, sponge grounds and cold-water coral patches can take years to decades, if they recover at all. A great deal of what a trawl catches is never landed. Non-target invertebrates and juvenile fish, hauled up as bycatch and discarded, add a further layer of mortality on top of the animals crushed or buried in the net's path; Indian studies from trawl landing centres along the west coast have documented dozens of discarded fish, crustacean and mollusc species at a single site, much of it juveniles of species that never get the chance to reach breeding size.

Impact on Bottom Flora

Seagrass meadows, macroalgal beds and the carpets of microscopic algae that coat sunlit seafloor sediment are just as exposed to a passing trawl as the animals that live among them. A trawl's groundgear can uproot seagrass rhizomes and shear off macroalgal holdfasts outright, while the accompanying sediment resuspension buries remaining plants under a layer of fine mud and cuts the light reaching the seafloor, both of which slow photosynthesis and recovery. Because seagrass meadows and vegetated sediments are important stores of ‘blue carbon’, carbon captured by marine plants and locked away in the sediment beneath them, their loss carries a cost that goes beyond the immediate habitat. Even where visible plant cover is not the main casualty, the sediment itself acts as a vast carbon reservoir, built up over years by the burial of organic matter from algae, seagrass detritus and marine plankton. Trawling disturbs this store directly by physically remixing and eroding the sediment surface, and indirectly by killing off the burrowing worms and shellfish whose activity normally helps bury fresh organic matter deeper and more securely. Recent modelling work on trawled shelf seas estimates that this combination of resuspension and loss of burrowing fauna can turn part of the seafloor from a long-term carbon sink into a source of carbon dioxide, releasing organic carbon that had been safely buried for years.

The Wider Ripple: Sediment, Carbon and the Food Web

The effects of trawling rarely stop with the animals and plants directly in its path. Because so many commercially important fish, plaice, croakers, threadfin breams and similar bottom-feeders, rely on benthic invertebrates as their primary food source, a decline in the abundance, diversity or average size of prey animals on a trawled ground can measurably affect the feeding success, body condition and growth of the very fish the fishery depends on. Researchers working off the Scotian Shelf and in the Celtic Sea have linked chronic trawling to poorer body condition in groundfish and to slower growth in plaice on gravel grounds where the preferred, larger prey species are also the most vulnerable to trawl damage. Sediment resuspension changes the chemistry of the seabed too, altering oxygen exchange, nutrient release and the rates at which bacteria and microscopic fauna break down organic matter, processes that ripple outward to affect water quality and productivity well beyond the trawled patch itself.

Evidence from India's Coast

India offers a useful, if sobering, natural experiment. Trawling arrived on the Indian coast in the early 1960s, following the Indo-Norwegian fisheries project, and catches rose steeply through the 1970s and 80s before stabilising, and in places declining, by the mid-1990s, a pattern widely read as a signature of overexploitation. Along the Karnataka and Kerala coasts, where the reference document accompanying this article originates, artisanal and small-mechanised fishers have long argued that intensive, often illegal, bull-trawling using paired boats and oversized nets scrapes the seabed clean of the bottom-dwelling organisms that sustain their own, less destructive gear. Every state along the west coast now enforces a mandatory monsoon trawling ban, in Kerala, it runs for about forty-five days each June and July, precisely the period when many commercially important species spawn and juveniles need undisturbed nursery grounds on the seafloor. The clearest demonstration of how quickly some benthic communities can recover comes from a study of tropical coastal waters before and after a trawl ban: within two and a half years of trawling stopping, researchers recorded higher organic content in the sediment, lower suspended-solid loads in the water column, and a significant rise in the abundance, species richness and functional diversity of the seabed community, evidence that a well-enforced closure can let the seafloor heal, at least for the fast-recovering part of the community.

Living with Trawling: What Can Be Done

Given how deeply bottom trawling is embedded in coastal economies worldwide and in India, the practical question is less whether to trawl than how to trawl with a lighter footprint. Larger mesh sizes and modified codends let juvenile fish and smaller bycatch escape, reducing pressure on populations that have not yet had a chance to breed. Turtle excluder devices and similar bycatch-reduction fittings, already mandatory in parts of India's shrimp-trawl fleet, cut down on the accidental capture of larger, slow-reproducing bycatch. Seasonal closures, like the monsoon ban already in force along the Indian coast, give the most vulnerable life stages, spawning adults and settling juveniles, a window free of gear disturbance. Spatial measures such as no-trawl zones around sensitive habitats, sponge grounds, coral patches and seagrass meadows, and rotational fishing that gives a trawled ground years rather than months to recover between passes, are supported by research showing that recovery is far more likely where trawling frequency is kept low and predictable. Lighter-touch gear, including electric-pulse trawls that use an electrical stimulus instead of heavy tickler chains to flush target species from the sediment, has been shown in North Sea trials to disturb the seabed less than conventional beam trawls, though such technology remains costly and is not yet widespread in Indian fleets. None of these measures eliminates the impact of trawling on the seabed entirely, but together they represent the difference between a fishery that mines the seafloor once and a fishery that can keep drawing a harvest from it for generations.

Conclusion

A trawl net does not distinguish between the prawns a fisher is after and the sponge, seagrass shoot or brittle star that happens to be in its path. The evidence, from the North Sea to the Karnataka coast, points in the same direction: bottom trawling measurably reduces the abundance, diversity and structural complexity of benthic fauna and flora, disturbs the sediment's role as a long-term carbon store, and can ripple upward to affect the very fish stocks the fishery depends on. It also points to a hopeful counterpoint: many benthic communities, given a genuine break from gear disturbance through seasonal bans, no-trawl zones or lower fishing frequency, show real signs of recovery within a few years. The choice facing coastal managers is not between trawling and no trawling, but between trawling that treats the seafloor as an inexhaustible resource and trawling that is paced, zoned and geared to let the seabed keep pace with the harvest taken from it.

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