COMPARATIVE GROWTH PERFORMANCE OF WILD JUVENILE SHOEMAKER SPINE-FOOT RABBITFISH (*SIGANUS SUTOR)* UNDER EXPERIMENTAL FEEDING WITH MACROALGAE DIETS

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DECLARATION

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

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DEDICATION

This work is dedicated to the artisanal fisher folk communities along the Kenya coast especially the south coast of Kenya. I dedicate this work also to my parents, especially my mother Ms. Zuleikha Mohammed for her patience, encouragement, love, and support throughout the study period. Without my family's unconditional support and valuable sacrifice, I would never have achieved this goal.

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LIST OF ACRONYMS AND ABBREVIATIONS

ANOVA	Analysis of Variance
AOAC	Association of Official Analytical Chemists
BMU	Beach Management Unit
ERE	Energy Retention Efficiency
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
FCR	Feed Conversion Ratio
KMFRI	Kenya Marine and Fisheries Research Institute
NEM	North East Monsoon
PER	Protein Efficiency Ratio
PRE	Protein Retention Efficiency
RAS	Recirculating Aquaculture System
SEM	Southeast Monsoon
SGR	Specific Growth Rate
SPSS	Statistical Package for the Social Sciences
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
UV	Ultraviolet
WIO	Western Indian Ocean
WT	Weight
USA	United States of America
UV	Ultraviolet
WIO	Western Indian Ocean
WT	Weight

ABSTRACT

Aquaculture is considered to offer one of the most crucial platforms for producing aquatic food on a worldwide scale. Over the years, there has been an increased dependency on fishmeal and soybean as the main protein ingredients in the aquafeed industry. Therefore, there is a need for an alternative source of protein in the aquafeed sector that is cost-effective and reliable. This study aimed to provide data on the comparative growth performance of cultured shoemaker spine-foot rabbitfish (*Siganus sutor*) under experimental feeding using three selected diets to recommend affordable alternative protein sources in fish diets. A semi-structured interview using questionnaires was conducted in Mkunguni, Kibuyuni, and Shimoni BMUs to assess the type of potential marine macroalgae where 62 fishers participated in identifying these naturally occurring marine macroalgae used as bait in the basket trap fishery. Proximate analysis for the macroalgae species used as bait was performed. Three diets were formulated: treatment I contained 100% macroalgae (macroalgae diet), treatment II contained 0% macroalgae (fishmeal diet) and treatment III contained 50% each of macroalgae and fish meal (mixed diet). Juvenile *Siganus sutor* individuals were collected from the wild and transported to the KMFRI lab and stocked in different flow-through systems of 1000-litre plastic tanks at a stocking density of 20 individuals/m3, and experimental feeding was conducted. Initial measurements of fish specimens were recorded using a graduated fish measuring board and electronic weighing balance for total length (cm) and individual weight (g). Sampling of fish specimens for growth was done bi-weekly for 28 days. Proximate results indicated the highest protein content in macroalgae species *Fischerella sp*. compared to that in *Chondrophycus papillosus* and *Chaetomorphus crassa* thus *Fischerella sp*. was selected for feed formulation. Fish growth in all feed treatments varied in mean body weight. Fish specimens fed with macroalgae diet (T1R1) recorded the highest total weight gain at 25.6 g followed by mixed diet (T3R1) and fishmeal diet (T2R2) at 19.8 g and 17.2 g, respectively over the experiment period. Fish fed with a mixed diet recorded the fastest growth in terms of total length gained by 0.41 cm, followed by macroalgae diet with 0.23 cm whereas fish fed with fishmeal had a decrease in mean total length by 0.05 cm. More results indicated fish specimens fed on fishmeal significantly differed in overall weight from those fed on a macroalgae diet and mixed diet ($p < 0.05$). However, no significant difference was observed in the overall weight of fish specimens between those fed on a macroalgae diet and those fed on a mixed diet ($P > 0.05$ in both cases). The highest survival rate was recorded in fish fed with a macroalgae diet at 83.0%, followed by mixed diet and fishmeal at 81.3% and 69.3%, respectively. Macroalgae diet was most proficiently utilized with a food conversion ratio (FCR) of 1.59. *Siganus sutor* individuals in experimental treatments II (fishmeal) and III (mixed diet) were not in good condition with condition factor (K) at -19.78 and -29.92, respectively. Based on these results, it is evident that using a macroalgae diet offers promising returns in terms of S. sutor survival rate compared to fishmeal although with higher growth performance.