

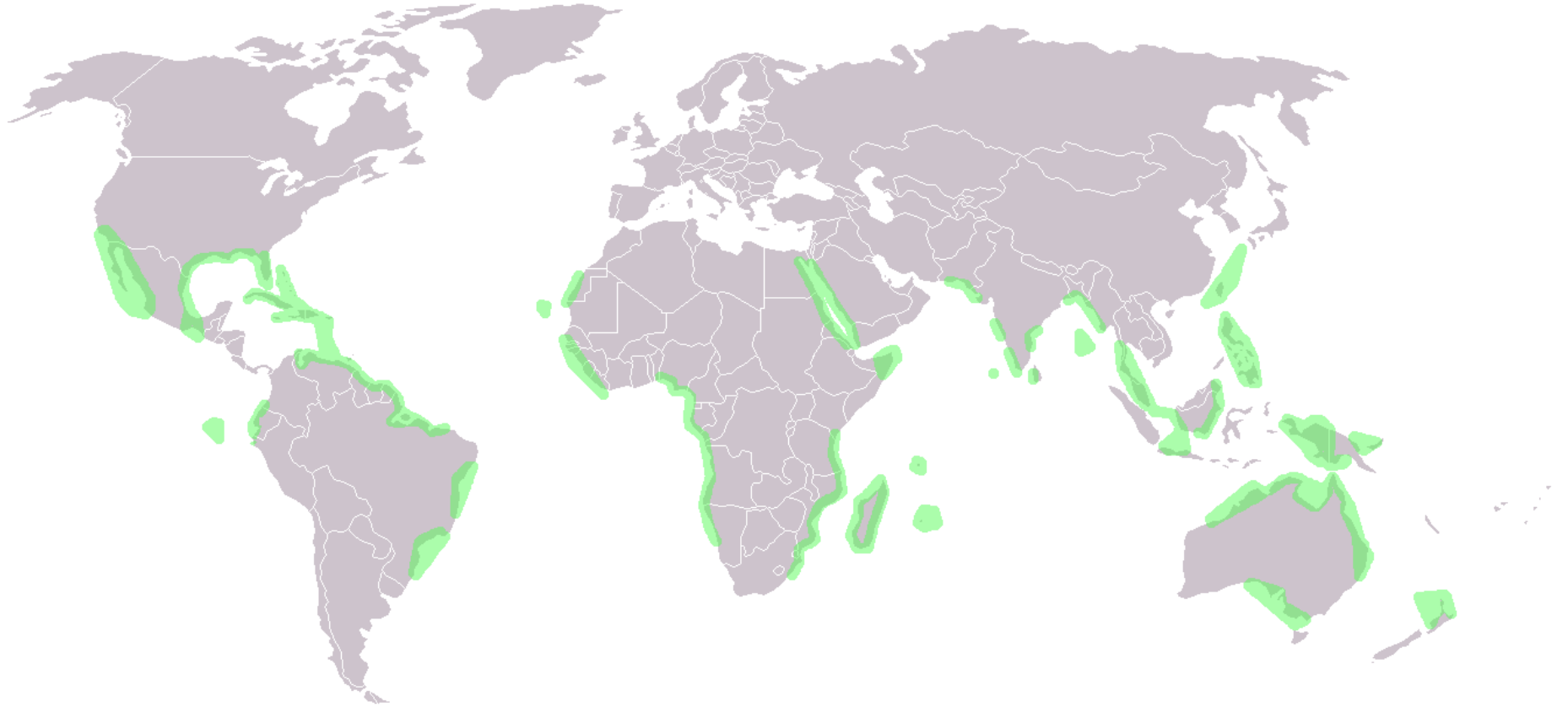
# PHIC - Community Industry Forum

## PPA Environmental Initiatives – Mangrove Program



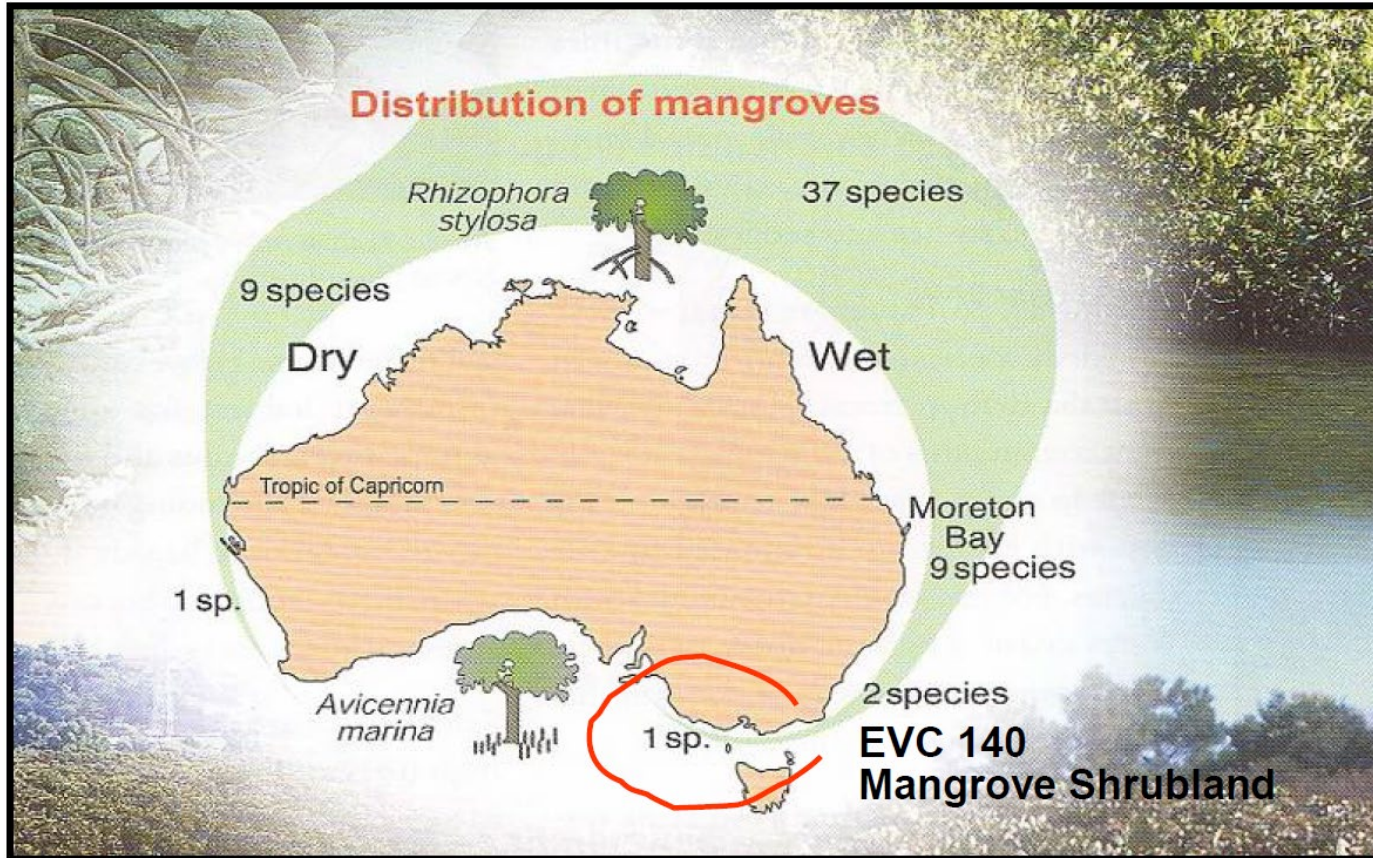


# Worldwide mangrove distribution



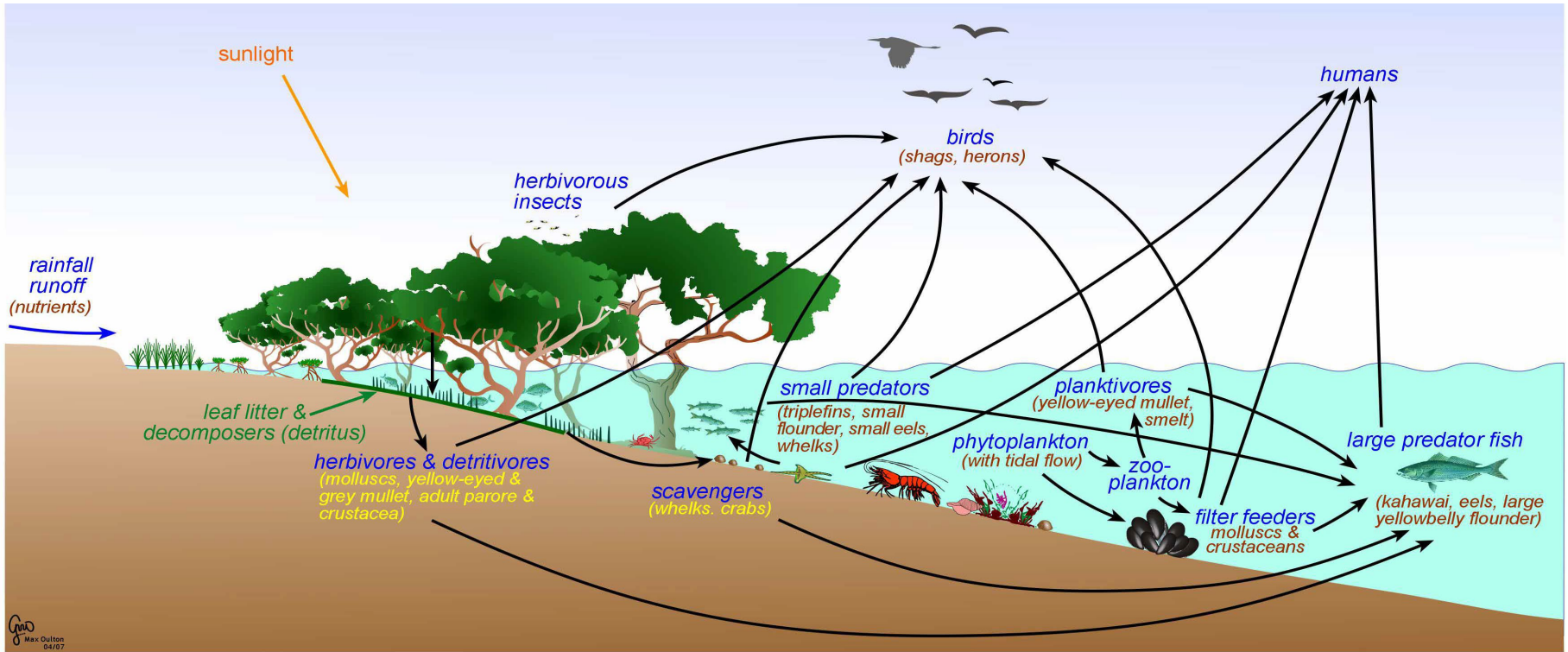
Australia has the third largest area of mangroves in the world after Indonesia and Brazil, totalling around 11,500 km<sup>2</sup> representing approximately 6.4% of the world's total mangrove area.

# Mangrove species in Australia



- 60 Species throughout the world (17 species in WA).
- We have 7 species here in Port Hedland.

# Mangrove food web

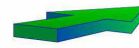


**Sediments**  
Larvae  
Adults  
Phytoplankton

**Flood**



**Ebb**



**Sediments**  
Detritus  
Nutrients  
Larvae



# Mangrove Mates Program

Mangrove Mates promotes environmental awareness to the younger members of the communities in which PPA operates.

- The program involves an education session run by the PPA Environment team followed by an interactive activity of potting a mangrove seedling.
- Since commencing in 2012, **2310** students from **13** schools across the Pilbara have been part of the program.

## Overview

- ✓ Locally, Port Hedland Primary School, South Hedland Primary School, Cassia Primary, Baler Primary, Port Hedland School of the air and St Cecilia's Catholic Primary School are involved.



# Mangrove Nursery

In 2010, PPA embarked on an ambitious mangrove propagation program (the first of its kind in an arid zone) in Australia.

- The mangrove nursery contains approximately 3000 mangrove seedlings across three different species (including those potted by our Mangrove Mates).
- PPA has also developed nursery techniques specific to the housing of mangroves and documented these in a Mangrove Nursery Manual.
- PPA maintains the nursery for rehabilitation projects.



**7,650**

**MANGROVE  
SEEDLINGS PLANTED  
IN REVEGETATION AREAS**



# Rehabilitation Projects





## Redbank Mangrove Rehabilitation Trial: Results of 3 Years Post-Planting Monitoring



Technical Report, Rev. 1

Client: Pilbara Ports Authority

Author: Dr. Paul L.A. Erftemeijer

Perth, October 2016

## Successful mangrove establishment along an artificially created tidal creek at Port Hedland, Western Australia

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**Abstract.** There is growing interest in innovative ways to minimise the environmental footprint of port developments. Herein we present results of a mangrove planting trial along an artificial tidal creek at Port Hedland, Western Australia. A 75 m-long tidal creek with exposed sloping and terraced banks was constructed, creating ~1000 m<sup>2</sup> of intertidal area in which 800 nursery-raised seedlings of four mangrove species (*Avicennia marina*, *Rhizophora stylosa*, *Ceriops australis* and *Leguminosae corniculatum*) were transplanted. Planting followed a randomised block design to test seedling performance against tidal elevation, bank design and erosion protection. After 3 years, 142 seedlings (18%) had survived. Another 1171 mangrove seedlings, dominated by *A. corniculatum* (75%) and *Aegialitis australis* (15%), had recruited naturally into the site. Performance and survival of planted and recruited seedlings was significantly affected by tidal elevation ( $P = 0.002$ ), but not by bank design or erosion protection. *A. marina* showed highest survival (46%), followed by *R. stylosa* (18%). These results demonstrate that by creating appropriate environmental conditions conducive to mangrove growth, seedlings will recruit and establish naturally. Owing to the slow growth typical of semi-arid mangroves, it may take well over a decade before vegetation at this site is comparable to adjacent natural creeks.

**Additional keywords:** monitoring, natural recruitment, seedling performance, tidal hydrology.

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### Introduction

Over the past decade there has been a growing interest in exploring innovative ways to minimise the environmental footprint of coastal construction and port developments worldwide through environmental enhancement of navigation infrastructure and the creation of new areas of (intertidal) habitat as compensatory mitigation for unavoidable adverse effects (Chapman and Blockley 2009; Borsje *et al.* 2011; Fredette *et al.* 2012).

Herein we describe and evaluate the monitoring results of a mangrove planting trial conducted by the Pilbara Ports Authority at Redbank (South East Creek) in Port Hedland, Western Australia, as part of a proactive approach to protecting the mangrove environment in the vicinity of port activities. Redbank provided an ideal location and opportunity to test, as a pilot, the viability of creating artificial (new) tidal creek habitats, gain experience with mangrove nursery, planting and monitoring techniques and to determine some of the critical physical and environmental conditions for success. The aim of the trial was to establish the appropriate environmental conditions to achieve acceptable levels of seedling survival for four selected mangrove species in the local environment of Port Hedland. The trial followed an experimental approach, involving the planting of

nursery-raised mangrove seedlings along a range of different environmental (micro) settings along an artificially created channel, including a gradient of tidal inundation, comparison of landscaped creek bank surfaces (sloping v. terraced) and the effect of erosion-prevention measures (coir mesh-protected v. unprotected surfaces).

The following criteria were used to evaluate success of the trial: (1) that significant seedling survival be achieved beyond the first year; (2) that practical experience be gained with mangrove planting and monitoring techniques; (3) that sufficient understanding be gathered for the mangrove species studied to inform future mangrove rehabilitation works on site selection, design and conditioning; and (4) that the creek at Redbank be developed into an easily accessible demonstration site to showcase lessons learnt and for use in further experiments.

### Materials and methods

#### Study area

The port of Port Hedland, located in the Pilbara region of Western Australia, is one of the world's largest export ports within which development continues to expand. The Port



