

**SELECTIVITY OF HOOK SIZE ON LETHRINIDS IN THE SMALL-SCALE
HOOK AND LINE FISHERY ALONG COASTAL KENYA**

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DECLARATION

This thesis is my original research work and has not been presented for award of a degree in any other University.

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ABSTRACT

Hook and line are commonly used fishing gear in Kenya's small-scale coastal and marine fishery. The most abundant catches of this gear is made up of the fish family Lethrinidae. Despite this wide usage of the gear along the Kenya coast, there is still limited information on the effect of various sizes of hooks used in the hook and line fishery on the target fish species. Therefore, this study assessed the sustainability of the small-scale hook and line fishery on lethrinids by evaluating mortality and exploitation rates, proportion of immature and undersized fish individuals landed and catch per unit effort (CPUE) variations. Shore-based fish catch surveys were conducted for ten days in a lunar month from July to December 2021 in the selected fish landing sites of Mkunguni, Mwaembe, Kanamai and Mtwapa along the Kenya coast. Hook sizes were categorized into three groups based on the standard numbering system and comprised of large (No. 6 - 8), medium (No. 9 - 11) and small (No. 12 - 14) hooks. Four lethrinid fish species dominated the catches, *Lethrinus borbonicus*, *Lethrinus lentjan*, *Lethrinus rubrioperculatus* and *Lethrinus mahsena*, and collectively accounted for 77.7% of the total fish landings. *L. lentjan* was found to be heavily overexploited, *L. borbonicus* lightly overexploited and *L. rubrioperculatus* and *L. mahsena* underexploited, compared to different yield-based exploitation rates reference points. Lengths at first capture (L_c) for these four species were less than length at maximum yield per recruit (L_{opt}) and length at first maturity (L_m). Proportions of individuals below L_m and L_{opt} were high in small hooks (41-71% and 49-77%) compared to medium (35-51% and 45-62%) and large (<11% and 3-19%) hooks, respectively. The CPUE differed significantly across hook size groups and landing sites ($p < 0.01$) but not between seasons ($p = 0.846$). The high exploitation rate for *L. lentjan* suggests the need for management measures to be put in place that will prevent the stock from collapsing. The high vulnerability of *L. mahsena* to over-exploitation warrants precautionary management measures to maintain light levels of exploitation for this species. The high proportion of individuals below L_m and L_{opt} of lethrinid species caught by small and medium hooks suggests that these hook sizes are causing recruitment and growth overfishing. Based on the results from this study, large hooks which captured low number of individuals below L_m and L_{opt} and resulted in higher CPUE should be trialed for use through gear modification to ensure the protection of the highly overexploited and vulnerable lethrinid species for sustainability in the fishery. Longer term studies covering larger fishing areas and depth distribution of target species are needed to develop comprehensive recommendations for the sustainable management of small-scale hook and line fishery in coastal Kenya.

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ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
ELEFAN 1	Electronic Length Frequency Analysis 1
<i>E</i>	Exploitation rate
<i>F</i>	Fishing mortality rate
FAO	Food and Agriculture Organization
FiSAT II	FAO-ICLARM Stock Assessment Tools II
CPUE	Catch per unit effort
IUCN	International Union for Conservation of Nature
<i>K</i>	Von Bertalanffy growth coefficient
<i>L_∞</i>	Asymptomatic length
<i>L_c</i>	Length at first capture
<i>L_{mat}</i>	Length at first maturity
<i>L_{opt}</i>	Length at maximum yield per recruit
<i>M</i>	Natural mortality rate
NEM	North East Monsoon
SEM	South East Monsoon
WIO	West Indian Ocean
Y/R	Yield per Recruit
<i>Z</i>	Total mortality rate