



Current state of research

# Serious Dieback of Mangroves around Mackay



Avicennia dieback

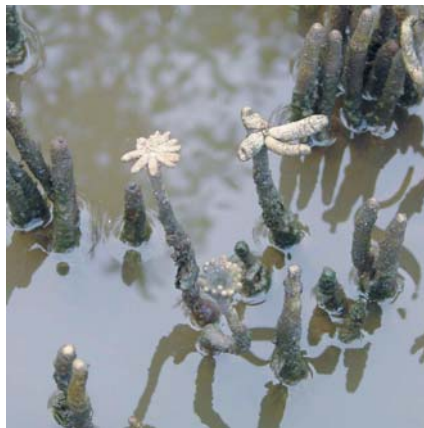


Water sampling

Dieback of mangroves in the Mackay region continues to be serious and progressive. After 2 years, mangrove plants, particularly *Avicennia marina*, the common mangrove, continue to show signs of deteriorating health and stress. Furthermore, there are serious implications from the dieback where sediment erosion appears to have increased from estuarine mudflats previously forested with thick stands of mangrove trees. Further field studies by UQ Centre for Marine Studies Marine Botany group were conducted in 2002. The results of these studies revealed that mangrove dieback was still advancing, especially in Basset Basin of Pioneer River estuary.

## Current Knowledge: The Facts

- Widespread dieback is present along 30km of coastline and centred in Pioneer River estuary (Duke et al., 2001).
- Dieback is species-specific apparently affecting only the common mangrove, *Avicennia marina*, leaving 20 others apparently unaffected.
- The herbicides diuron, ametryn, atrazine, hexazinone, simazine and tebuthiuron were present in sediment and corewater of the dieback areas.
- *Avicennia marina* - a 'salt excretor' species - has greater uptake of large molecules (salts) through its roots than other mangrove species.
- Toxic chemicals appear to be taken up through the roots with salt molecules. Diuron blocks the photosynthetic pathway in green tissue of plants.
- Planthouse trials have shown that mangroves are affected by herbicides, especially diuron, and *Avicennia* was affected more than other species (Bell, 2002).
- Seagrasses are affected by concentrations of diuron observed in mangrove sediments (Haynes et al., 2000).



Deformed breathing roots of *Avicennia*



Severe gully erosion in Basset Basin

The major cause of mangrove dieback in this instance appears to be the relatively high concentrations of agricultural herbicides in marine sediments - apparently brought down in runoff. Severe areas of dieback are correlated with herbicides at levels as high as 8.2ug/kg of sediment, over twice the concentration found in the study done in 2000. Degradation rates of diuron in mangrove sediments appear unusually slow, especially noting that sites re-sampled after 2 years had the same levels in 2002. Agricultural drain waters were also investigated, and in correspondence with detected high herbicide levels, there was either an absence of *Avicennia* plants nearby, or the plants showed signs of poor health and condition, like deformed breathing roots.

# Classification of Dieback



The areas of severe and moderate dieback were mapped for the first time in 2002. These maps quantify the extent of damage in three of the affected estuaries, Pioneer, Bakers and McCreadys.



Scattered dead individual trees and small patches of trees, occur widely throughout these areas. Quantified broadly as >15% and <30% of *Avicennia marina* trees, unhealthy or dead.



Unhealthy and dead trees occur extensively throughout these areas. Quantified broadly as >30% of *Avicennia marina* trees, unhealthy or dead.

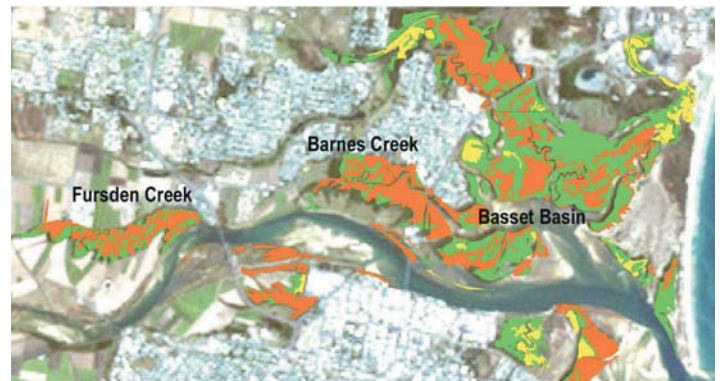
■ 'None' indicates either no *Avicennia marina* present or no dieback or both.

## Recommendations

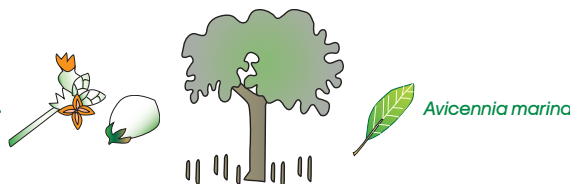
- Map the full extent of species-specific dieback in the region, and make retrospective assessment of the onset of dieback
- Determine recovery potential by investigating recruitment, species composition, and establishment success of mangrove seedlings in dieback areas
- Investigate broader implications and effects on key associated fauna, particularly crustaceans and corals
- Review pesticide usage for the region
- Improve strategies to deal with future incidents of widespread ecosystem disturbance and damage.

## Remote assessment of dieback

Pioneer River estuary, showing extent and severity of mangrove dieback.



Dead *Avicennia* in Fursden Creek, upper Pioneer River



To view the preliminary investigation into dieback, or for more information about this issue or developments in Marine Botany research, at the Centre for Marine Studies contact;

Dr. Norm Duke  
(07) 3365 2073  
n.duke@uq.edu.au



or visit the website <http://www.marine.uq.edu.au/marbot/significantfindings/mangrovedieback.htm>



Dead *Avicennia* in Barnes Creek, lower Pioneer River - severe affected

## References

- Bell AM (2002) Effects of Photosystem II-Inhibiting Herbicides on Four Mangrove Species. Honours theses, School of Life Science, Botany Department, UQ
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- Haynes D, Ralph P, Prange J and Dennison WC (2000) The impact of the herbicide diuron on photosynthesis in three species of tropical seagrasses. Marine Pollution Bulletin, 41:288-293



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Prepared by Centre for Marine Studies  
Text: Norm Duke, Alicia Bell  
Photos: Norm Duke, Serge De Pinto  
Map: Dan Pedersen  
Layout: Diana Kleine