

Case Study #3: Fish - Urchin Imbalance and Seagrass Decline in Coastal Kenya

Chloe Eckert, Global Rewilding Alliance

Background

Seagrass meadows along Kenya's coastline are crucial for marine biodiversity, coastal livelihoods, and climate resilience. These ecosystems serve as nurseries for fish and feeding grounds for a range of marine animals, including rabbitfish, parrotfish, sea turtles, dugongs, and seahorses. They also play a key role in carbon sequestration. Despite this, Kenya has experienced a steady decline in seagrass cover, 1.6% per year since 2000, largely due to anthropogenic pressures, particularly fishing and population growth.

Observed Changes

Between 2000 and 2016, seagrass declined by 1.9 km² per 25 km² area on average, with losses concentrated near urban centers such as Mombasa, Kilifi, and Lamu. One key factor is the overfishing of predatory fish like the Orange-lined triggerfish (*Balistapus undulatus*) and the Humphead wrasse (*Cheilinus undulatus*), which normally help control sea urchin populations. With these natural predators removed, urchin populations have surged, leading to overgrazing and localized die-off of seagrass beds. Experimental fishing trials showed that a single sweep of a seine net reduced seagrass cover by 8.3%, largely through uprooting and sediment disturbance.



The Sea urchin, *Tripneustes gratilla*. [Image source](#)

Ecological Consequences

The unchecked growth of sea urchins, especially *Tripneustes gratilla* (Figure 1), linked to the loss of fish predators, has resulted in overgrazing of seagrass meadows. This leads to "urchin barrens," where vegetation is stripped and recovery is inhibited. Alcoverro and Mariani (2002) reported that sea urchin grazing significantly degraded seagrass beds in Kenya, confirming how animal interactions can drastically alter seagrass structure and productivity (as cited in Mwikamba et al., 2024).

Destructive fishing practices like seining exacerbate these dynamics. Dragging nets stir up sediment, reduce light availability, and physically remove both seagrass and resident fauna. One seine net sweep removed 11.1 g/m² of seagrass biomass. This reduces the carbon storage potential of seagrass beds and disrupts the microhabitats that many invertebrates and juvenile fish rely on.

Loss of grazing megafauna, like sea turtles and dugongs, also affects nutrient cycling and sediment dynamics in seagrass ecosystems. These animals feed selectively on specific species and can help maintain meadow structure. Their decline, along with declining fish herbivory, shifts the balance toward more opportunistic grazers like urchins, which are less selective and more damaging.

Impacts on Biodiversity and Fisheries

Seagrass beds are foundational to the productivity of Kenya's artisanal fisheries. They provide habitat for key commercial species such as rabbitfish and seagrass parrotfish. Their loss threatens food security and livelihoods in coastal communities, where the number of small-scale fishers rose from 9,000 in 2004 to over 13,000 in 2016. Basket trap fishing showed minimal impact in field trials, suggesting that more sustainable methods can reduce harm while maintaining fish harvests.

Animal-dependent species, such as green turtles, dugongs, and seahorses, rely on dense seagrass cover for food and shelter. Seagrass loss forces these species to shift habitat or face starvation and reproductive decline. Reduced grazing pressure from large herbivores also means more organic detritus and epiphytic algae can build up, further lowering seagrass health.

Supporting Data and Metrics

- **Seagrass Decline:** 1.6% annually, equating to a loss of 1.9 km² per 25 km² cell (Mwikamba et al., 2024)
- **Population Growth:** 68.2% increase in coastal population density from 2000–2016 (Mwikamba et al., 2024)
- **Fishing Impact:** Seine netting reduced cover by 8.3% in a single sweep and removed 11.1 g/m² of biomass (Mwikamba et al., 2024)
- **Animal Impacts:** Overfishing of parrotfish has allowed urchin populations to surge, driving overgrazing and the formation of "urchin barrens" (Mahan, 2023)
- **Species at Risk:** Rabbitfish, sea turtles, dugongs, and seahorses depend on healthy seagrass beds; their decline disrupts food webs and ecosystem function (Mahan, 2023; Mwikamba et al., 2024)

References:

- Mwikamba, E. M., Githaiga, M. N., Briers, R. A., & Huxham, M. (2024). Understanding the drivers of seagrass loss in Kenya: Evidence for the impacts of population and fishing. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 34:e4229. <https://doi.org/10.1002/aqc.4229>
- Mahan, W. (2023). The Environmental Crisis on Kenya's Coast and Why We Must Solve It. *International Policy Digest*. <https://intpolicydigest.org/the-environmental-crisis-on-kenya-s-coast-and-why-we-must-solve-it/>