ECO Ecology + Conservation Outcomes

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The scientific report of the Conservation Ecology Centre – Cape Otway

Some environmental issues progress so slowly and quietly that, but for the work of dedicated field scientists, a glacier may gradually retreat or a species slip silently away. Other issues, however, can be extremely dramatic, with stark and conspicuous consequences for iconic wildlife species.

This is currently the case in areas of the Otways, including Cape Otway. Manna gum woodlands are declining rapidly and hungry koalas gaze down from skeletons of dead and dying trees.

We have observed the progression with mounting alarm and must face the reality of a habitat without manna gums and the potential for a starvation event amongst the resident koala population. Thanks to a grant from the Australian Government Biodiversity Fund we finally have the means to investigate the situation and hopefully address it. We think the issue is more complicated than simple koala over-browsing, but how complex is it?

Recently we held a forum at the CEC, attended by experts from around the country. In the following articles Dr Jack Pascoe shares insights, explores the issue and discusses the CEC's directions for research and action.

I will shortly be sending you a letter with some important updates on Manna Gum Reserve – keep an eye out for it!

With very best wishes,

Lizzie Corke
CEO

Why do koalas browse some manna gums more heavily than others?

This question is vital to understanding the pattern of koala browsing and given the current manna gum decline, this insight is becoming increasingly important. The following is a synthesis of information presented by Dr Ben Moore, a leaf nutrition ecologist from the University of Western Sydney, and Dr Desley Whisson, a koala and over-abundance ecologist from Deakin University at the recent forum held at the CEC.

It seems size matters to a koala, they prefer to sit in bigger trees during the day, and this makes sense if you consider that bigger trees have more leaves and subsequently more food. However, while koalas often rest in larger trees during the day, they are prepared to travel to a range of trees, including small ones, in search of browse (leaves) when they are actively feeding at night. The quality of browse on a food tree also influences where a koala is found in the landscape. For instance, a tree of good quality browse is likely to be more frequently occupied by a koala if it is surrounded by trees with poor quality browse.

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So what makes for a good quality browsing tree? For foliovores like the koala, good food trees have good leaves. Subsequently, the chemical composition of the leaves is of paramount importance and can influence the fecundity of a koala population. Good leaves are high in protein, but this needs to be balanced against the levels of chemical defences, known collectively as Plant Secondary Metabolites (PSMs) within the leaves. PSMs can act to make leaves toxic or the leaf proteins difficult to digest and this can potentially act as a deterrent to koala browsing. Manna gum leaves are, relative to other Eucalypts, high in PSMs, but they are also high in protein and, for koalas, this makes them irresistible.

There is some debate over whether trees in poor health produce lower concentrations of PSMs which subsequently make their leaves more attractive to koalas. This would lead to over-browsing of unhealthy trees. There is also a body of work that suggests the opposite, trees in good health produce leaves which are more likely to attract higher than average levels of insect and vertebrate browsing.

In collaboration with the University of Western Sydney, the CEC aims to determine whether improving the health of manna gums will enable them to produce a leaf that is high enough in chemical defences to encourage koalas to seek an alternate source of food.

Oh, and in case that's not complex enough, climate change is likely to alter leaf chemistry. Visit **www.abc.net.au/radionational/programs/scienceshow/how-plants-respond-to-increasing-carbon-dioxide/3031138** to hear about some current research by Ros Gleadow investigating this process. A recent Four Corners program also shed light on the plight of koalas across the country. Visit **http://www.abc.net.au/4corners/stories/2012/08/16/3569231.htm** for more details.

Where are the manna gum seedlings?

While the mature manna gums are dying there are no younger trees germinating and growing to replace them. The koalas could not have affected the trees' ability to reproduce and our investigations show that the manna gums of Cape Otway are still producing viable seed.

Vic Jurskis has spent most of his professional life working in forestry management in New South Wales. At our recent forum Vic provided many valuable insights into forest ecology especially the ability of fire and grazing to maintain forest health.

Vic's insight allowed us to hypothesise that the absence of fire and grazing, a process the entire country is adapted to, may be significantly contributing to the limited recruitment of manna gum seedlings. Regular moderate burning of Cape Otway woodlands would have once ensured the maintenance of open, grassy areas, encouraging an abundance of kangaroos and wallabies which would have further assisted in maintaining the grassy understorey. Clear areas of healthy soil would have allowed manna gum seedlings to germinate and establish under gaps in the canopy. Instead, a long period of no burning activity has created conditions in which a dense understorey and ground cover flourishes upon a thick layer of humus. You can see this story repeated across the Australian landscape.

So we may have found the reason for the absence of seedlings and young trees, but implementation of the solution is not so simple. Small private properties containing houses and other assets make it almost impossible to burn areas of forest for ecological reasons. The thick coastal scrub which is advancing in the place of our once open manna gum woodlands will make it challenging, if not impossible, to manage the intensity of the fire. Therefore the CEC is committed to investigating ways in which we can simulate the process of moderate fire as well as having small low intensity fires which do not threaten people's homes.

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What will happen next?

For the koalas, I see two options, they will either begin to browse other tree species more frequently and disperse into surrounding forest of mixed Eucalyptus trees, or there will be a big and very public starvation event of one of Australia's most iconic mammals. It is likely that both of these scenarios will play out, and possibly as soon as this summer when trees are put under further strain by hot and dry conditions.

I also see a couple of likely scenarios for Cape Otway's manna gum woodlands. The increasingly high density of koalas in the few remaining manna gums will exponentially increase the rate of woodland decline. The potential starvation event amongst koalas may slow this process, but unless it reduces the koala population to or below the carrying capacity of the habitat then further tree death is inevitable. As the canopy becomes increasingly sparse greater light penetration will make weed invasions more severe and rapid. Combined with the absence of fire, coastal scrub will make further inroads into the remaining woodland, making tree recruitment virtually impossible.

Without intervention I believe a positive result for either koalas or manna gums on Cape Otway is unlikely. Without fire and a reduction of koala density we will lose our woodlands. More regular burning would make for cooler burns which would make fires safer and increase their ecological benefits. We need to re-investigate how we manage fire on Cape Otway.

The CEC is committed to investigating ways to re-establish properly functioning ecosystems in manna gum woodlands. We hope our research will provide great insights into this issue as well as assisting with managing similar issues around the country.

Dr Jack Pascoe
Conservation Coordinator

Conservation Ecology Centre
Cape Otway

635 Lighthouse Road, Cape Otway
PO Box 296, Apollo Bay, Victoria 3233
T: (03) 5237 9297 | F: (03) 5237 9299
E: info@conservationecologycentre.org
www.conservationecologycentre.org

Conservation
Ecology Centre
Cape Otway