

AN ECOSYSTEM SERVICE:

POLLINATION OF CUSTARD APPLE BY TROPICAL RAINFOREST BEETLES

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Introduction.

➤ In many parts of the world custard apple (atemoya) flowers are pollinated by species of tiny nitidulid beetle. Only one of these species has been reported from Australian custard apples (in southern Queensland).

➤ Most custard apple varieties grown in north Queensland require labour-intensive hand-pollination to produce commercial quantities of well-formed fruit.

➤ Custard apple belongs to the family Annonaceae. There are numerous native species of Annonaceae, with flowers similar to those of custard apple, in the tropical rainforests of far north Queensland. Some of these plant species are also thought to be beetle pollinated.



Malformed fruit resulting from poor pollination



Well-formed custard apple

Aim.

➤ Our research aimed to discover whether any of the known custard apple pollinators occur in far north Queensland orchards and whether rainforest is likely to be a source of additional beetle pollinators.

Methods.

➤ We collected 100 female flowers from each of three custard apple orchards near rainforest (<500m away), and six custard apple orchards far from rainforest (5-24km away), on the Atherton Tablelands, far north Queensland.

➤ Each flower was placed in a separate small plastic bag and frozen to kill any insects present. The insects were extracted, identified and the abundance of each species recorded.

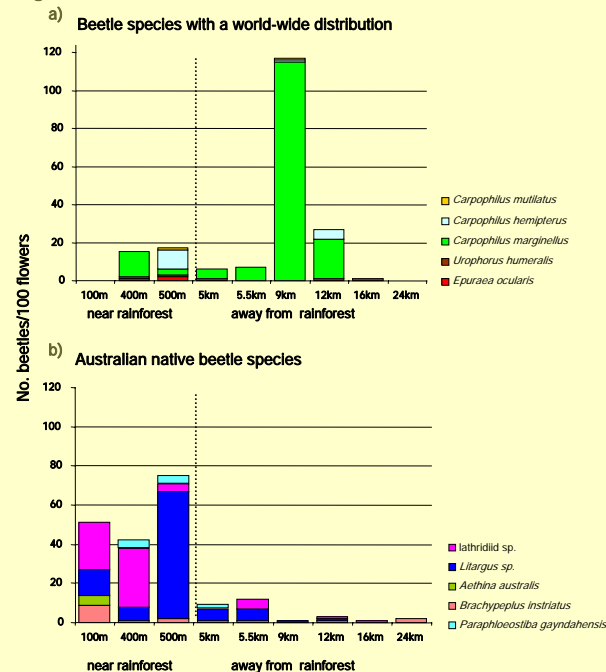


Female custard apple flower



Flowers of ylang ylang, a rainforest Annonaceae species

Fig. 1 Beetle distributions relative to rainforest.



Results.

➤ We collected a) five species of beetle which have world-wide distributions and are known pollinators of custard apple; and b) five Australian native beetle species not previously reported from custard apple.

➤ Total numbers of non-native (190) and native (196) beetles were similar but non-native beetles were six times more abundant than native beetles in orchards far from rainforest, while native beetles were five times more abundant than non-native beetles in orchards close to rainforest Fig. 1.

➤ Combining all species, the mean number of beetles/flower ranged from 0.02 to 1.2. The five orchards with fewest beetles were all ≥ 5 km from rainforest.

Native beetle species (1-3mm long) from custard apple flowers



Discussion.

➤ Numerous species of beetle with potential as pollinators, including several native species, are present in custard apple orchards on the Atherton Tablelands of far north Queensland. The association of native beetles with rainforest suggests that these beetle species originate in rainforest, or use rainforest as a refuge or breeding place.

➤ Other studies show that at least 4 beetles/flower are needed for pollination to be effective. No orchard we sampled had enough beetles to replace hand-pollination. The shortfall was greatest where native species were sparse.

➤ We need to attract and maintain sufficient numbers of pollinating beetles in orchards if hand-pollination is to be eliminated. Rainforest is a likely source of previously unrecognised pollinators of custard apple.