

# PROGRESS UPDATE

## COMPONENT I

Quantifying the value and market potential of coral reef and mangrove ecosystem services

## ACTIVITY

Examining seagrass filtration services for moderating human, coral reef and seaweed diseases in coastal Indonesia

## OBJECTIVE

To investigate and model the ecosystem service value of seagrasses to human, coral reef and seaweed health

Seaweed farmed alongside vast seagrass meadows in South Sulawesi, Indonesia.

Photo: J. Lamb

Nur Abu, Hasanuddin University, surveying farmed seaweed for signs of disease in Indonesia.

Photo: J. Lamb



## STUDYING VALUE OF SEAGRASS TO HUMAN HEALTH, SEAWEED FARMING

### Overview

Researchers from Hasanuddin University, Makassar, Indonesia, and Cornell University, Ithaca, USA, are studying the role of seagrass beds in filtering pathogens and improving seaweed farming.

Initially, Dr Joleah Lamb, Cornell University and Nur Abu, Hasanuddin University, together with Indonesian and international colleagues, started this activity during 2014/15 by documenting the role of seagrass in moderating pathogens impacting coral reefs adjacent to coastal islands in Indonesia.

Threats to human health from disease-causing pollutants entering coastal waters are growing in developing countries. Until now the filtration of toxins, nutrients and pathogenic microorganisms provided by coastal ecosystems, such as seagrasses, mangroves and bivalves, have not yet been examined as tools to moderate human and coral reef pathogens in the field.

Following this study, the research team turned its attention to seaweed farming.

Seaweed farming is frequently practised as an alternative livelihood and to reduce fishing pressure on over-exploited fisheries. However disease outbreaks threaten the value of this industry and livelihoods.

The researchers are using field and lab-based studies to understand the contribution healthy seagrasses make in moderating water quality and pathogenic bacteria that affect seaweed farmers in Indonesia.

### Progress

#### Human and coral health

During 2014/15, water samples were collected at 18 sites and analysed using the latest next-generation sequencing technology — more than 1200 different bacteria were sequenced.

Results during 2015 suggest seagrass meadows in Indonesia are capable of reducing the effects of bacteria that cause disease in humans and several coral reef organisms. Specifically, the study found a four-fold average decrease in total potentially pathogenic bacteria per litre of seawater within seagrass meadows, compared to outside of seagrass meadows.



These results underscore conceivable strategies for mitigating waterborne marine diseases and highlight novel services provided to humans and coral reefs by intact coastal ecosystems.

This data will be used to further inform scenarios and develop a valuation model using the InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) toolkit.

Preliminary collaboration with The Nature Conservancy on using InVEST is underway. This work is necessary because filtration services are poorly quantified at the level needed for model projections.

The results of this analysis will be incorporated into models that value the filtration service of seagrasses. This will assist in determining the past and projecting future impacts of habitat loss by using various levels of conservation and climate scenarios (i.e. restoration or business-as-usual).

### Seaweed farming

Researchers surveyed seaweed farms at 17 sites — nine sites cultivating seaweed without seagrass meadows and eight cultivating seaweed within seagrass meadows — in southwest Sulawesi during October 2015.

All the communities visited were concerned with disease at their

**RIGHT: A young boy swims in the seagrass meadows surrounding small islands of the Spermonde Archipelago in Indonesia.**

Photo: J. Lamb

seaweed farms. There was uncertainty within these communities about whether seagrass meadows influenced diseases of seaweeds.

The prevalence of seaweed disease ranged from 1% to 79%, with an average of 15% of farmed seaweeds surveyed affected by disease ( $n = 8,876$  individuals). Further analyses are underway to assess the influence of seagrass meadows and environmental variables on diseases that affect seaweeds.

By project end it is anticipated this activity will deliver:

- Novel publications which present evidence that seagrasses can moderate human enteric indicator bacteria and improve coral reef health and livelihoods of seaweed farmers by managing disease; and
- A model, which in collaboration with the Natural Capital Project will be incorporated into the freely available InVEST toolkit.

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**Dr Joleah Lamb, Cornell University, and Nur Abu, Hasanuddin University, surveying harvested seaweed for signs of disease.**

Photo: T. Abhy



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