Beyond captivity for two extinct-in-the-wild island reptiles

Jon-Paul Emery
Threatened Species Recovery Hub & University of Western Australia

In 2009, the Christmas Island blue-tailed skink and Lister’s gecko were headed for imminent extinction. Parks Australia acted quickly to collect remaining wild individuals in order to establish captive breeding programs on Christmas Island and at Taronga Zoo, Sydney. These programs have been highly successful. The Threatened Species Recovery (TSR) Hub is working closely with Parks Australia to help secure a future for the two lizards beyond captivity.

Until relatively recently the Australian external territory of Christmas Island, which lies 1,550 km off the north-western coast of mainland Australia, contained a distinct reptile fauna, comprising one endemic blind snake, two endemic geckos, two endemic skinks, and one native skink that also occurs elsewhere.

The endemic species comprise several million years of evolutionary isolation. All the lizards remained common up to the 1970s, but four then declined precipitously. These declines were probably caused by the inadvertent introduction of the Asian wolf snake (Lycodon capucinus) from stowaways on freight shipping.

In 2009 and 2010, Parks Australia in partnership with Perth Zoo and Taronga Zoo collected 66 blue-tailed skinks (Cryptoblepharus egeriae) and 43 Lister’s geckos (Lepidodactylus listeri) from the rapidly dwindling wild populations to establish captive breeding programs on Christmas Island and at Taronga Zoo. The blue-tailed skink was last seen in the wild in 2010 and Lister’s gecko in 2012, and both are presumed extinct in the wild. Efforts came too late for the Christmas Island forest skink (now extinct) and the coastal skink (extirpated from Christmas Island).

Captive breeding for the blue-tailed skink and Lister’s gecko has been very successful with over 1,700 blue-tailed skinks and 1000 Lister’s geckos now in captivity. However captive populations are a resource intensive and suboptimal option for the long-term conservation of both species and Parks Australia is...
investigating other complementary conservation options.

**Trial reintroduction**

The first of these explorations was trialling a soft release of blue-tailed skinks in a semi-wild enclosure on Christmas Island. The 2,600 m² enclosure is surrounded by a 1 m-high barrier designed to exclude potential introduced predators such as wolf snakes, black rats and giant centipedes. In April 2017, Parks Australia released 139 blue-tailed skinks into the enclosure and TSR Hub PhD candidate Jon-Paul Emery, from the University of Western Australia, monitored the new population.

Jon-Paul recorded a gradual decline in numbers, and by September 2017 none were detected. Further investigation indicated that the decline may have been due to predation by giant centipedes. Efforts had been made to remove them prior to release, but some were still present. Centipedes had not previously been considered a primary threat to the skinks as they had been on Christmas Island for nearly 80 years prior to the rapid decline.

Jon-Paul undertook an experiment exposing skinks in smaller enclosures to a density of centipedes that matched that of the enclosure for three months and found that it reduced the survival of the skinks by over 30%. Christmas Island National Park staff consequently made great efforts to eradicate centipedes from the reintroduction site, in preparation for another trial. Parks staff and Jon-Paul also added an estimated 20 tonnes of logs and branches, 10 tonnes of rock, ceramic tiles and wooden pallets to the site, to improve habitat suitability.

**Second trial**

The second trial saw 170 skinks released to the same site in early August 2018. Fifteen months later, in November 2019, the populations has increased to an estimated 550 individuals. Based on this success a second larger enclosure is being established and a further 300 blue-tailed skinks are planned to be released into it in March 2020.

In February 2019, 160 Lister’s Geckos were also released to the site. Monitoring indicates that by Dec 2019 the population had contracted to fewer than 40 adults, but site-born juvenile geckos have also been observed. The climbing ability of these geckoes presents more of a challenge to contain them within the enclosure, and we suspect that many dispersed from it.

**Gifted a tropical island**

A new stage of recovery action for the blue-tailed skink is underway. In September 2019, Parks Australia, supported by the Shire and community of the Cocos (Keeling) Islands, introduced 300 skinks to the tiny uninhabited island of Pulu Blan (2 ha) in the Cocos (Keeling) Island group. This island was selected because it had no native reptile species and no populations of the wolf snake.

The release followed successful rat eradication on the island by Parks Australia. TSR Hub Masters student Kristen Schubert, from the University of Western Australia, is monitoring the released animals and has found that survival of blue-tailed skinks three-month post release is high and skinks have been observed mating. Future work will also examine the extent of predation on the lizards by birds (reef egrets, night herons and white-breasted water hen).

A second release to another island in the Cocos group, Pulu Kembang (3.4 ha), is planned for March 2020.

For further information, contact Jon-Paul Emery here: jon-paul.emery@research.uwa.edu.au.
Assessing reptile health on Christmas Island

Jessica Agius  
Threatened Species Recovery Hub & The University of Sydney

Infectious diseases are an increasing threat to wildlife populations worldwide, and have been associated with species declines and extinctions, particularly on islands. In 2014, a novel Enterococcus bacterium was discovered in the captive breeding population of Lister’s geckos (Lepidodactylus listeri) and blue-tailed skinks (Cryptoblepharus egeriae) on Christmas Island and resulted in the deaths of over 50 individuals.

This outbreak prompted a more in-depth health analysis of Christmas Island reptiles, which was undertaken by Threatened Species Recovery Hub PhD candidate Jessica Agius, from The University of Sydney. The assessment additionally discovered two papillomaviruses and several parasites in both invasive and endemic geckos.

The bacterium

The Enterococcus bacterium results in inevitable death of infected animals. Screening has revealed that introduced geckos on the Cocos (Keeling) islands, the site of the recent skink introduction, are not affected. Antibiotics have been trialled on Asian house geckos on Christmas Island to see whether Parks Australia could treat infected animals, and while some promising results were achieved, those results also suggested the bacterium may be highly resistant to antibiotics. This disease therefore threatens the conservation management of the Critically Endangered reptiles on Christmas Island, and poses a high biosecurity risk.

The viruses

The discovery of two novel papillomaviruses in Christmas Island lizards is the first report of papillomavirus in lizards globally. The papillomavirus and Enterococcus bacterium occurred in some animals at the same time, meaning they may work together to cause disease. A diagnostics test to detect the viruses in apparently healthy animals has been developed, and continuing research is seeking to unravel the effects of these viruses on Christmas Island lizards.

The parasites

During the health assessment several internal and external parasites were found: mites, tapeworms, lungworms, roundworms, flukes and coccidia. Infestation by parasites can cause damage to the reptiles’ internal organs, increasing their susceptibility to disease and, in some cases, cause death.

Reptiles from the Cocos islands and Christmas Island are equally affected by parasites, so understanding them will be valuable to managing populations on both Christmas Island and the Cocos islands.

What’s next for Christmas Island reptiles?

The reintroduction of blue-tailed skinks into a Christmas Island exclosure has been successful to date, and continued monitoring will help us to evaluate longer-term success. Although initial results are promising for the translocation of skinks to Pulu Blan, more monitoring is needed to assess the longer-term fate of that trial.

The disease research will now attempt to understand more about the genome of the Enterococcus bacterium, its resistance to antibiotics, and the most effective antibiotic treatments.

We will also continue our investigation into the impact of introduced species on the Lister’s gecko and blue-tailed skink, which stand as fascinating examples of millions of years of reptile evolution in the isolation of Christmas Island.

This Threatened Species Recovery Hub project is a collaboration between Parks Australia (Christmas Island National Park), the University of Western Australia, Charles Darwin University, The University of Sydney, Taronga Conservation Society Australia, the Australian Registry of Wildlife Health Taronga Zoo and the Holsworth Wildlife Research Endowment, with input and advice from the Christmas Island Reptile Advisory Panel (a committee of Parks Australia staff and independent experts). The project is supported by the Australian Government’s National Environmental Science Program.

For further information, contact Jessica here: jessica.agius@sydney.edu.au
Subtropical islands are some of the most idyllic and unique places in the world, and this is especially true of Lord Howe Island. It’s located more than 600 kilometres from Australia’s east coast in cool subtropical waters that are warmed by the East Australian Current. This isolation and unique set of environmental conditions make it a marine hotspot of endemity, with 7.2% of all fish species being endemic. This unique ecosystem has prompted the creation of the Lord Howe Island (LHI) Marine Park, and the entire island has been designated a UNESCO World Heritage Site.

Despite having fewer than 1,000 people on the island at any one time, this delicate and unique ecosystem is under threat from human impacts, especially climate change.

In February and March of this year, the LHI Marine Park experienced a severe bleaching event, with some reefs within the lagoon experiencing bleaching of 90% of hard coral colonies. To understand the impacts of bleaching on reefs within the lagoon, a multi-university team of researchers lead by Rosemary Steinberg (University of New South Wales) and Tess Moriarty (University of Newcastle and University of New South Wales) visited the island three times over seven months. Working on this remote island offered unique benefits and challenges not found anywhere else, including fantastic research opportunities, highly engaged
local businesses and park management, dealing with supply issues, and public perceptions.

There are very few places in the world that offer themselves as perfect natural laboratories—islans are one of them. The LHI lagoon is small enough to be easily traversed, while large enough to have very different habitats across its length and breadth. In addition, coral species composition and physical conditions are varied and diverse across this gradient. The lagoon lends itself beautifully to understanding how and why heat waves affect some reefs but not others in such a small physical space. Because of this, we were able to survey and sample five unique reefs across the entire lagoon using only kayaks, or hitching short rides on boats.

All of this back and forth across the lagoon would not have been possible without the engagement of the local LHI Marine Parks staff and business owners. Between jumping on glass bottom boats and kayaks from Lord Howe Environmental Tours and dinghies from LHI Marine Parks, we trotted across the lagoon over 50 times! But that is the beauty of these small islands—communities and businesses that rely on natural resources are highly motivated to understand (and hopefully prevent) declines in the environment. Many locals are also out on the water every single day—they are the single greatest resource a marine environmental scientist could have when trying to understand the natural dynamics of these islands and choosing where to sample. Having open and earnest communication is the key to a successful field trip in remote island locations.

But what do you do when you know what you’re studying, have a ride to your site and have discussed with locals where to go, but your supplies haven’t turned up yet? At LHI, any large packages (like large quantities of sample fixatives and DNA-free water) are delivered by ferry every two weeks. Because of this, if a package doesn’t make it to the ferry on time you are without any supplies for a significant amount of time. This is not an uncommon occurrence; locals will tell you many stories of waiting months to receive packages. As you might guess, this did happen to us. Understanding that it was a possibility prepared us for the worst, and backup plans were in place. It is important to always have a backup plan—it may not be ideal, but you have to push through until supplies arrive.

In working with the local community, we were careful to keep the lines of communication open, and our sampling and intended uses for those samples as transparent as possible. LHI made this remarkably easy—the local community are interested in scientific work and will actively engage in conversation with researchers. LHI also has an island-wide newsletter, The Lord Howe Island Signal, that is widely read throughout the island. On each of our research trips we have written articles updating the island on what we are doing and what we have found so far, allowing people to keep up with what is happening in their own backyards. Finally, the LHI Museum has very kindly given us a venue to discuss our research with the public on each of our trips, allowing us to present our research and answer public questions face to face. These outreach opportunities have been paramount in our continued success over multiple trips—it would be incredibly difficult to conduct research in such a small place if our research was not accepted by the local population.

Overall, remote islands offer some of the most scenic, interesting, and comprehensive research experiences, but they do come with more challenges than can fit in a single article. Island research is an excellent way to practice your wonder, excitement, patience, flexibility, creativity and people skills. If you’ve never dipped your toes in the waters of island ecology, I would definitely recommend it!

Our research team included Rosemary Steinberg, Tess Moriarty, Jessica Bergman, Charlotte Page, Melissa Pappas, Teresa Bednarek, Bill Leggat, Emma Johnston, Tracy Ainsworth.

We would like to thank Lord Howe Island Environmental Tours, ProDive Lord Howe Island, and the Lord Howe Island Marine Parks Service for all of their assistance during our time on the island.

For further information, contact Rosemary: r.steinberg@student.unsw.edu.au,

Or follow us on Twitter:
Rosemary Steinberg: @RosieRiots
Tess Moriarty: @TessMoriarty
Australia’s sub-Antarctic islands: Gifts to test ecological theory and inspire the world

Steven L. Chown & Laura Phillips
School of Biological Sciences, Monash University

Over the past several decades, much of our research and collaborations with colleagues has concerned the sub-Antarctic islands. These islands lie in the Southern Ocean, between about 40°S and 55°S, and are the only land in this region (with the exception of small parts of Australia, New Zealand and South America).

Australia is responsible for two of the sub-Antarctic island groups: the Heard and McDonald Islands (HIMI) in the Indian sector of the Southern Ocean, and Macquarie Island (MI) in the Pacific. We have been fortunate enough to work at both. Our research has spanned the mountainous, glaciated South Georgia in the west, to the more temperate Macquarie Island in the east. Our major aims have been to use sub-Antarctic island biotas to test ecological theories and provide answers to management questions relevant to the region and elsewhere.

Our work at Heard Island has been through a long-standing collaboration with the Australian Antarctic Division and a suite of collaborators both from the Division and elsewhere. Mostly our research has been focussed on two groups—weevils and springtails. Amazingly, HIMI has at least five species of weevils, most closely related to those of the Indian Ocean Province islands to the north and west (Kerguelen, Crozet and Prince Edwards). The fauna includes an extraordinary weevil which lives in the intertidal and feeds on algae and lichens. Weevils are the most diverse beetle family globally (tens of thousands of species) and are usually associated with flowering plants. The HIMI weevils are truly unusual because at least three of the species are specialists on algae, mosses and lichens.

Our work has tested the ecological idea that in seasonal climates, like that found on HIMI, body size in ectotherms decreases with declining temperatures. Low temperatures limit the growing season, thus insects cannot get very big. But in aseasonal climates (like the more northerly sub-Antarctic Prince Edward Islands), the opposite is true. By comparing HIMI and Prince Edward Islands weevils across the full elevational range of their distribution we were able to show how this happens.

Our later work also showed that invasive house mice at one of the Prince Edward Islands completely alter these patterns, changing community structure and functioning.

“Our research has spanned the mountainous, glaciated South Georgia in the west, to the more temperate Macquarie Island in the east.”

Heard Island in the southern Indian Ocean in 2017, a rare clear day. Credit: Steven L. Chown.
Luckily, HIMI is one of the few sub-Antarctic islands with almost no invasive species. Australia has done a great job of biosecurity, but our research has also shown that as climates warm, more will have to be done. HIMI environments are becoming easier for the establishment of non-indigenous species.

At MI, our recent work has had one major goal—we use springtails (small soil invertebrates key for all terrestrial ecosystems) to test the idea that warming and drying will benefit alien over indigenous species. What we have found is that, largely, this is true. Alien springtails tend to be more tolerant of dry conditions, develop faster and prefer warmer temperatures. Our research has shown that this is true not only for MI, but also for springtails down the coast of Australia, from the tropics to the sub-Antarctic.

Thus, soil systems will change significantly as anthropogenic climate change progresses, with non-indigenous species gaining the upper hand. We know from work elsewhere that changes to the springtail fauna can affect the functioning of both below-ground and above-ground systems. The two solutions are: keep up the biosecurity; and limit greenhouse gas emissions so that climate change is limited and eventually, we hope, reversed.

We often get asked what it’s like working on these islands. ‘Life-changing’ is the best response. Yes, it rains, snows and blows. And life in the field can be cold, wet and very uncomfortable. But it also glows; either from the Aurora Australis, from light reflected off glaciers, or from Big Ben on Heard Island showing that it is an active volcano.

A good lesson has also been to be careful about what you wish for. At Atlas Cove on HIMI, one of the small field camp teams wished for a white Christmas. Hey presto, it started snowing and sleet started the 23rd of December and did not let up until about the 18th of January!

Australians are in the fortunate position to be responsible for two sub-Antarctic island groups. That responsibility has been shown through the program at MI to remove alien vertebrates—a global success story. It has also been shown through the stringent biosecurity measures applied to visits to HIMI. As ecologists we have had the fortune to visit both places. Much further responsibility rests on us and all visitors to ensure that Australians are aware of these gifts to the world of knowledge and wonder.

For more information contact Steven Chown: Steven.Chown@monash.edu
Exploring a temperate rainforest inhabited island

**Baptiste Wijas**  
*Centre for Ecosystem Science, University of New South Wales*

I believe the idiom “so near yet so far” applies perfectly to islands. Although some islands can be seen from the coast, whether it be for us humans or any other species, getting onto an island is challenging. The isolation of islands is one of the reasons why they are such unique places. The slow turnover in species creates ecosystems that obey different ecological standards to the mainland, allowing unique species such as giant tortoises or flightless kiwi birds to prosper. The thought of coming across such individualities gave me the desire to explore an island. So, I decided to carry out six weeks of fieldwork on a remote island off the coast of Scotland with a research team to look at small mammals, birds, bees and rocks.

The first exciting part of the journey was the ferry. There is no going back once you’re on the ferry; you make sure that you have all your fieldwork gear as forgetting an expensive piece of equipment could cost you a significant amount. Once you’re on your way and are sure that you have everything, you can relax and admire the dolphins swimming by the boat! As the mainland disappears behind you and a piece of land starts appearing on the other side, the excitement rises as you can finally see where you will be staying for the next few weeks and can’t help but wonder what it will be like.

The island I worked on had a few small villages and a total population of 3,000 people. Once you arrive with the ferry you see a few houses, a pub, a grocery store, a post office and a coffee shop. Surely, I thought, that couldn’t be it, but it was. Finding our accommodation wasn’t hard though as there wasn’t many opportunities to get lost on the three roads crossing the island. Once we were settled in our house with an ocean view, it was time to get to work.

The island had one ranger whom we contacted to get more information about the island’s ecology and form a collaboration. A challenge on some islands is the lack of knowledge around certain species. Our research focussed on locally understudied species, being small mammals and bees. We therefore we had to get our preliminary data ourselves.

We also got in touch with a local organisation that had introduced recycling facilities on the island. We helped to clear plastic along a 100 m strip on the island’s longest beach, which had no inhabitants around it. We collected an astounding amount of plastic, most of which was washed in from the ocean. We were shown that layers of plastic were starting to accumulate under the sand, which was worrying to witness. Turns out a pristine beach, on a remote island, was being directly impacted by the deposition of plastics from the mainland, showing how the most remote of places are connected to the rest of the world.

I have also conducted research on temperate rainforest islands. While there is some general knowledge on island ecology, most of it comes from popularly studied systems such as the Florida Keys, the Galapagos or Hawaii, which are tropical ecosystems. Less is known of the ecology of boreal and temperate rainforest islands. The main...
challenge of studying temperate rainforest islands is that most of them are found within developed areas and have been heavily altered. As islands are fragile ecosystems, due to their small size and highly adapted species, the impacts of humans are more heavily felt. When humans start inhabiting a small island, logging and agriculture can increase, creating a barren landscape such as seen in the Easter Islands for instance.

While my research didn’t apply to island ecology directly, a previous study had shown that island gigantism applied to small mammals on this temperate rainforest island. This provides evidence for the worldwide existence of concepts such as this.

The small size of the island allowed us to get from one field site to the next easily, allowing us to do more detailed work around each area. Small islands can also be easier to manage in their entirety if they aren’t inhabited. However once people settle on a small island, the need for space can have negative impacts on the local ecosystems, creating prominent human-wildlife conflicts. Human-wildlife conflict can be witnessed, for instance, on Australian islands such as Fraser island where dingoes and humans come in frequent contact in part due to the small area in which they are found. Interestingly, little has been done around human-wildlife conflict on islands, but it could be an important avenue to explore.

The temperate rainforest island I worked on is of major importance as a breeding ground for migrating bird species, such as barnacle geese. However, the amount of protected areas on the island is very small compared to that exploited for human purposes. This offers a great risk to these populations which depend on this small space for their survival.

In conclusion, my personal experience has shown me that islands can be a great place to carry out fieldwork, as it introduces you to a unique environment. While the lack of knowledge around island ecology, especially in temperate and boreal systems, can be a setback, the thought of contributing to a new area of research makes it worthwhile. My experience has shown me that collaborating with local organisations opens up conversations on the future paths to take when carrying out fieldwork on an island. While islands may seem disconnected from other parts of the world, evidence shows that they are more connected than we think.

For more information contact Baptiste here: b.wijas@student.unsw.edu.au

“... islands can be a great place to carry out fieldwork as it introduces you to a unique environment.”

Island ecosystems face a large number of threats, such as overgrazing. Credit: Baptiste Wijas.
Dr. Erinn Richmond’s statement, a standpoint echoed throughout Ecological Society of Australia’s annual conference (ESA 2019) plenary talks, implies the damaging power of humanity on our biodiversity and the environment. Meanwhile, the voice of science has recently been forced into hiding by fear and its friends, misinformation and money. However, ESA 2019 has demonstrated fantastically how humanity can be a substantial positive driver of change in resolving our current environmental crises. The research presented this year sparkled with ingenuity and hope in developing socio-ecological approaches in science to provide practical solutions, as well as satisfying our innate ecological curiosities. The three key research areas at the 2019 conference had a heavy focus on indigenous land management practices and working on Country, achieving landscape-scale conservation practices, and using science communication effectively to see our solutions through.

**There has never been a more critical time for ecologists to inspire a community of practice through science.** Don Driscoll highlighted how and why science is suppressed or altered, resulting in uninformed policymakers that detrimentally affect public discourse and policy development. But Cass Hunter’s work demonstrates how we can unlock our science to the world by creating user-friendly, adaptive information that is receptive to a wide variety of audiences. Our ESA gold

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*Meena S. Sritharan  
Fenner School of Environment & Society, The Australian National University*

“Humans are substantial drivers of global change.”

**“The research presented this year sparkled with ingenuity and hope in developing socio-ecological approaches in science to provide practical solutions as well as satisfying our innate ecological curiosities.”**

*Dr. Menna Jones’ Keynote address on the first day was a fantastic introduction to the conference, highlighting the importance of taking a landscape scale approach to uncover socio-ecological interactions and processes to inform more effective conservation action. Credit: Meena S. Sritharan.*
medallist, Jann Williams, emphasised that science communication is a two-way street; not only do we need to speak (and speak out) about our science but we must also listen to the needs of our communities and act accordingly. This two-way connection between science and the public is critical in informing the actions we take, from conserving species like the Tasmanian Devil (Dr. Menna Jones), initiating effective changes in policy and writing better laws to protect our biodiversity (Dr. April Reside), to developing landscape-scale process conservation efforts (Dr. Gary Tabor). We are already seeing how our ecologists are communicating research in various art forms, ranging from comics and photography to musical ensembles and even stand-up comedy!

**The voices with which we communicate have led to cross-cultural dimensions in ecological research.** The ESA 2019 forums had a strong emphasis on working with Country to incorporate traditional land management practices for conservation outcomes. We’re traversing the urban space too, involving our local schools and councils to participate in conservation, whether we’re examining the human impacts of species on urban environments (Dr Caragh Threlfall and Dr Erinn Richmond) or marine ecosystems (Dr Adriana Vergès). Further, ESA’s new initiative, *ESA Envoys*, will assist in establishing connections with local government to support evidence-based policy and decision-making processes.

**ESA 2019 has shown us that by giving science a compelling, vision-driven voice, humans can be substantial positive drivers of change.** Our researchers have shown us how we can harness science to provide practical solutions by demonstrating how collective visions and communication are key to resolving our ecological dilemmas. Ecologists have a crucial role in providing accurate information to the public and need to further improve our ability to communicate by thinking outside the box, acknowledging traditional knowledge and strategically conveying our science to changing societal needs with its diverse preferences. Giving science a voice allows us to collectively tackle the fear and consequences that come with the restrictions on academic freedom, opening doors to establishing effective policies and practices that can have a positive, powerful impact Australia-wide.

I can’t wait to see how our voices will assist in enacting the change we ecologists wish to see in the world!

For more information, contact Meena here: Sivagowre.Sritharan@anu.edu.au,
In the first couple of years of my PhD, I would often find myself catching up with a friend at a party, going through the usual small talk:

“What did you do on the weekend?”

“What have you been up to?”

“What are your plans for the next while?”

Very quickly, my friends began to anticipate certain responses from me:

“I just got back from a field trip.” Or maybe:

“I’m off on a field trip next week.”

And sometimes, after noticing my suspect wrist tan lines or having been bombarded with cute animal photos on social media, the conversation will cut straight to “How was your field trip?”.

Despite social media and my efforts fervently showing people my study site locations on my phone, I think to many people my long desert field trips are something of a journey into empty space. But to me field work has become a quintessential component of my identity. Part of the reason I started my PhD in arid ecology was to ensure a field-work based lifestyle for a few more years before the real world demanded something else of me.

To my Uber drivers I describe my job as going to the desert to count plants and animals. This is the essence of each day’s routine, but of course there’s more to it. One of my study sites is in the Strzelecki desert, at the corner where New South Wales, Queensland and South Australia meet. To get there my volunteers and I have to drive for about 2 days. From 7am to 10pm. On the first day, after you’ve driven until you can’t drive anymore, you unroll a swag on the side of the road, sleep until sunrise, roll your swag back up and keep going. Early on the second day, when you hit the dirt road, the air conditioner goes off to save fuel. After a few hours, you find yourself in the real outback. It is in the wide open spaces of red sand country the Australian in me feels most at home.

Once we’re at our study site we start work. We do our flora and fauna surveys on sand dunes. Big, red, sand dunes. Sand gets everywhere. When it gets in the food it’s called desert spice. When I get back to the city it’s falling out of my shoes and pockets and bags for weeks.

Field work in the desert is all about self-sufficiency—we have only what we take with us. There’s no water available so we wash our dishes with paper towels and shower with baby wipes. We can go a week without seeing anyone else, but there’s no time to get lonely when you are working all day. This remoteness also means that it is much harder to get help if something happens, so you have to be constantly aware of your surroundings. Avoiding snakes is as simple as avoiding chewing gum on the sidewalk, really. But look down for too long and you might walk into a fence.

I find life in Sydney very draining. Every day I have to dedicate a certain amount of time and effort to planning how to get from A to B, catching public transport that never arrives. Waking up to traffic instead of sunshine. The constant social push to be out with friends drinking and eating—it’s fun but can be too crazy sometimes. Being away frequently also means I have to squeeze the same amount of socialising into half the time!

In the city time moves fast. I wake up and before I know it I’m ready for bed again. A day is defined by lists of tasks that never gets shorter and appointments with people all over the place.

In the desert time moves very differently. Nothing happens before sunrise, and everything slows down after sunset. Each day has tangible achievements and surprises that make you feel like you are getting to know the land a little bit better. As you explore you may see stone tools left by the traditional owners of the land, testaments to the long history of people waking up to dingo howls, birdsong and fresh animal footprints on the dunes.

Every day you get as much done as you can, then you accept that the day is over. You reminisce about having internet or hot water or food without desert spice. Weekends and holidays are a city thing. If things go
wrong and you can’t fix them, it can be very peaceful to have to just accept the situation and work around it.

Field work, and long, remote field trips aren’t for everyone. It can be disorientating, uncomfortable, and exhausting. But it can also offer space—both physical and mental.

If I had to pick one image to represent my idea of happiness, it would be waking up in red sand country, with the golden sunrise stretching as far as I can see, and knowing that another day of field work lay ahead.

For more information on Charlotte’s research, you can follow her on Twitter: @ecologistmills.

“Each day has tangible achievements and surprises that make you feel like you are getting to know the land a little bit better.”
Casey M Kirchhoff  
*University of New South Wales*

Fieldwork has been one of the most enjoyable, and at times challenging, parts of my PhD research. Despite occasional logistical difficulties, every time I arrive at my field sites I fall in love with my study system all over again. Working year-round in the alpine environment of Kosciuszko National Park has required extensive planning, networking, skill acquisition and, importantly, time. For the past two years, I have conducted a field experiment in which I have manipulated snow cover to see how alpine plants respond to lower snow depths during winter and earlier snowmelt during spring. During the snow-free season, plants are repeatedly measured, meaning a lot of time spent up the mountain.

Prior to setting up my field experiment and just a month into my PhD candidature, I got the supervisory green light to head to the mountains to scope out potential sites. After a quick crash course in using a SpotTrakker, GPS and EPIRB, I was on my way to Kosciuszko National Park. Even though I have spent a lot of time hiking in the Kosciuszko alpine region, the excitement and anticipation of walking through the alpine herbfields searching for tiny target species felt like learning a whole new way of seeing. I was hooked.

One thing that became clear soon after is that navigating the university OH&S system, and being on the good side of OH&S officers, was equally important as navigating the mountains. More than once I received queries on my risk assessment documentation listing ‘avalanche’ as a potential hazard. I’d like to say this is an over exaggeration, but just this year an avalanche occurred on the Etheridge Range, just across the valley from one of my sites. Alpine hazards are not something to take lightly. A rolling fog can engulf the mountains in mere seconds, reducing visibility to just a few meters, UV exposure is substantially higher than in the lowlands, and angry thunderstorms seemingly appear out of nowhere. Hazards aside, it seems I was never short of eager volunteers willing to spend a few days counting beautiful alpine wildflowers and tiny alpine leaves. After all, this fieldwork had perks; commuting up the mountain was via a ride on the Kosciuszko Express chairlift from Thredbo Village.

As much as I love seeing the alpine flora in bloom, as a skier, winter and early spring fieldwork has undoubtedly been my favourite. When the first snow starts to fall, I hop into my trusty old snowshoes, trudging across the ridgelines to clear snow from my plots. As the snow accumulates, there is a tradeoff between the time taken to reach my field sites and the time required to dig out the plots. There is a fine art to neatly shovelling snow off 1 m² plots, which I’d like to say I got pretty good at by the end of the experiment. For the most part, I would conduct winter fieldwork solo, with the exception of running into Australia’s premier alpine ecologist and my wonderful co-supervisor, Susanna Venn, in the Kosciuszko backcountry.

At times, winter alpine conditions made fieldwork impossible. Strong winds that fill a freshly dug plot with snow in a matter of minutes is deflating, as is driving all the way down to Kosciuszko only to find the snowpack covered with thick sheet ice, making the ski out to the plots impassable. Adverse conditions aside, winter fieldwork in the alpine really is something else, especially on a bluebird day when it’s just you, fresh snow and the beauty of the snow-covered mountains.

To read more about this fantastically unique alpine environment, check out the ‘Kosciuszko Alpine Flora’, or my Instagram: [alpine_flora_of_australia].
Communicating ecological challenges to children through books — Bird migration

Samantha Lloyd
South East Queensland Fire and Biodiversity Consortium

Children have an instinctive curiosity for the natural world. It is important that we nurture this curiosity and inquisitiveness, as it will encourage them to be aware of the ecological challenges facing the world, and maybe even be more proactive in addressing them. Children’s books can help achieve this by providing a gateway to exploring biology and ecology from around the world and in a wide variety of ecosystems that children may not otherwise be able to experience first-hand. Here I review a recent children’s book on bird migrations and the threats they face.

Title: Windcatcher: Migration of the Short-tailed Shearwater
Illustrator/Author/Design: Diane Jackson Hill and Craig Smith
Publisher: CSIRO Publishing
Themes: Bird migration, bird habitat, bird food, bird behaviour and bird biology.

This is another fantastic addition to CSIRO Publishing’s ever-growing collection of ecological and science themed books. Windcatcher: Migration of the Short-tailed Shearwater, is the remarkable story of a bird that makes a massive 30,000 km return journey from southern Australia to the Arctic Circle. The story follows the adventures of Hope, a fledgling Short-tailed shearwater and its perilous journey from the safety and warmth of its burrow on Griffith Island (near Port Fairy, Victoria), all the way to the Arctic Circle (and back).

This story highlights the challenges and risks that parent birds face to successfully rear their chicks, and how miraculous it is that a bird can make such a huge journey. We learn about the many threats the birds face on their journey, including getting tangled in fishing nets, exhaustion and, most disturbingly, the ingestion of plastic. Whilst there are theories, we still don’t fully understand how Short-tailed Shearwaters, and many other migratory birds, manage such a long journey, or how they manage to leave and arrive on approximately the same day each year.

Importantly, this story also tells us of the valuable work scientists and volunteers are doing on Griffith Island to tag and monitor hundreds of these birds, to help us learn more about this incredible species and safeguard its future.

CSIRO Publishing recommends this book for ages 6 – 9 years, but, honestly, I could see this book being well received by younger children as well (ages 4 – 6). This book could also be an excellent resource and inspiration for further investigation in upper primary school grades. There are two pages of reference information at the back and some excellent “Teacher Notes”, supporting the use of this book through a variety of grades.

To see the original review of this book, visit: https://childrensbooksdaily.com/book_reviews/review-of-windcatcher/
The Ecological Society of Australia Ltd (ESA) is the peak group of ecologists in Australia, with over 1500 members from all states and territories. The ESA has an impressive 50 year history supporting ecologists, promoting ecology and ecological research. We aim to create a community of knowledge and understanding amongst ecologists, and reach out to those working in related fields. We invite you to join us in our efforts to promote the scientific study of all organisms in relation to their environment, and encourage the application of ecological principles in the development, use and conservation of Australia’s natural resources. The ESA is a Registered Environmental Organisation with the Department of the Environment, and Registered Charity with the Australian Charities and Not-for-profits Commission. The ESA has Deductible Gift Recipient status.