# RAPID CREEK MANGROVE REGENERATION, THIRTEEN YEARS ONWARDS

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## Introduction

Rapid Creek is a small perennial stream which drains the Marrara Swamp, then flows through Darwin's northern suburbs and finally empties into Beagle Gulf (see locality map). The catchment size is relatively small being about 2500 ha, i.e. 1.6% of that of the Darwin Harbour. About 4% of the catchment area (90 ha) is covered with mangroves. This represents 0.3% of the mangrove coverage of Darwin Harbour (Dames & Moore 1985). It has received little attention by previous researchers of mangrove communities in the Darwin region (e.g. Dames and Moore 1985) and omitted by others (e.g. Semeniuk 1985).

A brief history of Rapid Creek reveals why there has been little interest in its biota. Prior to the development of the northern suburbs of Darwin, it is assumed that Rapid Creek was typical of many of the small streams in the top end of the Northern Territory. With the development of the northern suburbs came the proposal for the construction of a fresh water recreational lake with lake-side real estate development. By June 1974 most of the mangroves had been cleared from the creek, although little damage was done to the topography. After Cyclone Tracy in December of that year, the real estate development and lake were postponed and eventually withdrawn in 1978. The area seaward of the bridge on Trower Road is now part of the Casuarina Coastal Reserve and designated for conservation, administered by the Conservation Commission of the Northern Territory. In 1980, D.J. Dwyer and Associates prepared a report for the N.T. Department of Lands and Housing. The report outlined a three stage recreational project for Rapid Creek of which the Water Gardens was one stage. The remaining stages which included a Mangrove Botanical Gardens did not come to fruition (Dwyer and Associates 1980).

In March 1987 the students who were enrolled in the Certificate of Environmental Biology at the Darwin Institute of Technology investigated the regeneration of the mangroves of Rapid Creek as part of an ecology project. Their results form the basis of this presentation.

## Procedures

Of the six transects used by Dwyer and Associates (1980) five were found to be intact. Transect 2 of the report had been extensively damaged by the construction of a storm water drain through the mangroves that border the DIT campus. As Dwyer and Associates had used the "point-centered quarter method" of Cottam and Curtis (1956) to assess the mangrove density, the same method was employed in the present study. The transect lines were divided into 10 m intervals. Within each subdivision, a random number was obtained from tables to designate the position of the point-centre. A line perpendicular to the transect line and passing

through the point-centre, produced four quarters. The following data were collected;

(a) the distance along the transect line,
(b) the distance from the point-centre to the nearest plant in each quarter,
(c) the species of the plant closest to the point-centre in each quarter (identification was made using Semeniuk et al. 1978),
(d) the height of the plant closest to the point-centre in each quarter,
(e) the girth of the plant closest to the point-centre in each quarter,
(f) the diameter of the crown of the plant closest to the point-centre in each quarter.

These measurements were used to calculate the total density of all species and the importance value for each transect using these equations:

$$\text{Total density} = \frac{\text{unit area}}{(\text{mean point-to-plant distance})^2} \quad (1)$$

$$\text{Importance value} = \text{Relative density} + \text{relative dominance} + \text{relative frequency} \quad (2)$$

## Results

A total of 119 point centres were used in the study. The transects were of different lengths. The length of the transect was dependent upon the width of the mangrove zone from the main channel of the creek. The lengths of the transects were:

| Transect number | Length |
|---|---|
| 1 | 210 m |
| 3 | 200 m |
| 4 | 250 m |
| 5 | 150 m |
| 6 | 380 m |

The number of mangrove species had increased from the nine which were reported by Dwyer and Associates (1980) to seventeen in the present study (Table 1). Most transects displayed a decrease in average tree density of between 35% and 55%. The exception was in transect 3 which had an increase in density of 54% (Table 2). *Avicennia marina* consistently scored the highest importance values for each of the five transects (Table 3). *Lumnitzera racemosa*, *Aegialitis annulata* and *Ceriops tagal* were of secondary importance where they occurred. The remaining species were poorly represented along the transects.

Mean heights for regenerated trees varied from 0.61 m (SD = 0.3, n = 26) for *Aegialitis annulata* in transect 1 to 4.27 m (SD = 1.85, n = 58) for *Avicennia marina* in transect 4 (Table 4). The mean height for *Avicennia marina* in transect 5 was 7.89 m (SD = 3.54, n = 34). However the extent of clearing and regeneration along this transect was unclear. There has been a detectable increase in mean height for *Aegialitis* (transect 4) and for *Avicennia* (transects, 1, 3, 4, 6) and a significant decrease in

TABLE 1

List of mangrove species observed in Rapid Creek during the 1987 Survey. Those species that were recorded by Dwyer & Associates (1980) in Rapid Creek are indicated by an asterisk (*)

* *Acanthus ilicifolius*
* *Aegialitis annulata*
*Aegiceras corniculatum*
* *Avicennia marina*
* *Bruguiera exaristata*
*Bruguiera parviflora*
*Camptostemon schultzii*
* *Ceriops tagal*
*Excoecaria agallocha*
*Hibiscus tiliaceus*
* *Lumnitzera racemosa*
*Osbornia octodonta*
*Pemphis acidula*
* *Rhizophora stylosa*
* *Scyphiphora hydrophylacea*
*Sonneratia alba*
* *Xylocarpus australasicus*

TABLE 2

The density of mangrove trees along each transect in 1974 (estimated), 1980 (Dwyer and Associates 1980) and 1987 (present study).

| | Density (trees/100 $m^2$) | | |
|---|---|---|---|
| Transect Number | 1974 | 1980 | 1987 |
| 1 | 0 | 14 | 8 |
| 2 | 0 | 17 | Transect Damaged |
| 3 | 0 | 13 | 20 |
| 4 | 0 | 40 | 18 |
| 5 | ? | 43 | 28 |
| 6 | 0 | 79 | 41 |

TABLE 3

The Importance Values (relative density + relative dominance + relative frequency) for the species of mangroves recorded along the transects in 1987 are shown with the total number of species for each transect.

| | Transect Number | | | | |
|---|---|---|---|---|---|
| Species | 1 | 3 | 4 | 5 | 6 |
| Acanthus ilicifolius | - | - | - | - | - |
| Aegialitis annulata | 64.8 | 41.9 | 35.6 | - | 44.4 |
| Aegiceras corniculatum | - | - | - | - | - |
| Avicennia marina | 117.1 | 194.5 | 177.3 | 176.3 | 158.3 |
| Bruguiera exaristata | 7.4 | - | 10.4 | 5.9 | 24.2 |
| Bruguiera parviflora | 3.7 | - | 6.9 | 5.9 | 2.9 |
| Camptostemon schultzii | - | - | 3.2 | - | - |
| Ceriops tagal | 72.2 | 3.8 | 3.8 | - | 16.7 |
| Excoecaria agallocha | - | - | - | - | - |
| Hibiscus tiliaceus | - | - | - | 6.6 | 5.8 |
| Lumnitzera racemosa | 33.8 | 45.7 | 58.6 | 70.5 | 47.7 |
| Osbornia octodonta | - | - | - | - | - |
| Pemphis acidula | - | - | - | - | - |
| Rhizophora stylosa | - | 8.6 | 3.5 | - | - |
| Scyphiphora hydrophylacea | - | - | - | - | - |
| Sonneratia alba | - | - | - | - | - |
| Xylocarpus australasicus | - | 3.8 | - | - | - |
| Total Number of Species = | 6 | 5 | 8 | 5 | 7 |

mean height for Lumnitzera in transect 1. There has been a single significant increase in mean girth of Avicennia in transect 1 and a significant decrease in mean girth of Lumnitzera in transect 1. The reason for the decrease in mean height and mean girth of Lumnitzera in transect 1 remains obscured, but could have resulted from earth works along the DIT boundary after 1980.

## Discussion

In 1987 the regeneration of the mangrove community in Rapid Creek was characterised by an increase in the number of mangrove species present, a decrease in tree density in most of the transects, and the emergence of Avicennia marina as the most important species in terms of density, dominance and frequency. Increases in mean height and girth were recorded but were verified statistically for only a few species. Continuous colonisation by the species involved could explain the high variations in height and girth.

The above observations have come from brief glimpses in 1980 and 1987 into the progress of the regeneration process at work in Rapid Creek. This report is intended to demonstrate that in spite of the near total destruction of the mangrove community, the regeneration process is clearly underway.

TABLE 4

Comparison in tree heights (upper) and girths (lower) along the transects of Dwyer and Associates (1980) and this study in 1987. An asterisk (*) has been used where differences in height and/or girth have been detected at the 95% confidence level

a) Tree height (m)

| Species | Transect number 1 | | 3 | | 4 | | 5 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1980 | 1987 | 1980 | 1987 | 1980 | 1987 | 1980 | 1987 | 1980 | 1987 |
| Acanthus | - | - | 0.3 | - | - | - | - | - | - | - |
| Aegialitis | 0.8 | 0.6 | 0.5 | 1.1 | 0.9 | 1.9* | - | - | - | 1.9 |
| Avicennia | 0.1 | 2.2* | 1.0 | 2.2* | 3.0 | 4.3 | 4.6 | 7.9 | 1.2 | 3.5* |
| B. exaristata | 1.5 | 2.0 | 1.0 | - | - | 3.6 | - | 4.0 | 1.8 | 2.4 |
| B. parviflora | - | 1.4 | 4.0 | - | 1.8 | 3.1 | 1.5 | 3.3 | - | 4.0 |
| Ceriops | 1.4 | 2.0 | 1.5 | 1.6 | - | 3.3 | - | - | 1.6 | 1.7 |
| Lumnitzera | 2.4 | 1.6* | 1.0 | 1.4 | 1.1 | 2.5 | 3.4 | 5.7 | - | 2.7 |
| Rhizophora | 1.1 | - | - | 3.1 | - | 4.0 | - | - | - | - |
| Xylocarpus | - | - | - | 1.9 | - | - | - | - | 2.1 | - |

b) Tree girth (mm)

| Species | Transect number 1 | | 3 | | 4 | | 5 | | 6 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1980 | 1987 | 1980 | 1987 | 1980 | 1987 | 1980 | 1987 | 1980 | 1987 |
| Acanthus | - | - | 6 | - | - | - | - | - | - | - |
| Aegialitis | 18 | 20 | 17 | 26 | 15 | 21 | - | - | 15 | 15 |
| Avicennia | 11 | 37* | 10 | 27 | 17 | 33 | 15 | 34 | 7 | 23 |
| B. exaristata | 14 | 41 | 9 | - | - | 21 | - | 65 | 22 | 18 |
| B. parviflora | - | 10 | 25 | - | 19 | 21 | 6 | 2 | - | 28 |
| Ceriops | 15 | 31 | 14 | 11 | - | 48 | - | - | 17 | 15 |
| Lumnitzera | 55 | 30* | 19 | 39 | 9 | 25 | 18 | 27 | - | 23 |
| Rhizophora | 12 | - | - | 15 | - | - | - | - | - | - |
| Xylocarpus | - | - | - | - | - | - | - | 2 | 14 | 12.5 |

Further research is encouraged to document the changes in the community with time, so that a better understanding of the regeneration process can be obtained. To this end, Rapid Creek holds great potential for the students of biology to practise field techniques in an area with a relatively well documented history.

As Rapid Creek is situated amidst the largest suburban region in Darwin, it holds enormous value for interpretative and educational activities. It is located centrally to many primary and secondary schools and is adjacent to the Darwin Institute of Technology. The creek is important to many children and adults in the northern suburbs as a recreational fishing area. Picnickers and family groups are common sights around the mouth especially in the evenings. Since the construction of a cycle bridge across its mouth in 1986, Rapid Creek is visited by hundreds of users of the Casuarina Coastal Reserve each day.

In spite of the regeneration and growth Rapid Creek still has the unfortunate label of being an area of degraded mangroves and hence is more likely to be used for development than is a more pristine area. I urge the administrators of Rapid Creek to consider the resource that they have in their protection. It is hoped that a history of degradation will not facilitate further degradation in the name of development.

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