Propagation of Mangroves©

Luke Dent[1]
Wallum Nurseries, 1237 New Cleveland Rd., Gumdale QLD 4154, Australia
Email: luke@wallumnurseries.com

INTRODUCTION

Background Details on Wallum Nurseries. Wallum Nurseries is located 15 km from Brisbane's central business district in the bay side suburb of Gumdale. The nursery was established by my parents in 1999, and is now one of Australia's largest and leading wholesale nurseries specializing in Australian native flora for revegetation. Wallum Nurseries is a tube-stock grower of bushland flora, coastal flora, rainforest species, grasses, and wetland species.

Wallum Nurseries has been an Nursery Industry Accreditation Scheme, Australia accredited nursery since its establishment. We are also Eco-Hort Accredited and are now undertaking BioSecure (Hazard Analysis Critical Control Point) accreditation. This ensures the quality of stock our customers have come to expect from us. In 2005 Wallum Nurseries won the best Medium-Sized Production Nursery Award from the Australian Garden Industry.

Personal Details. I started working at Wallum Nurseries in 2001. And when working for your parents you start at only one place the very bottom. Consequently I have had every job imaginable. Packing orders for despatch, plant stock maintenance, customer deliveries, and sales. This has given me the experience to manage our nursery. Now, as General Manager I oversee all staff, co-ordinate pest and disease management programs, do production planning, and handle customer enquiries. I also ensure that all mandatory accreditation commitments are met. I have Certificate III Horticulture and am currently studying for a Diploma in Horticulture.

GREY OR WHITE MANGROVE

Distribution of the *Avicennia marina*. The *Avicennia marina* is one of the most widely distributed mangrove species in the world due to its ability to tolerate cool temperate conditions. The global limits of *A. marina* occur in the latitudes of 30° Northern Hemisphere and 44° in the Southern Hemisphere. Although *A. marina* will grow in the far reaches of these latitudes it is more prolific in the tropical regions, where the average temperature is more than 19 °C.

The country where the *A. marina* is most prolific is Australia where it occurs in every mainland state. It also occurs throughout east Africa, the Arabian Gulf, South West and East Asia, and New Zealand.

Habitat of *Avicennia marina* in Australia. In Australia there are three forms:

- *Avicennia marina* subsp. *australisica* — which occurs from the mid Queensland coast to the South Australia coast.
- *Avicennia marina* subsp. *marina* — which occurs from the Northern Territory to central coast of Western Australia.

[1]Luke Dent was selected as the Rod Tallis Memorial Youth Award recipient for 2009.

- *Avicennia marina* subsp. *eucalyptifolia* — which occurs from the mid Queensland coast north to Cape York and west to the Northern Territory and around to Western Australia. This subspecies also occurs along the west coast of western Australia and overlaps with subsp. *australasia* in South Australia

All of the subspecies occur along the intertidal coastal foreshores of Australia's bays, rivers, and sheltered coast lines.

Key Features. Pneumatophores are specialized aerial roots which enable mangroves to "breathe" air in habitats that have waterlogged soil. Pneumatophores are essential due to the extremely low amount of available oxygen to the root system.

Salt-Excreting Glands on the Leaves. This aids exclusion of salt taken up from the roots. The ability to defoliate excess leaves / bark also helps.

Viviparous Propagules. One of the most important attributes of *A. marina* is viviparous propagules. In viviparous plants the seed germinates and grows under its own energy while still attached to its parent before dropping into the water. Seedlings remain in a protective outer skin which will split and open to release the fully developed seedling.

Sustainability of *Avicennia marina*. Aspects to be considered prior to production planning:

- The availability of seed for propagation or seedlings for transplantation
- Production or growing standards to be achieved
- Environmental conditions required for optimal growth
- Production requirements
- Establishment requirements
- Maintenance requirements — pest and disease management

Marketing Strategies. With the above information put into practice it would be more than likely that *A. marina* would be successful if put into our production nursery.

Trial Propagation. The following propagation trials have been conducted at Wallum Nurseries. In November 2008 I contacted the Port of Brisbane in relation to the transplantation of *A. marina*. The Port of Brisbane has been given a permit from the Department of Primary Industries and Fisheries for the removal of mangroves from one of their tidal drains on the eastern side of the port. Arrangements were made to remove a trial number of approximately 400 plants.

PROPAGATION TRIAL

In regards to transplantation of *A. marina*, small mangroves were chosen for removal with a size less than 300 mm in height. Seedlings were dug out using small spades (with a root ball diameter of approximately 75 mm). Plants were then taken direct to Wallum Nurseries. When plants were dug out they were kept in containers with salt water. Once at the nursery individual plants were washed to remove most of the mud. Plants were cut back to reduce transpiration. Plants were then potted into 75-mm round tubes.

Once potted, the plants were then watered thoroughly and moved into one of our growing tunnels.

These tunnels are 18 m × 4.2 m covered with a white poly cover. Natural air ventilation, with no bottom heat was used due to the season (summer).

Plants were left to grow on in the tunnel and within the first 10 days some of the mangroves started to wilt and drop their leaves and consequently died. The most likely cause was plant stress due to being transplanted and also the amount of time taken to get plant stock back to the nursery (approximately 5 h).

Nursery Growing Conditions. Growing medium that was used to backfill tubes was our native growing medium, containing the following:

- Composted pine bark up to 5-mm fine slash
- 3–4 month Osmocote
- 8–9 month Osmocote
- 12–14 month Osmocote
- Sterilized rice hulls
- Micro-Max
- Diatomite 0.5–2 mm
- Various other fertilizers and wetting agents

Water. Recycled irrigation water was used to hand-water plants. The recycled irrigation water used at Wallum Nurseries is treated with chlorine to kill water-borne pathogens; water pH is adjusted to 5.5 with nitric acid, and filtered through two sand filters. Water regime for the mangrove plant stock was:

- Watered before 8.00 AM allowing time for the leaves to dry to reduce the risk of fungal leaf diseases.
- Plants were watered once a week with salt water.

Pesticide and fungicide application were used on a fortnightly basis. Due to the use of the below application of pesticides and fungicides there were no plant losses due to pest and disease problems.

- Fungicides used: Banrot®, Mancozeb, Thiram, Spinflo®
- Pesticides used: Diazinon, Confidor®, Bugmaster®

RESULTS

Although all was done to ensure survival of the transplanted mangroves, losses were quite substantial. Out of the 400 propagated only 170 survived (42% success rate). The 170 surviving plants were planted along the Coomera River in late February 2009. Plants were planted at 1-m centres along a 50-m stretch of the river bank. These mangroves were planted to assist in stopping river bank erosion.

In my opinion, the mangroves were planted far too deep about 2 m in from the high tide mark. This caused some of the mangroves to be completely submerged 3 h either side of high tide for approximately 4–6 h. This caused the mangroves to develop a thick green algae growth on the leaves; this constant inundation of the mangroves eventuated in their nonsurvival.

It is essential that before planting mangroves to ascertain a high tide mark and plant mangroves above this mark. This will ensure that the planted mangroves will not be submerged at any stage of the tide, thus increasing the survival of the planted mangroves.

Also in this area a "go slow" zone (6 knots no wash) should have been put in place to reduce boat wash.