

Size Composition of Small-scale Demersal Catches in a Multi-Species, Multi-Gear Fishery along the Kenyan Coast

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Introduction

Background

- Globally, small-scale demersal fish are a major source of protein and trade.
- They play a crucial role in food security and income generation for coastal communities, particularly in developing countries.
- The fishery faces challenges such as excessive fishing effort, overfishing, and habitat degradation.
- In Kenya, small-scale demersal fisheries are among the most important exploitative activities on coral reefs, sustaining many coastal communities.
- Sustainable management of these fisheries in Kenya is challenging due to their multi-gear and multi-species nature.
- Overfishing and destructive fishing practices remain significant threats to this fishery.

Rationale

- Small-scale demersal fisheries in Kenya are characterized by a complex multi-species, multi-gear system.
- Various fishing methods target different fish species and size classes.
- Detailed knowledge of size composition is lacking.
- This poses a significant challenge to sustainable fisheries management.
- Fishing often targets juvenile fish, which can negatively affect recruitment.
- This threatens fish stocks and livelihoods of coastal communities.
- Understanding size composition is essential for assessing the impact of fishing on different species and identifying signs of overfishing.

Aim and Objectives

Aim

To assess the size composition of catches across a series of fishing gears to evaluate their role and importance in exploiting different fish species and sizes.

Objectives

- To examine the size distribution of dominant demersal fish species caught using different types of fishing gear.
- To evaluate the proportion of juvenile fish captured by each gear type.
- To provide data-driven recommendations for fisheries management, including gear-specific regulations and size limits.

Methodology

Catch dependent data (2017-2023)



Figure 1: Length-weight data collection of *S. sutor* at Kibuyuni landing site (gear used, basket trap). Photo credit: Janet Mwangata (2023).

Study site

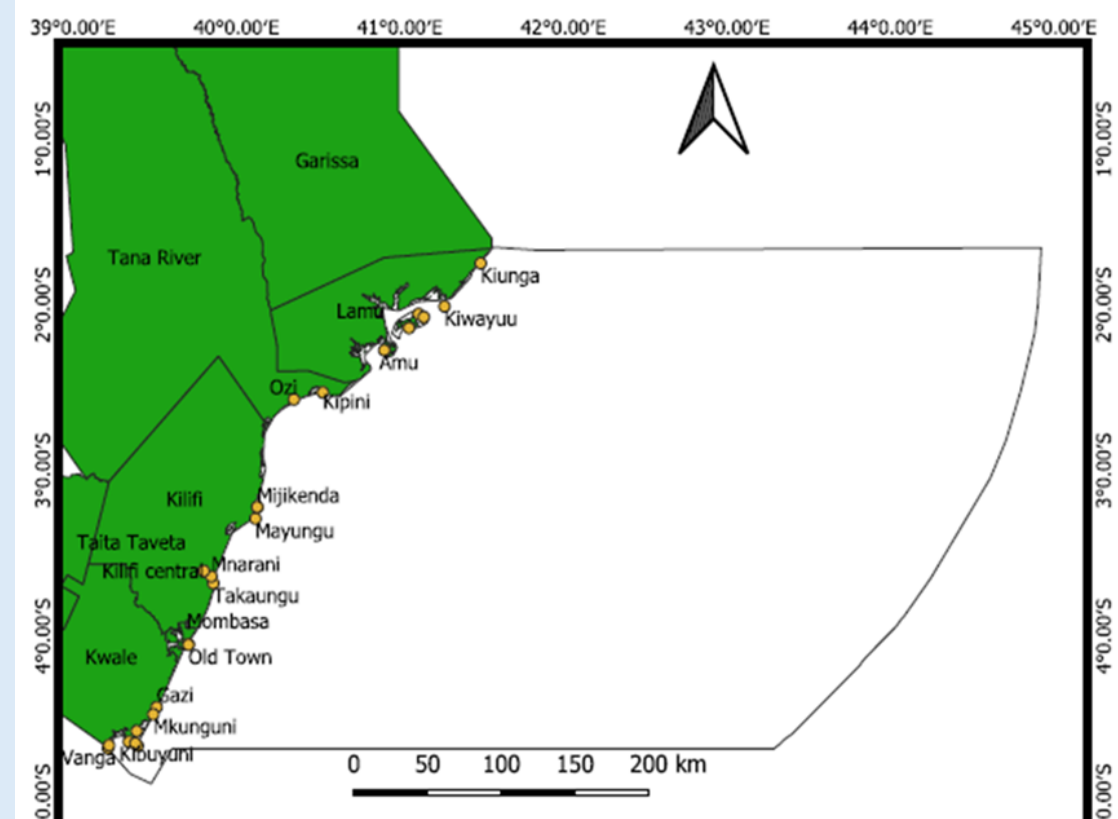


Figure 2: Distribution of study sites along the Kenyan coast. Source: KMFRI, 2024.

Data analysis

- Length data from catch dependent surveys conducted between years 2017-2023 were analyzed.
- Length frequency distributions were plotted for the three main species across five consistently sampled gear types.
- Theoretical values of length at first maturity (L_m) from FishBase were used to determine the cutoff between juvenile and mature length distributions for each species.
- Length frequency distributions of the three species were plotted across habitats and regions to identify which are more common in specific habitats and regions.
- Gamma regression within a Generalized Linear Model (GLM) framework was applied to estimate the length distribution.
- All analyses were conducted using R statistical software.

Results and Discussion

Gear, habitat and region selectivity of the three dominant species

Siganus sutor (Rabbitfish)



- Basket traps, handlines, and monofilament gillnets primarily target mature fish.
- Reef seines and multifilament gillnets capture a high proportion of juveniles.
- Both juvenile and mature Rabbitfish inhabit coral reef habitats in both regions.
- Juveniles are also found in seagrass habitats along the south coast.

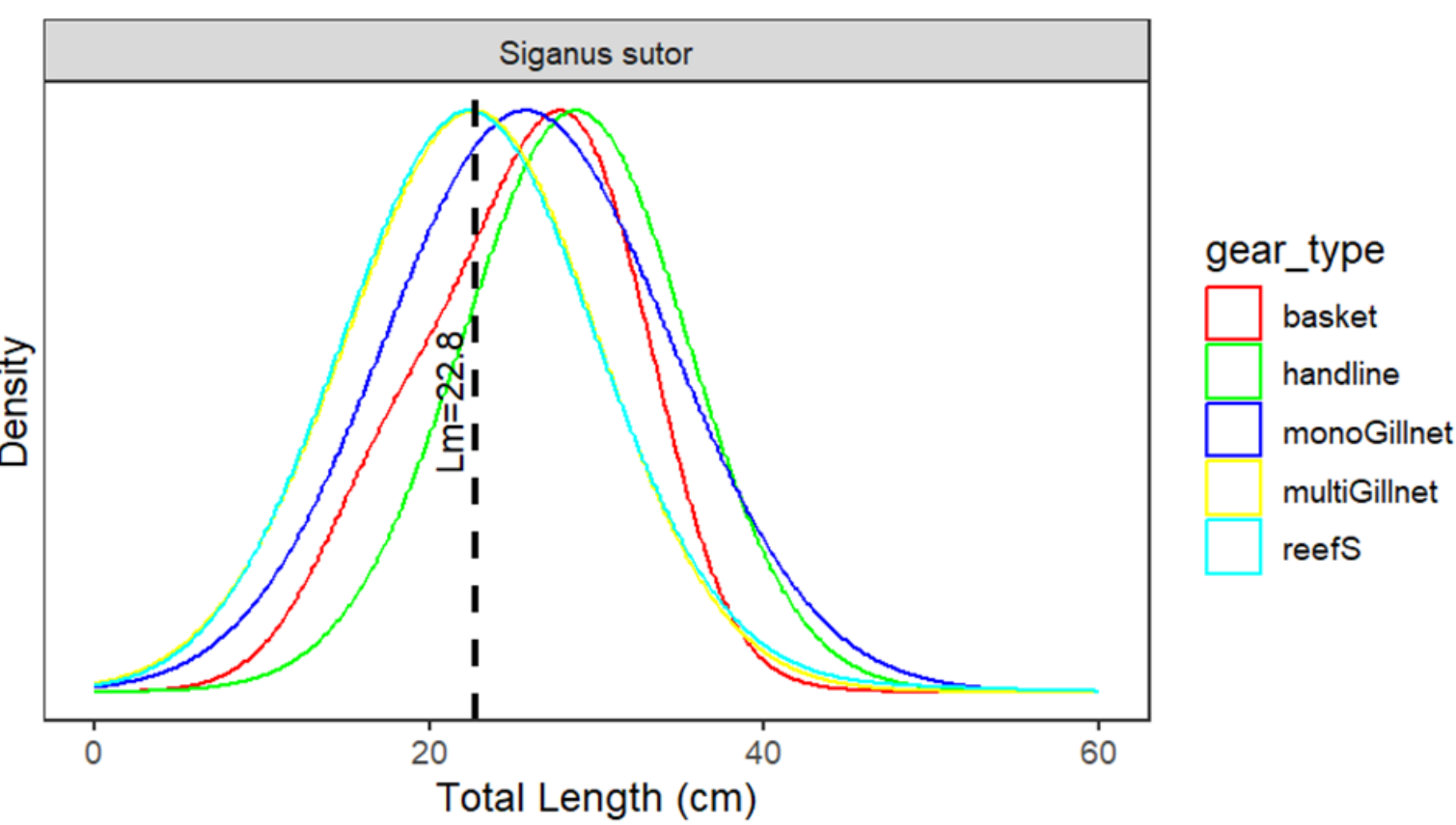


Figure 3: Observed size distribution of *S. sutor* by gears. Black dashed line denotes the length at first maturity (L_m).

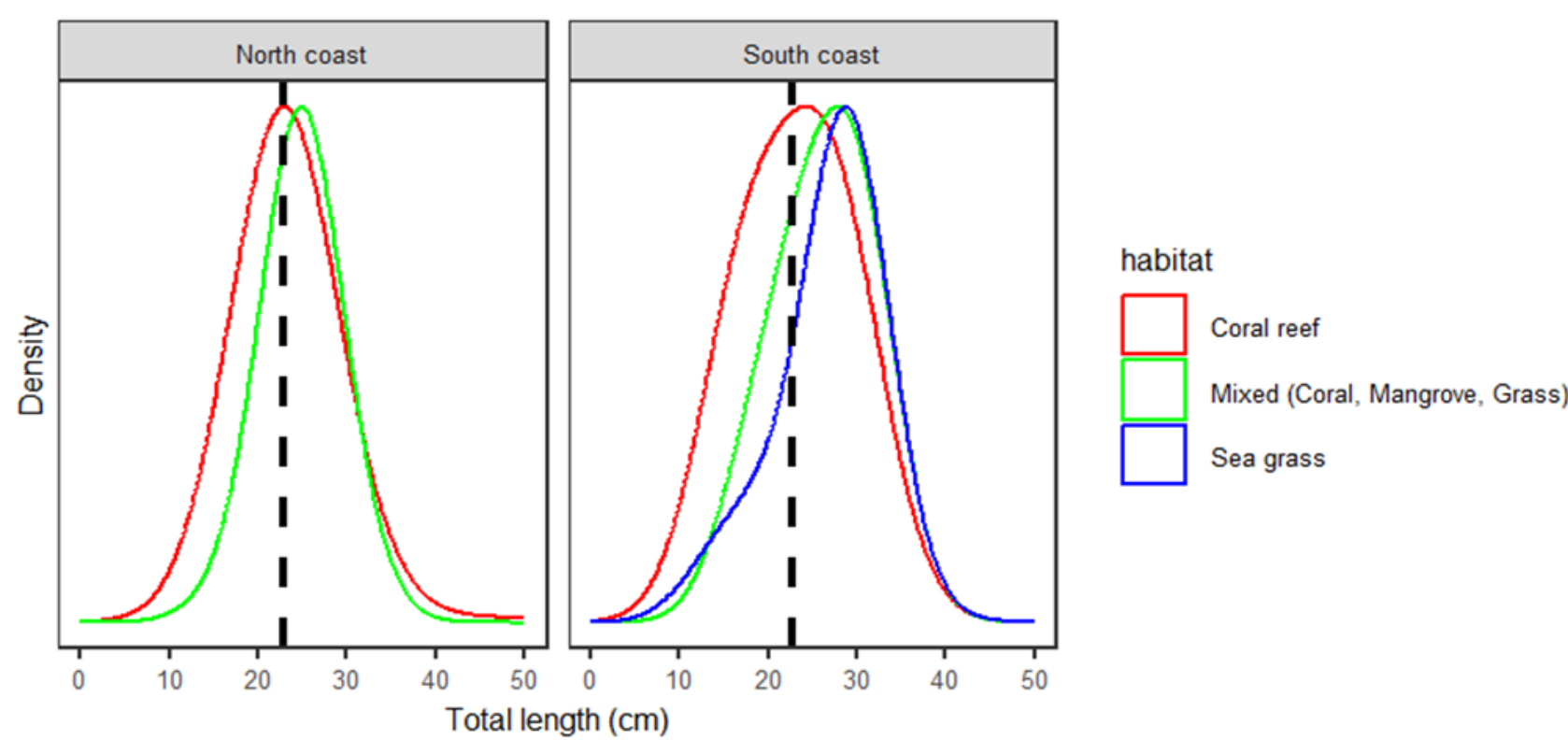


Figure 4: Length distribution of *S. sutor* by region and habitats. Black dashed line is the $L_m=22.8\text{cmTL}$.

Lethrinus lentjan (Pink ear emperor)



- Handlines are targeting mature fish; monofilament and multifilament gillnets capture both juveniles and mature fish, and basket traps and reef seines mainly target juveniles.
- Juveniles inhabit coral reefs along the north coast.
- Both juveniles and mature fish are found across all habitat types on the south coast.
- Samples were limited for seagrass and mixed habitats on the north coast.

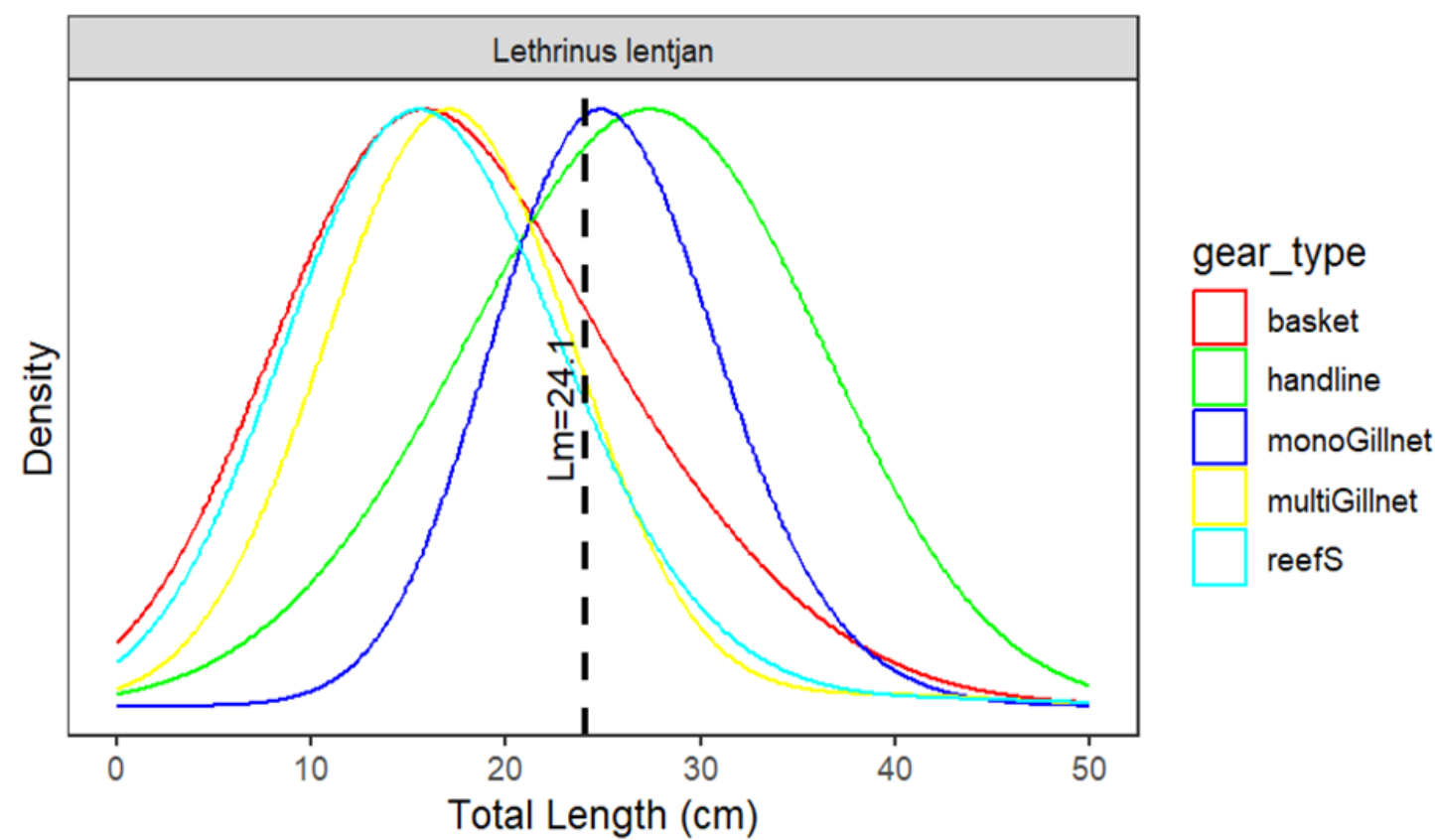


Figure 5: Size length distribution of *L. lentjan* by gears. Dashed line denotes the length at first maturity (L_m).

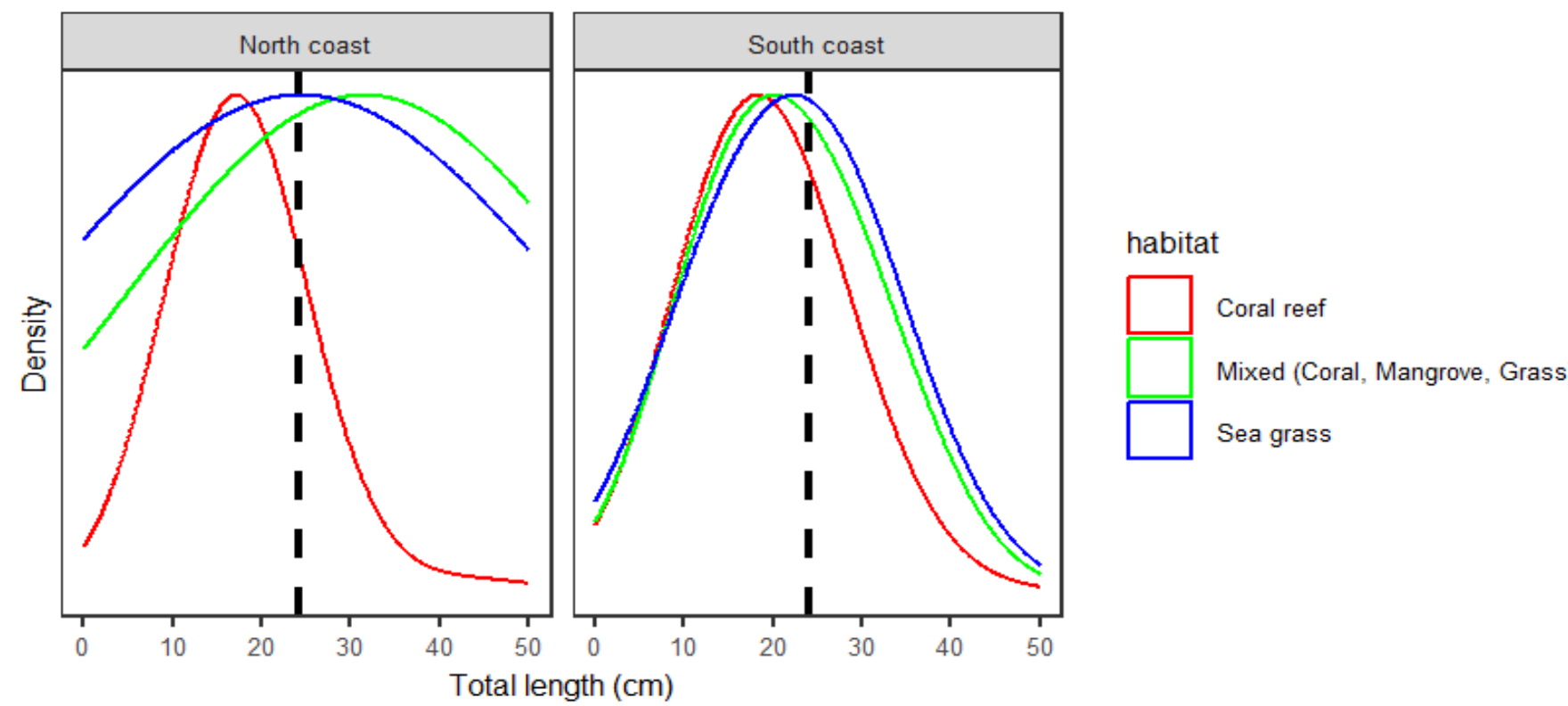


Figure 6: Length distribution of *L. lentjan* by region and habitats. Dashed line is the $L_m=24.1\text{cmTL}$.

Lutjanus fulviflamma (Dory snapper)



- Monofilament mainly target mature fish; Multifilament gillnet target both juvenile and mature fish.
- Basket traps, handlines, and reef seines mainly target juveniles.
- Mature fish inhabit seagrass habitats along the north coast.
- Juveniles are found across all habitat types on the south coast.

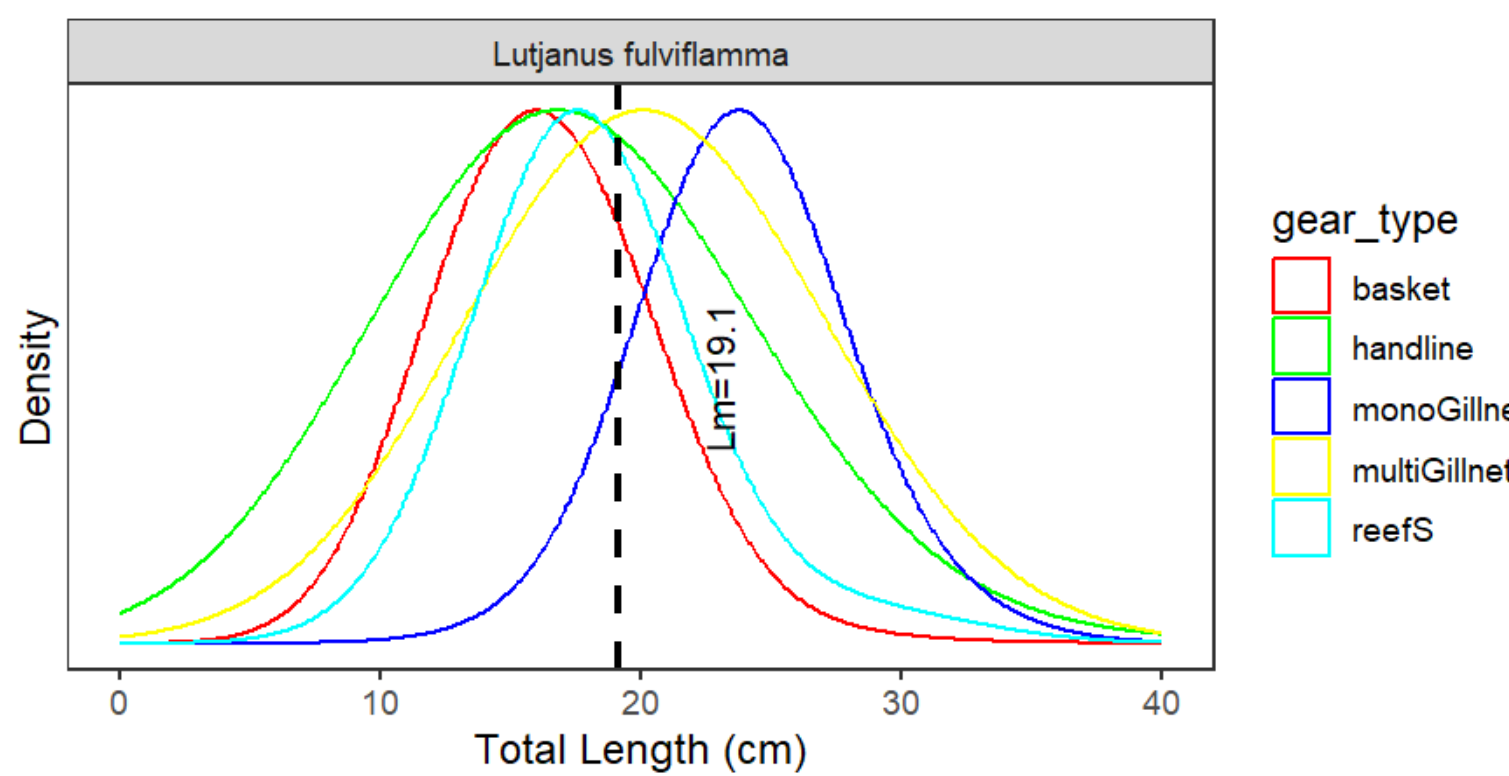


Figure 7: Size length distribution of *L. fulviflamma* by gears. Black dashed line denotes the length at first maturity (L_m).

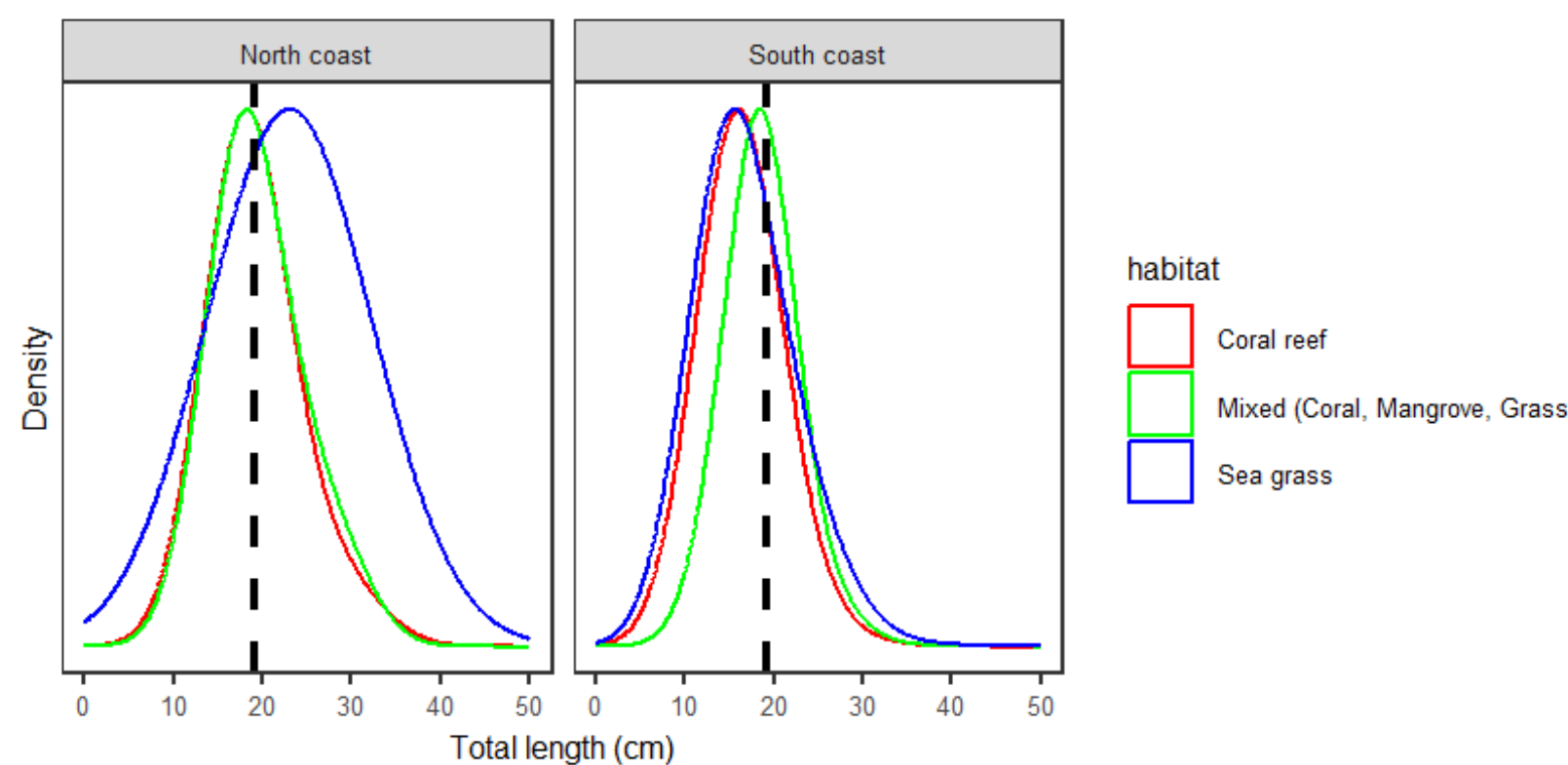


Figure 8: Length distribution of *L. fulviflamma* by region and habitats. Black dashed line is the $L_m=19.1\text{cmTL}$.

Management Recommendations

To promote sustainability in Kenya's small-scale demersal fisheries, gear regulations should focus on reducing juvenile catch and enabling mature fish to reproduce. Based on the findings of this study, the following actions are recommended:

- Revision of legal minimum mesh sizes.
- Limit the use of non-selective gear types such as basket traps and reef seines.
- Modify basket traps to include escape gaps.
- Implement seasonal closures in critical habitats, such as coral reefs and seagrass beds.
- Control fishing effort in the critical habitats.
- Strengthen enforcement of existing gear-based restrictions.

Acknowledgements

