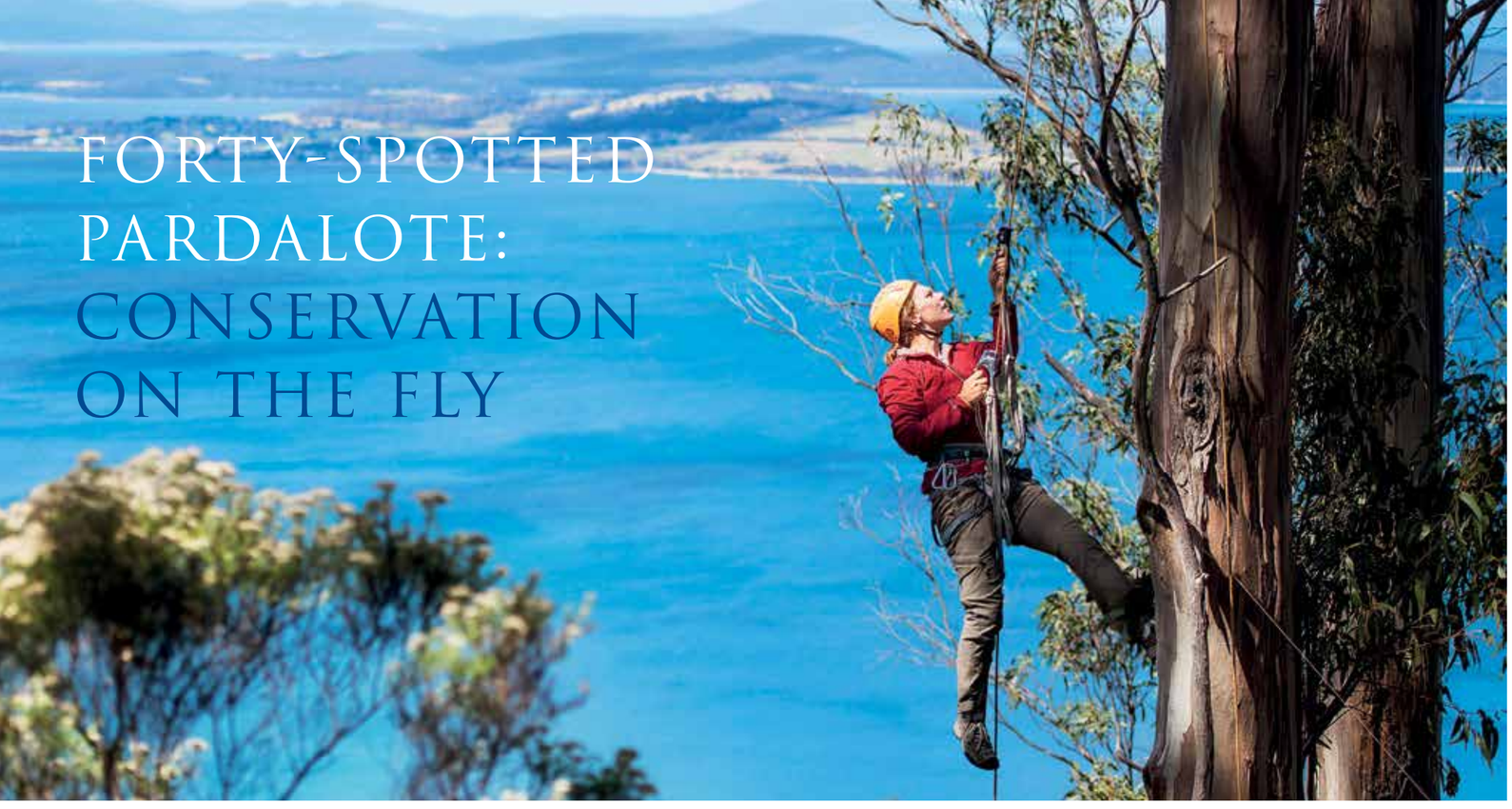
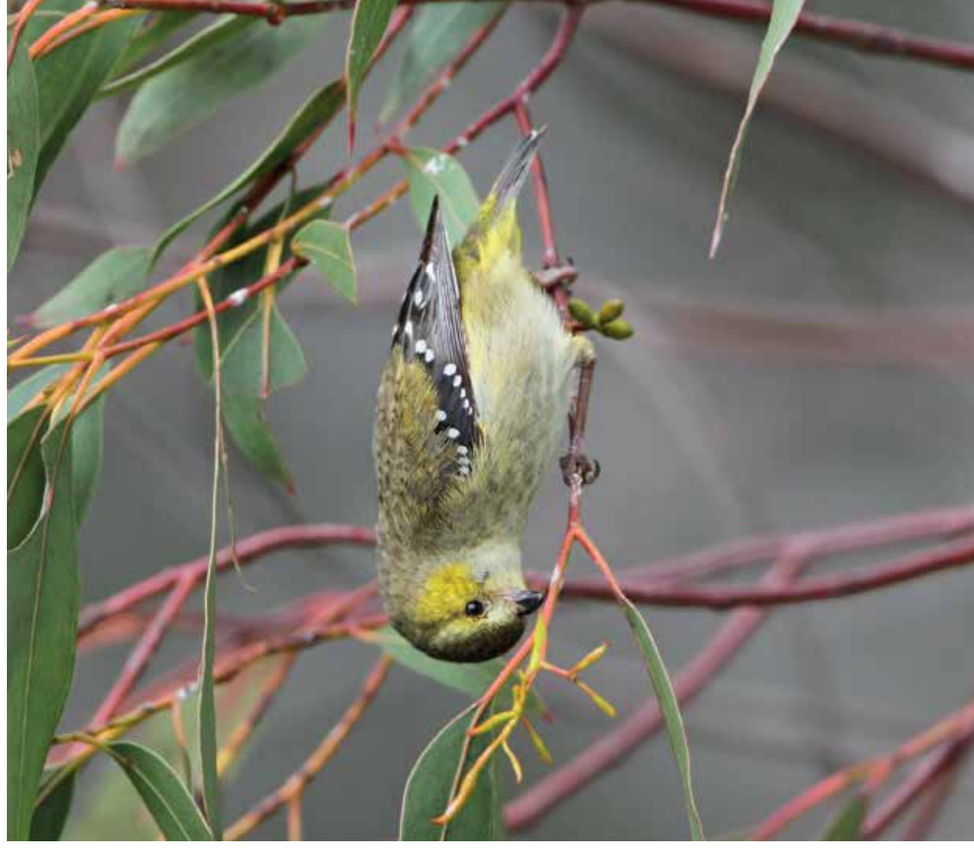


FORTY-SPOTTED PARDALOTE: CONSERVATION ON THE FLY



Dangling 15 metres above the forest floor to search for small tree hollows is all in a day's work for a Forty-spotted Pardalote researcher. **Amanda Edworthy** shares some of the insights her research on this leaf-sized songbird has uncovered.

Endemic to Tasmania, Forty-spotted Paralotes have evolved unique survival strategies to withstand the local conditions. The best place to find them is among White Gum trees on Maria and Bruny Islands, in the south-east of the state. These islands look almost tropical in tourist brochures, but are actually some of the southernmost regions in Australia and experience strong winds, low winter temperatures, and the occasional snowfall during the beginning of August—the Forty-spotted Pardalote's breeding season. Non-migrating residents of Tasmania, Forty-spots tolerate a full range of weather conditions and are a tough, tenacious species because of it. Yet like many habitat specialists, Forty-spots are vulnerable to environmental change. They evolved to take advantage of the rich food sources and safe nest sites provided by White Gums, but many of these resources were lost following European settlement. As a result, Forty-spots have retreated from much of Tasmania's eastern forests to the surrounding islands—Maria, Bruny and Flinders—as well as a few isolated mainland patches in the South East. Although their distribution and population have been small for decades, Forty-spots were thought to be safe, with nearly two-thirds of their remaining habitat protected by reserves.

But in 2008 biologists began to notice a lack of Forty-spots in prime habitat, and in 2009 and 2010, a Tasmanian biologist, Sally Bryant, led a population-wide survey of their numbers by visiting all known habitat patches. She found an alarming 60 per cent decline in Forty-spotted Pardalotes since the previous survey 13 years earlier, and estimated the population lay at 1,500 birds. The cause of such sharp decline within existing habitat was unknown.

I have spent the past three years investigating causes of decline in Forty-spotted Pardalotes as part of my PhD. With a crew of three to four field assistants, I studied Forty-spots on Maria Island, Bruny Island, and mainland Tasmania near Bruny, looking at range-wide threats to the species. We set up field bases in each of these locations and studied the birds intensively throughout the breeding season. We checked nests for the numbers of eggs laid, nestlings hatched, and fledglings that successfully left the nest. While Forty-spots occasionally nest within a few metres of the ground, most often they are found nesting 10 to 15 metres up, requiring ropes and harnesses to access the nests. Forty-spots choose hollows that have narrow entrances and deep chambers, so we used a video-camera on a flexible stalk to view the contents of the nests.

This study was the first to regularly look inside the pardalotes' nests, and we quickly uncovered a new major threat to the species. Nestlings were disappearing within a week of hatching, so to catch predators entering the nest, we taped motion-sensor camera traps to the branches outside the nests. After a week in the trees, we retrieved the camera traps and found thousands of photos of leaves and pardalotes—but no predators.

We switched tactics and looked more closely within the nest, and were shocked to find parasitic maggots living under the skin of nestlings, feeding on their blood. The maggots turned out to be larvae of a fly species endemic to Tasmania, *Passeromyia longicornis*—and they were killing about 70 per cent of nestlings. The related fly species on mainland Australia are scavengers of nestling faeces in honeyeater nests, but its Tasmanian cousin is no scavenger: it is an obligate parasite—meaning it cannot complete its lifecycle without exploiting a host. Adult flies lay their eggs on the eggs and nestlings of Forty-spots and after hatching the fly larvae spread across the bodies of the nestlings to the eyes, wings, legs, tail, neck and nares (nostrils). Gruesomely, they then drill underneath the skin and develop into 1.5-cm maggots. After five to ten days they leave the nestlings, form pupae in the nest material, and emerge several weeks later as jet-black flies.

P. longicornis is native to Tasmania, but native parasites can become a threat to other species when their abundance increases due to changing environmental conditions—or when the host species already faces other pressures. Studies in Argentina and Canada have shown that parasite numbers in nestling birds increases in response to forest disturbance and changes in the climate. While the factors affecting parasite loads in Forty-spots are uncertain, we have identified several isolated habitat patches containing just one or two pairs, which have repeatedly failed to breed because of the invading parasites. These pairs will be unable to replace themselves in the local population, let alone contribute to boosting their overall population in Tasmania.

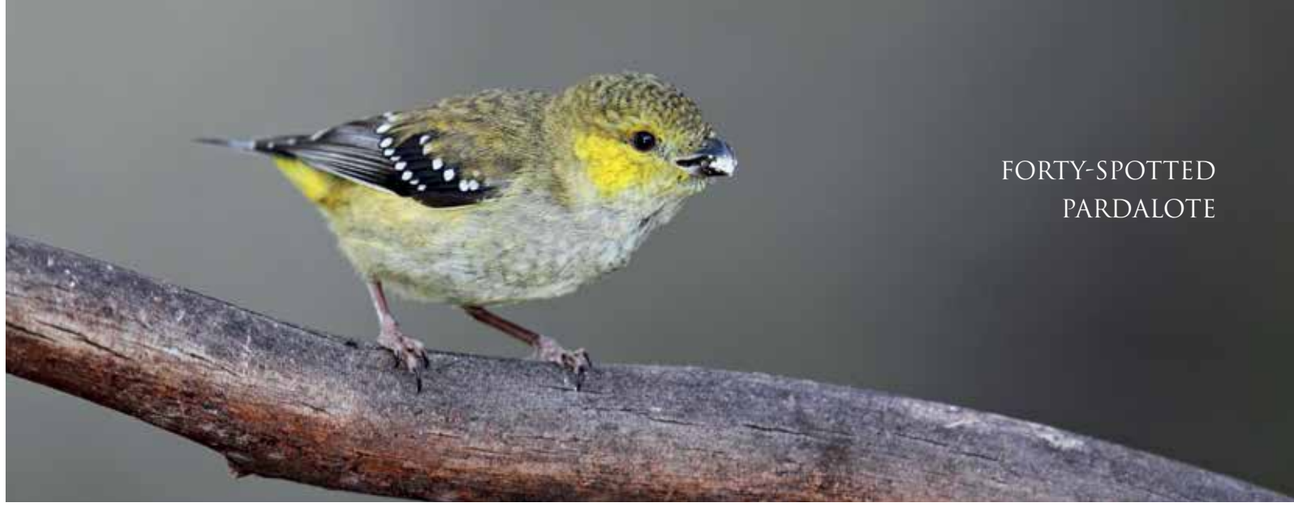
Controlling the fly population in these vulnerable habitat patches may be a key aspect of protecting Forty-spotted pardalotes. In 2014, I tested a bird-safe fly repellent called 'Avian Insect Liquidator' by spraying the solution on Forty-spot nest material before the nestlings hatched. The spray was successful in eliminating almost all parasites from the nest—and increased fledging rates to an average of three to five nestlings per nest, compared to an average of just one nestling fledging per untreated nest. Ideally, this use of fly repellent will combine with a fuller understanding of the forest conditions that lead to such high parasites loads. By doing so we can

Covenants for the future

A number of conservation covenants totaling more than 250 hectares have been brokered by BirdLife Australia's Woodland Birds Project and the Tasmanian Land Conservancy, with private landholders working to protect important Forty-spotted Pardalote habitat. Conserving remnant White Gum habitat into perpetuity and providing vital links between other key existing pardalote sites, these covenants are an essential springboard to securing this endangered Tasmanian endemic.

Above: A Forty-spotted Pardalote foraging for manna, a sugary substance secreted by White Gums. Photo by Chris Tzaros

Opposite: The author hoisting herself up the trunk of a White Gum, in search of Forty-spotted Pardalote nesting hollows with a view. Photo by Angi Kim



FORTY-SPOTTED PARDALOTE

manage pardalote habitats, with the goal of reducing the prevalence of parasitic flies.

However, before battling the flies, the pardalotes must first acquire a suitable nest hollow. All remaining Forty-spot habitat is in second-growth (post-logging) forest and the young trees in these forests generally contain few hollows. Using binoculars and climbing ropes to survey tree hollows in more than 200 forest plots, we found less than one tree hollow per hectare, the territory size of a Forty-spotted Pardalote. Unfortunately, most of these hollows were unsuitable for Forty-spots, lacking the narrow entrances and deep chambers required to deter predators. The veteran trees in old-growth forests may provide an abundant supply of tree hollows but these trees take centuries to grow.

Even when suitable tree hollows do exist, there is fierce competition for the best quality nesting sites. Early in each season we observed Forty-spots aggressively defending their nest sites and frequently chasing off their much more prevalent cousin, the Striated Pardalote, which take possession of the hollow up to 15 per cent of the time.

In many areas of the world, artificial nest boxes have been crucial in reversing declines of hollow-nesting birds, including Eastern Bluebirds and Echo Parakeets. Nest boxes are an effective way of restoring the natural availability of nest cavities and by doing so reducing competition between species for them. In 2009, biologist Matt Webb installed 100 nest boxes on Bruny Island. None were used during their first year, but when I began my research in 2012, one quarter of them were occupied by Forty-spotted Pardalotes and furthermore, these boxes had the greatest density of breeding pairs. In fact, by monitoring nest success in both nest boxes and natural hollows we found that nests in boxes had higher success rates than natural hollows—45 per cent fledged at least one young, compared to 37 per cent in natural hollows. This is possibly due to the increased shelter they offer from harsh weather conditions and potential predators, or that the box offers a larger chamber than tree hollows usually do. Another benefit of these nest boxes is that they are also easier to fumigate for fly parasites, a method which resulted in a 100 per cent success rate in my trial overall. We have shown that nest boxes can increase populations of Forty-spotted Pardalotes, which in turn helps to maintain the genetic diversity of the population by producing juveniles to recolonise unoccupied habitat and increasing the resilience of the species

in the face of other threats.

During our research we also found that White Gum trees are providing a critical food source for Forty-spots. We set up video-cameras near nest entrances to monitor the food items brought to nestlings by their parents. Fifty hours of Forty-spot TV revealed that the nestling diet was about 95 per cent manna (a sugary substance exuded by the White Gum trees), the remainder consisting of flies, lerps and spiders. Historical land clearing caused loss and fragmentation of this White Gum habitat, and the recent drought has caused further die-back and stress in the trees—resulting in reduced food supply for Forty-spots. The restoration of this habitat will be crucial in increasing the distribution and abundance of Forty-spotted Pardalotes into the future.

Through competition for tree hollows, fly attack on nestlings and limited food supply, the Forty-spotted Pardalote population that remains faces an enormous challenge to survive. Having identified these threats there are positive actions we can take. In 2013 I joined with the Bruny Island Environmental Network, the Bruny Island Men's Shed, and ANU furniture students to build and install more than 200 nest boxes, giving Forty-spots a hand in this struggle. Insect control and the subsequent maintenance of these boxes further increases the chance of chicks reaching fledging stage. Protection of existing White Gum habitat and revegetation of cleared areas will help to link suitable woodland habitat for pardalotes and aid in the dispersal of younger birds into new territories, as well as providing more food resources for the current Forty-spot population. By involving the community in this project we can extend this work across both public and private land. While there is currently grave concern for the population of Forty-spotted Pardalotes, we can now see a way forward for the conservation of this unique species.

Above: This Forty-spotted Pardalote holds manna in its beak, which Amanda Edworthy's research shows makes up around 95 per cent of their diet. Photo by Chris Tzaros

Inset: A fly in the ointment: Passeromyia longicornis in larval and fly stages. The larvae burrow under the skin of nestlings in order to complete their life cycle. Photo by Amanda Edworthy