



The upward-growing roots penetrate the tree's papery bark, enhancing respiration and nutrient uptake.

Tree roots defy gravity in the Daintree

DEEP in the hot, wet Daintree forest of northern Queensland, a team of CSIRO scientists has made an amazing discovery. At a study site just south of Cape Tribulation, 11 of the 15 dominant tree species have extra roots that grow upwards, in some cases more than five metres above the ground.

The scientists, Dr Paul Reddell, Dr Mike Hopkins and Andrew Graham, are based at the Atherton Tropical Forest Research Centre. They believe that the upward-growing (apogeotropic) roots, which penetrate the trees' papery or flaky bark, may contribute to the dominance of these trees in flood-prone coastal rainforests.

Special strategies for nutrient-uptake are vital to survival in these swampy, infertile environments where the soils are sandy and the rainfall averages almost 4000 millimetres a year. In a paper soon to be published in the *Journal of Tropical Ecology*, the scientists speculate that the roots may aid the trees' survival by:

- allowing root respiration and nutrient uptake during periods of inundation;
- intercepting nutrients from rain washing down the trunks;
- actively recycling nutrients from the bark; and
- acting as wicks during periods of waterlogging, drawing water up above the flood level to where the roots can continue absorbing nutrients while the submerged roots are inactive.

The scientists found that the roots originated from epicormic buds under the bark and from the soil, and were frequently colonised by mycorrhizal fungi which may exchange nutrients siphoned from the soil for sugars manufactured in the trees' leaves. This type of symbiotic relationship is common in rainforest trees, but generally occurs in the more common dense mats of thread-like roots lying at the soil surface.

Papery bark, with its multi-laminate structure, appears to provide a sheltered

environment that supports apogeotropic root growth. Preliminary examinations suggest that the relationship between apogeotropic roots and papery-barked stems is robust and probably exists in a range of north Queensland forests beyond the present study site.

A knowledge of key ecological characteristics of particular rainforests is essential to their management and conservation. The protection of surface root mats, for example, is a dominant theme in the management of some Amazonian forests on nutrient-poor soils. This research was undertaken as part of the Cooperative Research Centre for Tropical Rainforest Ecology and Management program.

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