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Squirrel Gliders in agricultural landscapes

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Ross has many years of experience with gliders and has been a leader in research on these animals. This presentation covers the species of gliders and their status and his research into the many tools that are now available for the management of gliders.

Australian gliding species

Gliding evolved independently three times among the marsupials of Australia. Gliders occur in three different families, two with non-gliding species.

Family *Acrobatidae*: Feather tail Glider – now recognised as two species. Similar-sized Pygmy Possums are classed as a distantly related family.

Family *Petauridae*: Sugar Glider, Squirrel Glider, Mahogany Glider and Yellow-bellied Glider (in order of size). Sugar Glider is potentially 3 species - what was recognised as a northern subspecies of Sugar Glider is apparently related to the Squirrel Glider. The non-gliding Leadbeater's Possum is in the same family.

Family *Pseudocheiridae*: Greater Glider, may be 2-3 species. Ring-tail Possums are in the same family.

See Jackson, S. & Groves, C. (2015). *Taxonomy of Australian Mammals*. CSIRO Publishing, Melbourne.

Ed: Mason Crane provided the following reference: Pavlova, A., Walker, F. M., van der Ree, R., Cesarini, S., & Taylor, A. C. (2010). Threatened populations of the Australian squirrel glider (*Petaurus norfolcensis*) show evidence of evolutionary distinctiveness on a Late Pleistocene timescale. *Conservation genetics*, *11*(6), 2393-2407.

Conservation status

The following species are classed as threatened:

	Federal	State
Feathertail Gliders	-	SA (?extinct)
Sugar Gliders	-	
Squirrel Glider	-	NSW, Vic, SA
Mahogany Glider	endangered	Qld
Yellow-bellied Glider	vulnerable (N Qld)	NSW, SA
Greater Glider	vulnerable	NSW (populations)

Basic requirements of gliders

Gliders need: food; tree hollows for shelter; and tree cover to enable dispersal. Knowledge about these requirements form the basis for developing management tools.

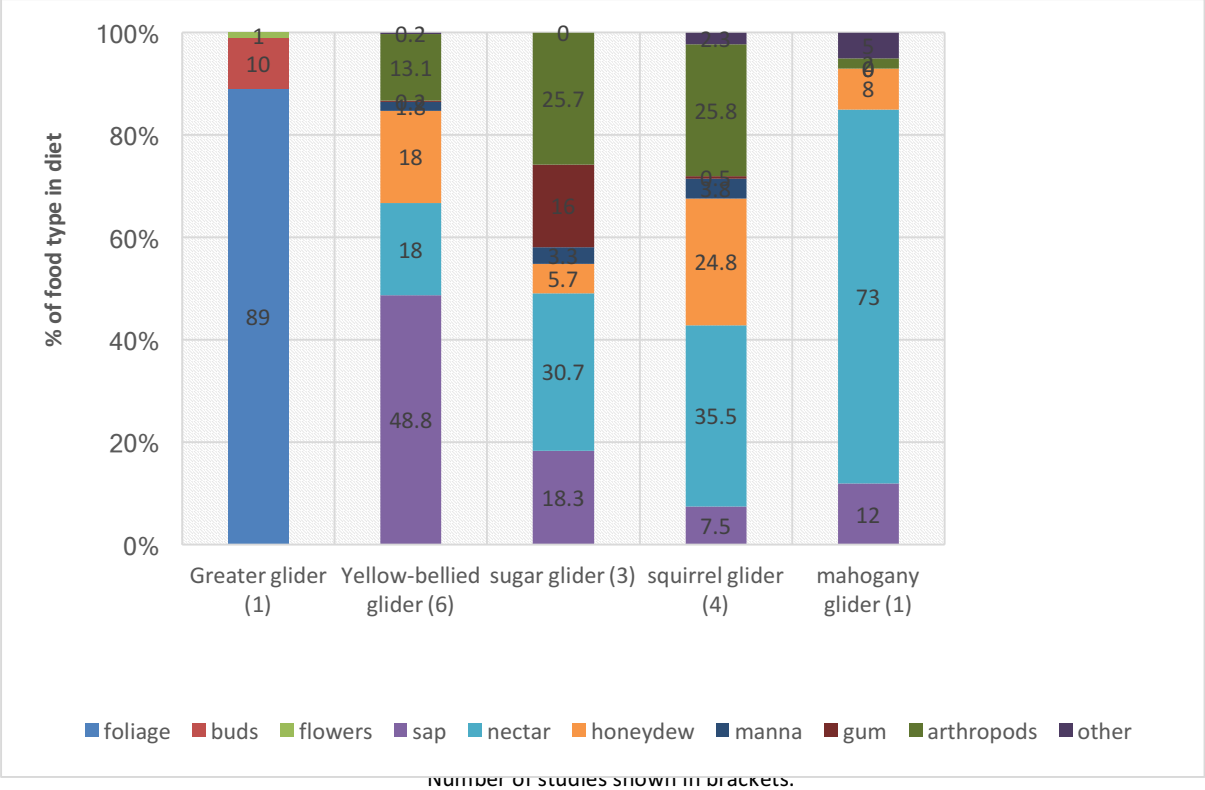
Glider diets and habitat restoration

Habitat restoration can be guided by knowledge of diets. Greater Gliders are folivores; their food is abundant throughout the year but is slow to digest.

The other glider species rely on easily digested foods high in sugars and protein. This includes eucalypt sap and acacia gum (obtained by incising tree trunks and branches), manna (dried sap that oozes from wounds in plants), nectar and pollen, arthropods (insects and spiders) in the leaves and also under ribbony bark, and honeydew (the exudates of sap-sucking insects).

Yellow-bellied Gliders have a diet high in the sap of a few selected individual trees of a few eucalypt species in the forests where they live. The smaller gliders use less sap and more of the other more-easily obtained foods. The smaller gliders also use less tree species for sap and mostly make small incisions; they rarely make small V-shaped incisions, whereas Yellow-bellied Gliders make large and multiple V-shaped incisions on a wide variety of species.

The proportions may vary across sites depending on availability at different times of the year. The smaller species favour nectar and pollen in winter, and prolific winter-flowering eucalypts with big flowers and long flowering seasons are valuable habitat. Depending on locality, Red Gums and Ironbarks may be an important part of their habitat. But diversity is also important for year-round food resources, including understorey. For example, Sugar Gliders rely on acacia gum particularly in winter when other foods are less available. Gliders play an important role in pollination of banksias, eucalypts and other trees.



Number of studies shown in brackets.

Managing gliders with nest boxes

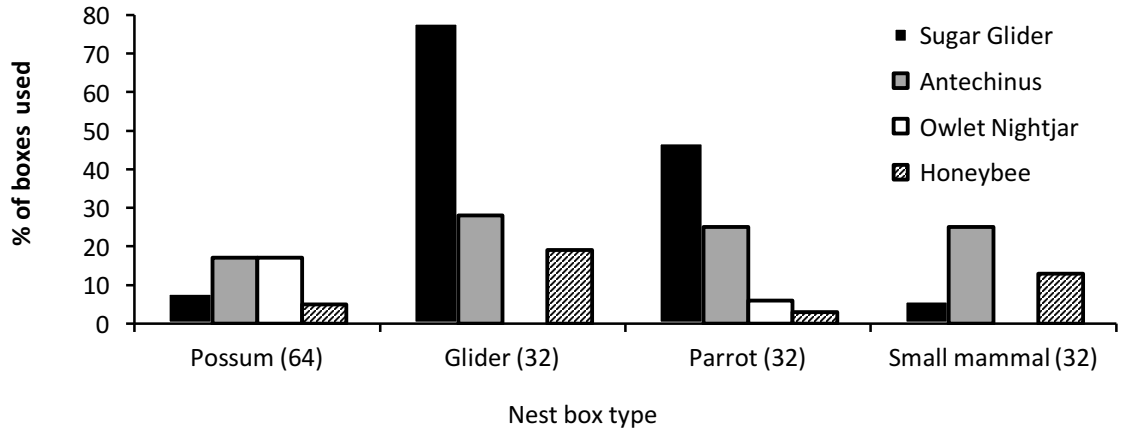
Nest boxes are used to compensate for a lack of natural tree hollows, particularly in planted areas where no hollows will develop for more than 100 years; nest boxes fast-track the value of planted areas for wildlife. But nest boxes should not be used as an excuse to remove hollow-bearing trees or as a temporary fix.

Nest boxes have received some criticism due to poor performance. In general, this is due to lack of adequate research:

Nest box design and glider preferences

Low uptake can occur with poor design. Existing studies don't assist much although some very useful older work has been done (e.g. Menkhorst 1984). Installation is often guided by data on den trees (eg. entrance height). Newer studies have clarified design preferences. Often a general front-entry box (4-7 cm diameter entrance) is installed for gliders.

Nest box preferences were studied at Brunswick Heads, NSW (Goldingay *et al.* 2015).



Possum box, rear-entry glider box, front-entry parrot box and side-entry small mammal box.

Nest box installation

Nest boxes can suffer high attrition rates, with boxes falling apart and falling off trees. Nailing nest boxes to trees needs to allow for tree expansion, otherwise trees will pop their boxes. This is another area needing more research.

Bees in nest boxes

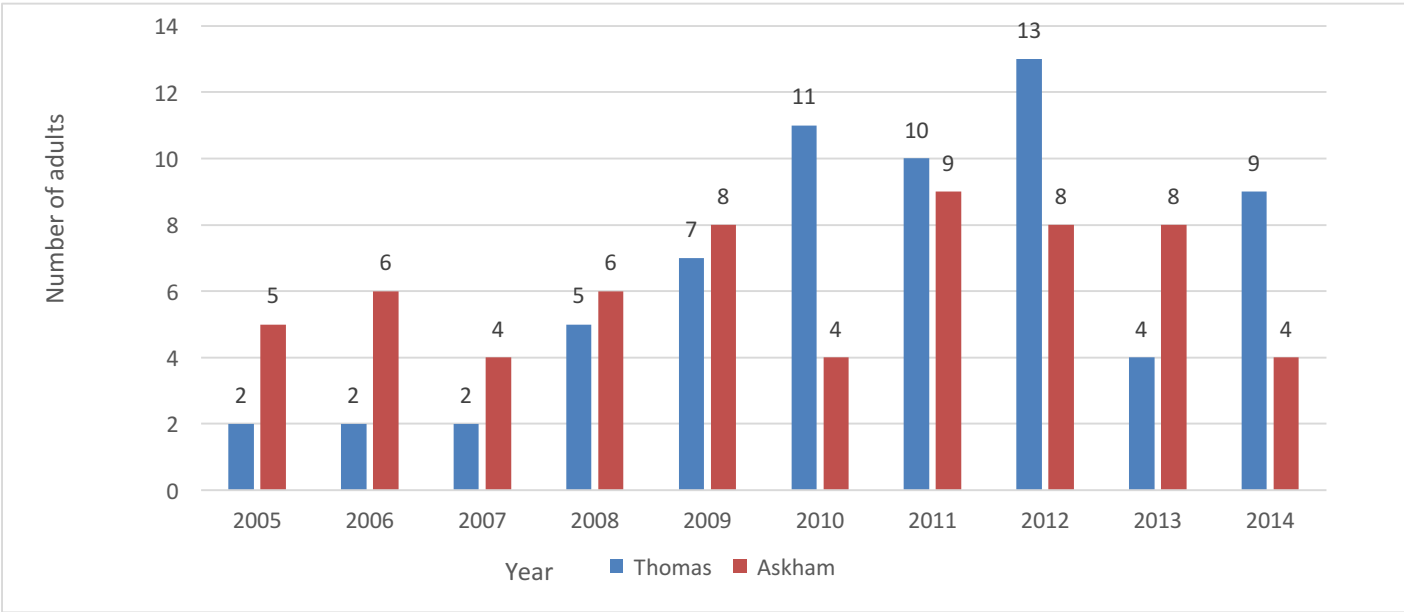
Bees take over boxes. While insecticide strips and carpets have been tried, experience shows that bees depart after a year or two, and gliders move in to feed on the honeycombs.

Long-term nest box studies

Long term studies are needed to show that glider populations can be kept in nest boxes for long periods.

Few studies have been carried out or reported. We ran a 10-year nest box experiment at Pomona, Qld; 6-10 rear-entry nest boxes were installed at 2 sites and checked 1-2 times per year.

The nest boxes were used over the ten years of the study; 46-61 adults were tagged at the two sites. We recorded 32-34 breeding events. Two gliders were present for 7 years, and another 5 present 5-6 years. Gliders generally use more than one box.

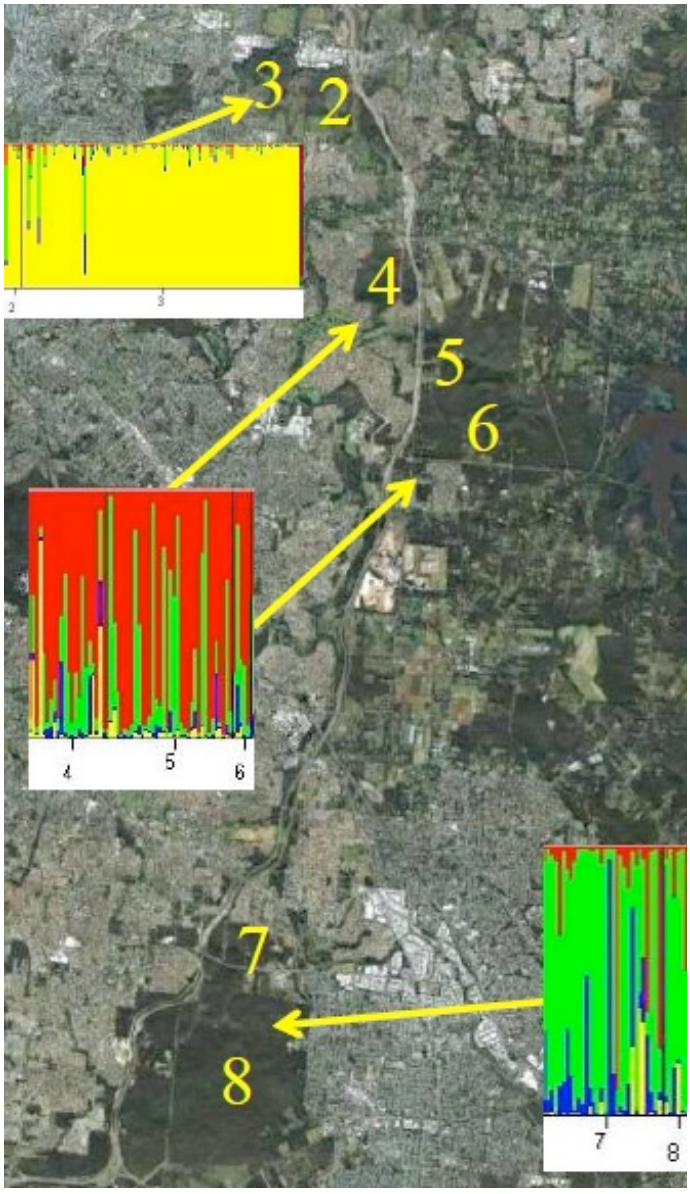


Managing habitat fragmentation

Is habitat fragmentation a concern for gliding mammals? Genetic evidence suggests canopy gaps beyond gliding capability disrupt gene flow.

We have conducted a genetic study of Squirrel Gliders in remnant habitat on the south side of Brisbane, Qld., with analysis of 5 variable marker genes from 250 Squirrel Glider tissue samples. The figure shows graphs with different colours indicating different genetic clusters. (Numbers 6 and 7 are 9 km apart.).

This demonstrates that gene flow has been severely disrupted. Inbreeding also appears to be high (Goldingay *et al.* 2013).



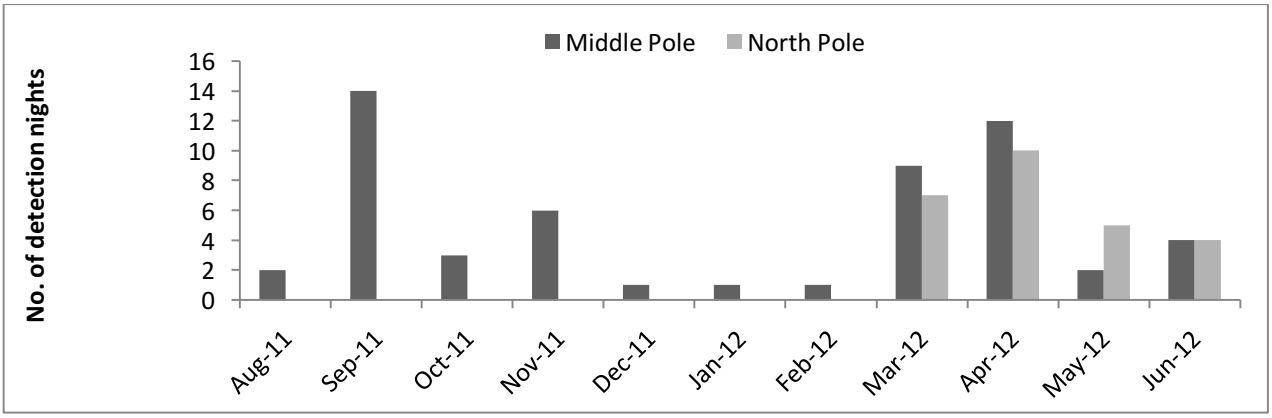
How do we get gliders across gaps?

In 1993 I proposed the idea of installing power poles (without electricity wires!) to reconnect glider habitat (i.e. stepping stones). The first glide poles in Australia (& anywhere for that matter) were installed at Bomaderry Creek, Nowra, NSW in 1995.

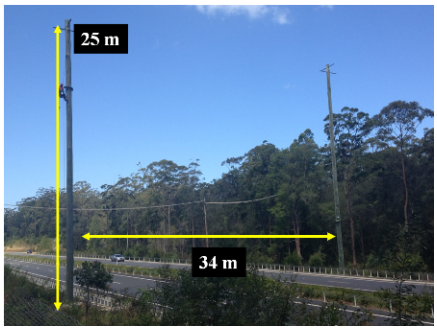
This led to a trial being conducted at Mackay, Qld, where 5 poles were installed between two habitat remnants occupied by Squirrel Gliders (Ball & Goldingay 2008).

This was followed by installation on a wildlife land-bridge at Compton Road, Brisbane, by Brisbane City Council. Glide poles on the land-bridge were installed with cameras for monitoring. This revealed a crossing frequency by Squirrel Gliders of 1-2 per week (Taylor & Goldingay 2012).

Subsequently Brisbane City Council was advised to install road-side glide poles on Scrub Road. A camera was first installed on the middle pole in August 2011 and then on the northern pole in February 2012 to confirm crossings. Many photos on each pole were within 2 minutes of each other and used to confirm crossings (Taylor and Goldingay 2013)



Glider poles on the Oxley Highway at Port Macquarie are providing more ideas about the design of highway crossings and will be the topic of further reports (Goldingay and Taylor, unpublished).



Conclusion

We now have the tools to restore glider habitat. We just need to employ them.

References

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