

Management Recommendations for the Sea Cucumber Fishery in Papua New Guinea



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INTRODUCTION

Since 2001, management of the sea cucumber fishery has transitioned from export-based catch controls to stock assessment-driven approaches.

However, overfishing persists despite additional measures such as night-diving restrictions, licensing systems, and size limits.

In Papua New Guinea, this is particularly concerning given the fishery's importance to coastal and island communities as a key source of income and livelihoods.

This study evaluates the effectiveness of current management measures in addressing ongoing overfishing and proposes an innovative approach to inform management reform.

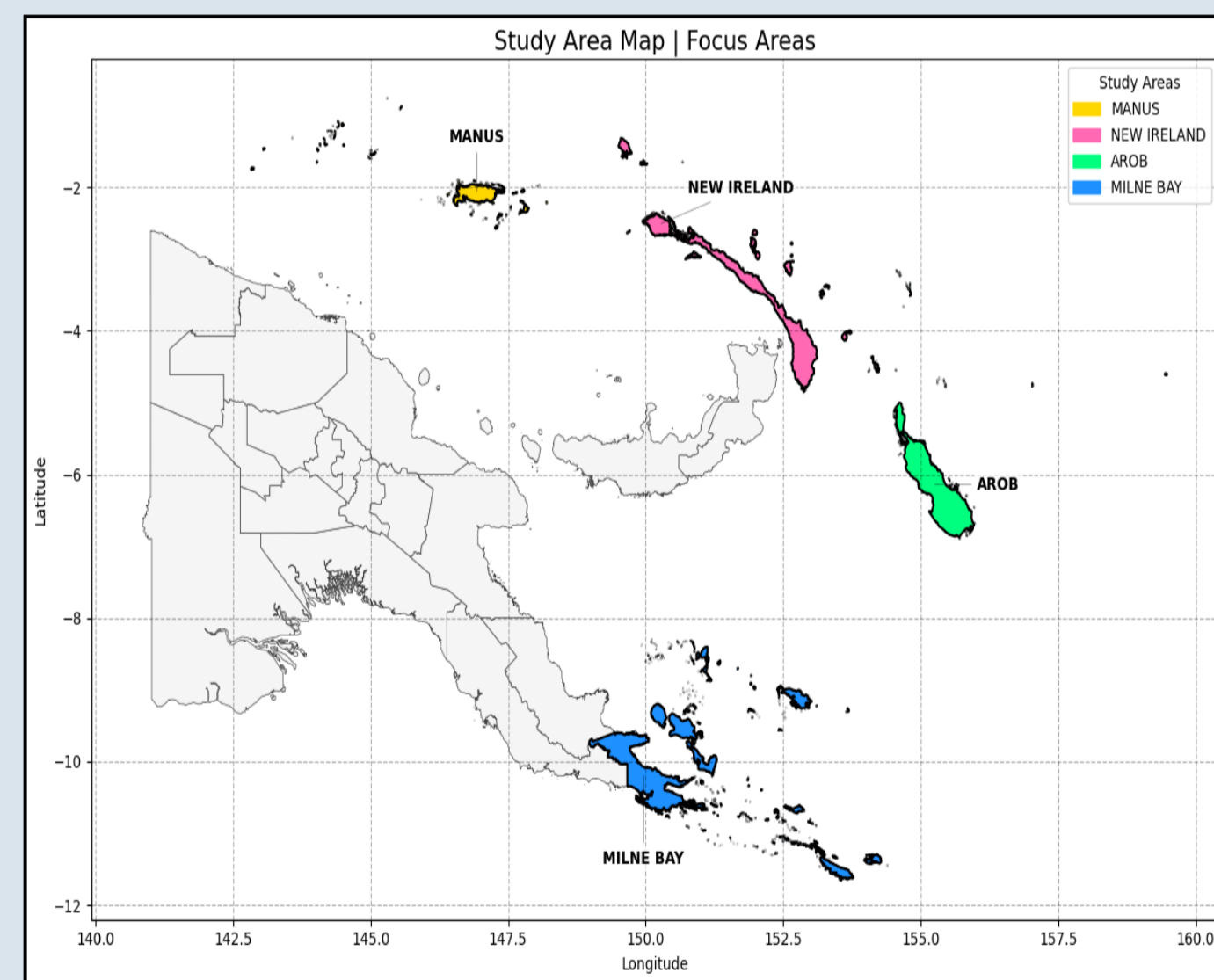


Figure 1. Map of Papua New Guinea indicating the location of study areas.

AIMS & OBJECTIVES

The overall goals are to:

1. Evaluate the status of sea cucumber stocks
2. Assess profitability under different scenarios
3. Estimate reference biomass levels
4. Provide management recommendations

MATERIALS & METHODS

The study integrated three datasets:

1. **Density Biomass**
2. **Daily Purchase Records**
3. **Catch Survey Data**

This study applied the Gordon-Schaefer surplus production model (SPM), using biomass as a proxy to account for density-dependent dynamics in sea cucumber populations. While the standard surplus production model typically uses fishing effort as a measure of stock abundance, this study instead utilises biomass density.

$$1. \text{ Biological: } \frac{dX}{dt} = rX \left(1 - \frac{X}{K}\right) \dots \dots eq1$$

$$2. \text{ Economic: } TC = cE = c * \frac{H(X)}{qX} = c * \frac{rX \left(1 - \frac{X}{K}\right)}{qX} = \frac{cr}{q} \left(1 - \frac{X}{K}\right) \dots \dots eq2$$

RESULTS

Stock status

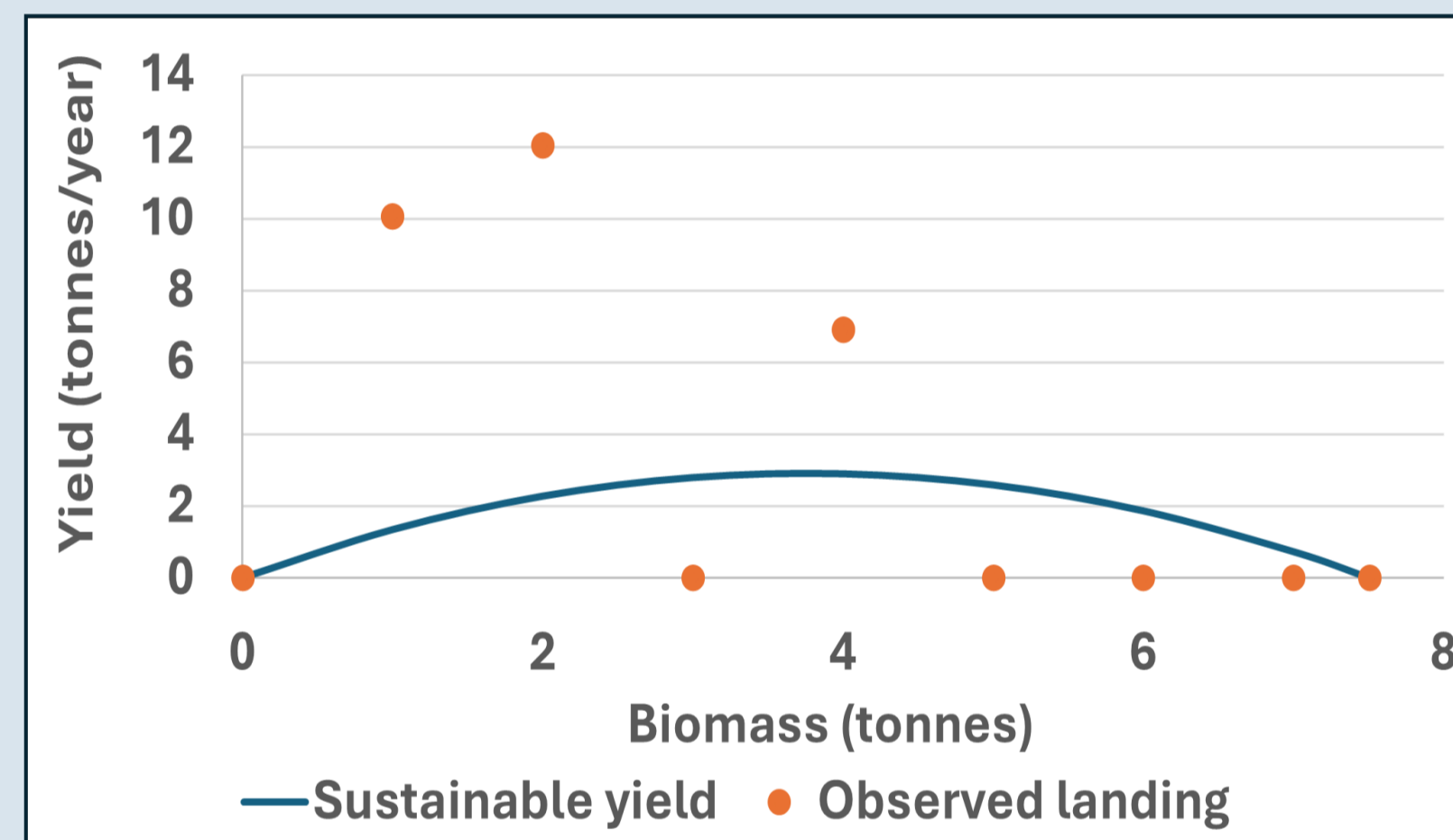


Figure 2. Evaluation of sandfish (*Holothuria scabra*) assessed in New Ireland Province (NIP).

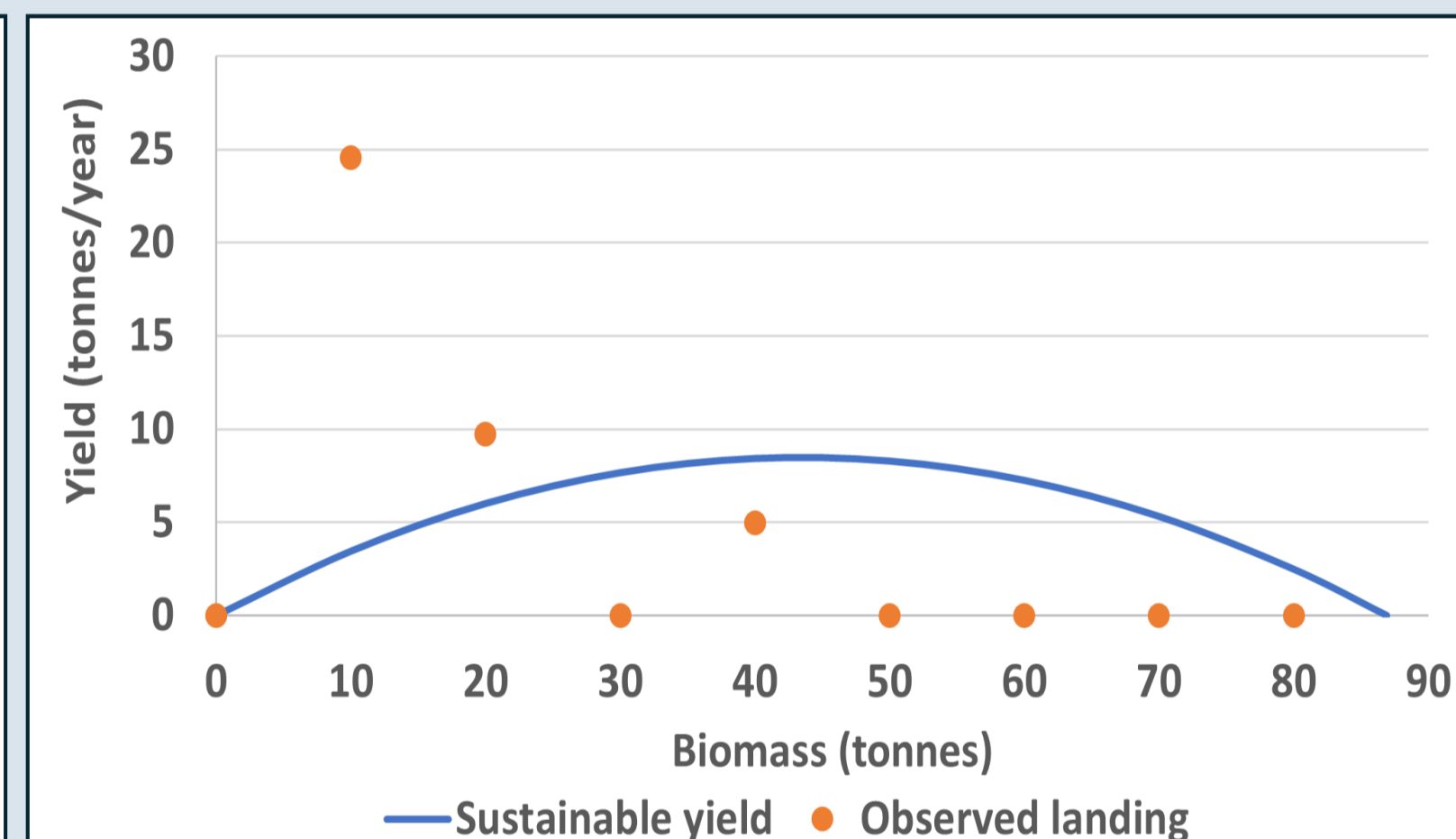


Figure 2. Evaluation of white teatfish (*Holothuria fuscogilva*) assessed in Manus province.

Bioeconomic scenarios

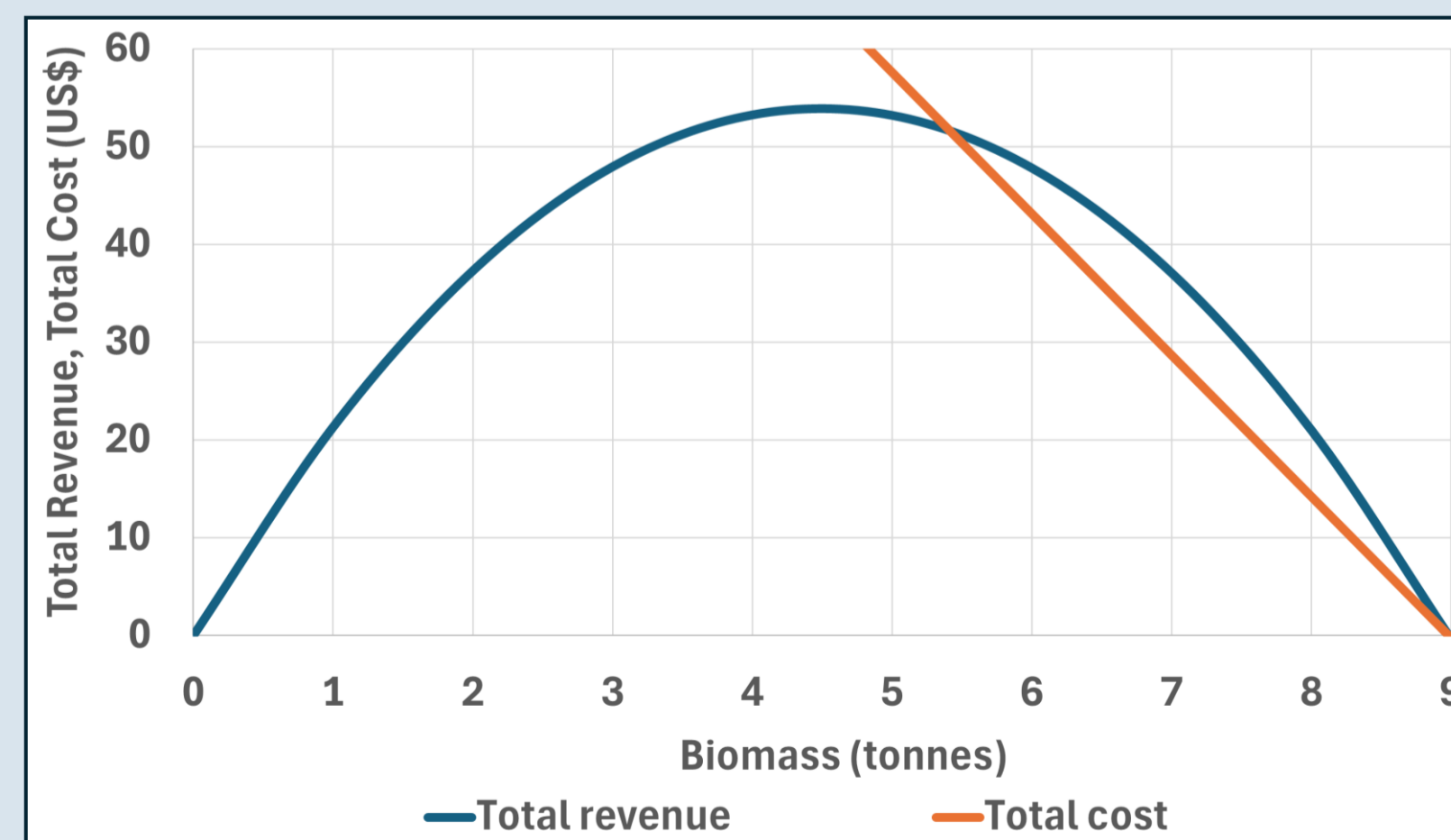


Figure 4. Bioeconomic analysis of sandfish (*Holothuria scabra*) in Autonomous Region of Bougainville (AROB).

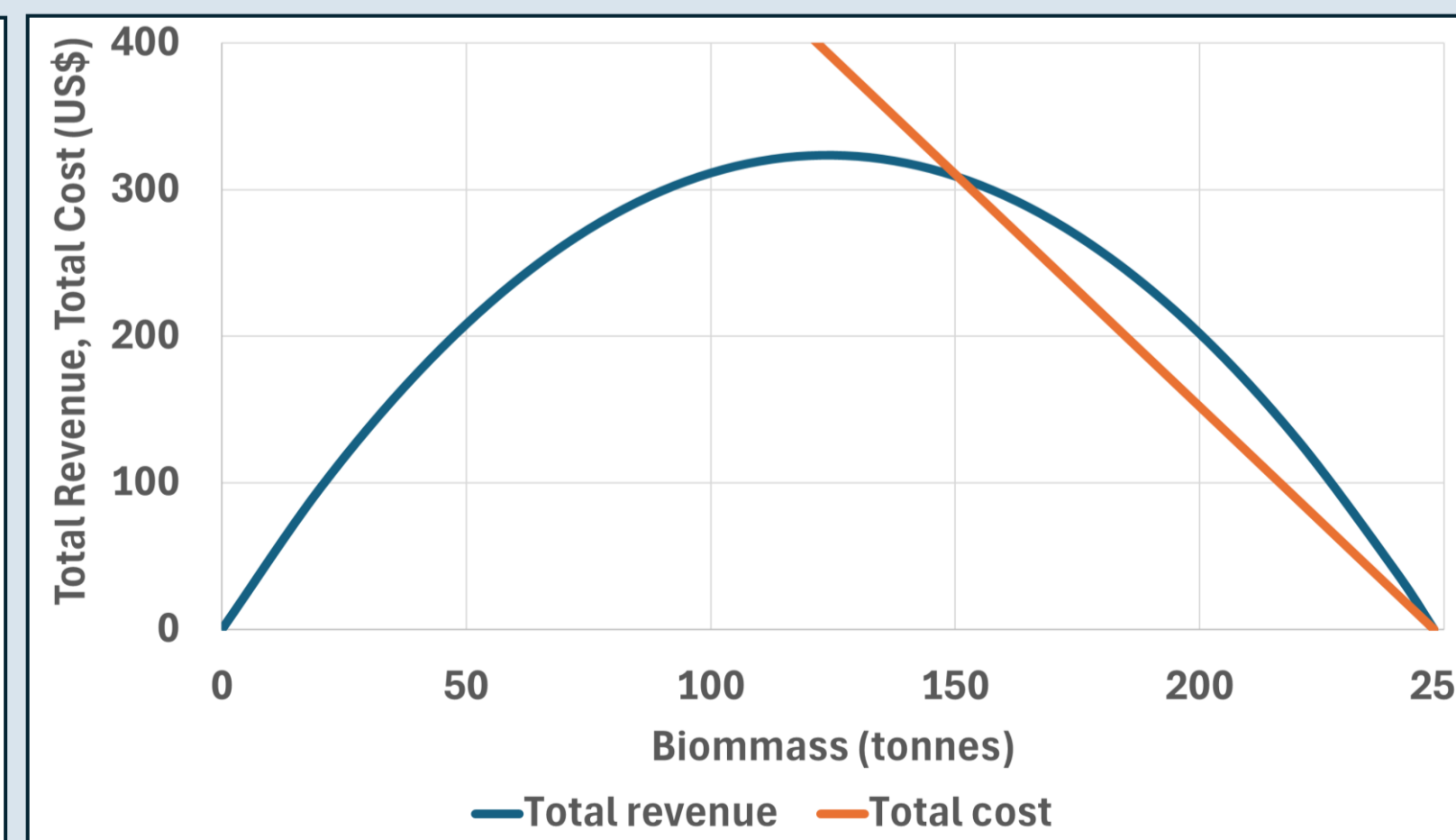


Figure 5. Bioeconomic analysis of prickly redfish (*Thelenota ananas*) in New Ireland Province.

Reference Biomass

The indicative reference biomass for sandfish (*Holothuria scabra*) in New Ireland Province was estimated at **2.16 tonnes**, based on an intrinsic growth rate of 1.15 per year and a carrying capacity estimated at **7.51 tonnes**.

CONCLUSION

Sea cucumber stocks are experiencing significant overfishing, with fishing pressure exceeding sustainable levels across the study area.

A consistent declining trend was observed for most studied species across all locations, indicating widespread population depletion.

Bioeconomic analysis revealed that fisheries become economically unviable as biomass declines, demonstrating a direct link between stock depletion and reduced profitability.

The current management framework faces substantial challenges, and sea cucumber populations are struggling to recover due to continued intense fishing pressure.

This study highlights the need for innovative management approaches, advocating a shift from a purely precautionary strategy toward a more scientific, evidence-based framework.

RECOMMENDATIONS

- i. Encourage community-level management (co-management)
- ii. Shift from multi-species to conservative, species-specific management
- iii. Establish reference biomass levels to guide fishing
- iv. Develop a fisher licensing and registration system

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