



Newsletter

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From the Editor

Kia ora koutou,

Welcome to the 179th NZES newsletter! Winter feels like it has truly set in here, so I hope you all are staying warm. I also hope you had a wonderful Matariki and it was a good chance to pause, reflect, and think about the future too. This newsletter contains several notices about upcoming conferences (including the NZES conference later this year!), as well as Notes from the Journal Editor's Desk, and Introduction to our new NZES Sustainability Officer, Illustrate Ecology and Ecotones.

I hope you enjoy this newsletter, and be well this winter.

Ngā mihi, Rowan

News from NZES Council

Mānawatia a Matariki

The NZES Council met in early April, and confirmed the appointment of Vanitha Elangovan as the new NZES Sustainability Officer. This is an exoffico Council position, responsible for the implementation of the NZES Sustainability Strategy. I would like to welcome Vanitha to Council, and I look forward to the new ideas and enthusiasm I am sure she will bring to the role. One of the key activities of the Sustainability Officer role is to make sure our conferences have as low an environmental impact as possible. Planning for this year's conference in Dunedin is well underway. The Conference Organising Committee is working hard alongside our professional conference organisers, Conferences & Events, on what is shaping up to be a great conference with an impressive array of symposia.

In our recent member survey, several respondents noted that they would like NZES to be active in making submissions. Over the years, several members have kindly contributed an enormous amount of time preparing submissions, and the Society continues to make submissions on relevant topics of national importance. NZES was recently invited to give feedback on conservation law reform being undertaken by the Department of Conservation. In June we prepared a submission on amendments to Conservation Act permitting, and we will make a submission on revisions to the Wildlife Act at a later stage. I'm grateful to Rod Hitchmough in particular for contributing his time and expertise to conservation law reform submissions, and Tim Curran for coordinating our input. Review of conservation legislation has important implications for the activities of many of our members, and for conservation in New Zealand. We rely on members to volunteer their time and expertise in order to prepare submissions on behalf of the Society. So if you would like to contribute to future submissions on conservation law reform, or may be willing to be involved in submissions on other topics that arise, please contact our Submissions Coordinator Tim Curran.

In other news, NZES Secretary Kate McAlpine continues to do a fabulous job running the popular NZES Mentoring Scheme, with 17 mentee/mentor pairs matched up in 2022. Thanks to all those members willing to contribute their time and wisdom as mentors. If you would like to be involved next year as either a mentor or mentee, you can find out more information on the Members-Only area of the NZES website.

Tēnā koutou, tēnā koutou, tēnā tātou katoa.

Debra Wotton

Introduction from Vanitha Elangovan, new NZES Sustainability Officer

I am working for DOC as a Biodiversity Flora ranger. My mahi includes weed control, threatened plant monitoring in the Maniapoto King Country District and other biodiversity ranger work. I'm passionate about native regeneration and restoration. My interest in ecology stems from wanting to understand the interactions and complexities of nature and our place within it. I try to practice waste free living as much as possible in my everyday life, and love to promote sustainability amongst people! One other thing that other people might not know about me is that I used to run volunteer yoga classes.



Notes from the Journal Editor's Desk



Posthumous authorship

There was an interesting issue that came up recently, how to deal with posthumous authorship. This topic is clearly one that has the potential to cause upset, so I felt it was important that the journal created some guidance around how to handle the situation in a clear, concise, and kind manner. I have had some experience of this myself having joined an authorship team to help complete a paper that was in revision when one of the authors died unexpectedly, and I remember the corresponding author struggling to balance their own ethical views with the journal's authorship requirements.

The problem is that like most science journals, our journal follows the <u>authorship guidelines of the</u>

International Committee of Medical Journal Editors, which include a requirement of all authors to both approve the final manuscript and take responsibility for the content post-publication. Clearly a deceased author cannot do either of these, and hence would fail to meet the criteria for authorship. But I think many co-authors would want to give appropriate credit for a deceased colleague who may have been instrumental in designing and undertaking a study, and potentially have been involved in much of the writing. Such levels of input would certainly warrant authorship, and in such a situation it seems unnecessarily cruel for the journal to potentially insist a deceased author be removed from the author list – especially if the death is recent.

So, what to do? It transpires that there is not a lot of guidance, but I did find one discussion by <u>Teixeira da Silva and Dobránszki (2015)</u> that seemed to take a simple pragmatic approach. The key concern seems to be ensuring that the situation is clearly communicated such that the deceased author's name isn't associated with things that were beyond their control. The journal recently introduced a requirement for an Author Contributions section, and while this section's purpose is primarily to document who did what, I see no reason why it cannot also be used to document who did not do what. So, including a statement here to the effect that there is posthumous authorship, and explaining the elements of the work that the deceased author was not able to comment on, would seem to me to be a way to recognise the involvement of a recently deceased scientist, while also protecting their scientific legacy by making it clear which elements of the work they were unable to take responsibility for. Therefore, the Author Guidelines have now been updated to take this situation into account so that hopefully it will be easier for our editors and authors to efficiently and delicately work through any future instances of posthumous authorship.

Any compliments and complaints about the journal are always welcome at nzjecol.editor@gmail.com be it on this topic or any other.

Tom Etherington Scientific Editor, New Zealand Journal of Ecology

Illustrate Ecology

The inside-out Bag-moth problems

John Flux



When a bag-moth doubled its size in a month (20.4.22 – 19.5.22) eating my highly poisonous Castor oil plant (*Recinus communis*) I was not too surprised – they are called *Liothula omnivora* – and admired the way it navigated complex leaf forms in the dark (Fig. 1. Arrows show silk cable

to temporary anchor plate). Then a wasp (*Vespula vulgaris*) giving up after eight minutes chewing at the bag without leaving a mark (Fig. 2) sent me to Google. In 2016 Japanese and Chinese researchers discovered bag-moth silk was many times stronger than any other: Hudson (1898) wrote "it is impossible to tear it, or indeed cut it, except with sharp instruments". Wasp's problem solved. Bag-moths have tachinid parasites, that look like blowflies, which emerge by the frass vent at the foot of the bag, after eating the caterpillar. But the tachinids have hyperparasitic wasps that chew neat holes (Figs. 3,4). How? And why not use the frass vent?

Notice about Island Biology Conference 2023

We would like to inform you that due to causes beyond our control, i.e., the complex situation of the COVID pandemic in New Zealand that has already forced the delay from July 2022 to July 2023 of the 4th Island Biology Symposium to be held in Wellington, the board has decided to **cancel the Wellington event**. This decision has been made after an intense debate and was finally reached due to the large uncertainty existing about the possibilities of celebrating the event in Wellington, and as such international events need at least one year of preparation, we decide to assure our 2023 meeting by shifting its location.

After analysing several possible options, the SIB board has finally decided to bring the **International Island Biology 2023 Symposium** to the Mediterranean Sea, and more concretely, to the **Italian Aeolian Islands**, the unique active volcanic archipelago of the Mediterranean Sea. With that aim a local organization committee, formed by eminent Italian Island Biologists led by **Prof. Alessandro Chiarucci, with the involvement of Riccardo Guarino and Simone Fattorini**, has been already formed and is working very hard to make the personal reencounter of island researchers and managers worldwide possible again from the **3rd to the 7th of July 2023**. You will receive soon more information about the event, but for the moment please save those dates in your agendas.

Notice about Australasian Society for the Study of Animal Behaviour Conference (ASSAB 2022)

We invite you all to come together online for the ASSAB 2022 conference running for three days from the 29th of August, 2022 – 31st of August, 2022. The registrations are now open and you can find more info here: <u>https://assab.memberjungle.com/assab-2022</u> For any questions, contact us at: <u>conference@assab.org</u>

NZES Conference Notice



New Zealand Ecological Society 2022 Conference 28 November - 1 December 2022 University of Otago, Dunedin

14 symposia announced with call for abstracts open!

NZES is calling to members of the New Zealand ecological community to submit abstracts for the 2022 conference. Submissions are welcome across all ecological topics. One of the key aims of NZES is to provide an opportunity for ecologists from all career stages to share their work annually.

Key Dates

4 September 2022 – Abstracts submission deadline
30 September 2022 – Presentations acceptance advised
October 2022 - Programme Announced

Are you a student? Looking for travel support?

Be sure to visit the <u>NZES website by clicking here</u> to learn more about applying for a student travel grant for the conference. You will need to submit an application to NZES as well as an abstract via this webpage by the abstract deadline.

More on abstracts here

Confirmed Symposia

Pollination focused Plant-Animal Interactions Symposium Organiser: Max Buxton (Plant & Food Research)

Aotearoa in the dark - effects and mitigation of artificial light at night

Organiser: Ellen Cieraad (Nelson Marlborough Institute of Technology)

Bridging the gap: integrating conservation genomics into species management

Organiser: Ludovic Dutoit (University of Otago)

Coastal People Southern Skies

Organiser: Chris Hepburn (University of Otago)

PF2050 and beyond

Organiser: Dan Tompkins (Predator Free 2050) & Clement Lagrue (Department of Conservation)

Environmental Weeds

Organiser: Kate McAlpine (Department of Conservation)

Invertebrate Ecology and Conservation

Organiser: Tara Murray (Department of Conservation)

Bioacoustics for New Zealand Wildlife: Applications and Challenges

Organiser: Zohara Rafi (University of Otago)

Palaeoecology of Aotearoa New Zealand Organiser: Nic Rawlence (University of Otago)

Restoration of New Zealand subantarctic islands Organiser: James Russell (University of Auckland)

Partnerships for Ecology and Conservation: case studies and lessons from successful partnerships Organiser: TBC

Urban Ecology: People and nature

Organiser: Dr. Margaret Stanley (University of Auckland)

Opportunities and challenges for conservation translocations in Aotearoa New Zealand

Organiser: Zoe Stone (Massey University)

Ecosystem impacts of tree pathogens

Organisers: Dr. Marijke Struijk & Dr. Andrew Barnes (University of Waikato)

INTECOL Registration is Open

The upcoming INTECOL 2022 conference will be in Geneva from August 28 to September 2 2022.

Check the list of <u>keynote speakers</u> and <u>great sessions</u> that we are planning. <u>Registrations</u> are now open; this will be a hybrid event, with inperson sessions which will be live-streamed.

If you are interested, **join us on Twitter** to keep you updated: <u>@intecol20222</u>

Call for applications to Editor-in-Chief of *Ecospheres*

The Ecological Society of America is seeking applicants for the position of Editor-in-Chief of its Open Access journal Ecosphere. This broad and expansive publication covers subdisciplines across ecology. It is comprised of 12 focus areas with their own editorial boards and submissions: Agroecosystems, Coastal and Marine Ecology, Disease Ecology, Eco-Education, Ecology of Critical Zones, Ecosphere Naturalist, Emerging Technologies, Faunal Studies, Freshwater Ecology, General Ecology, Macrosystems Ecology, Methods, Tools, and Technologies, and Socio-Ecological Systems. The position is part-time and is competitively compensated.

For a full job description and application information, please consult [Career Opportunities at ESA – The Ecological Society of America].

Completed applications must be emailed to <u>editorsearch@esa.org</u>. The review of applications will begin on July 1st, 2022. We welcome applicants

from diverse and international backgrounds. All applications will be strictly confidential.

Ecotones – New ecological research

Bruce Burns, University of Auckland

A selection of recently published research on or relevant to New Zealand ecology (except that published in the New Zealand Journal of Ecology). The list of other publications on New Zealand ecology can be found towards the end of the newsletter.

1. Ship rats moving up in the world

With global climate change, weather patterns are predicted to change and temperatures to increase. How might climate change affect the intensity and distribution of impacts of mammalian predators, considered a key threat to New Zealand biodiversity? One of these predators is the ship rat (Rattus rattus), which is now widespread. Historically, however, areas above 1000m elevation generally have been refuges from ship rat populations, which are limited by low temperatures. Harris et al. (2022) have recently analysed stoat and ship rat trap catches at Craigieburn Forest Park from 2007-2020 in relation to mean winter temperatures and beech seedfall. The key results of this analysis were that ship rat catches and mean winter temperatures both increased over time, suggesting a possible relationship between these two variables, but stoat catches remained the same. The increases in ship rat catch rates are probably related to ship rats effectively colonizing mid-elevations during the period studied. This upslope expansion seems likely to have occurred because of increases in winter temperatures. There was no significant increase in seedfall over this period, so this seems unlikely to have driven the increase in ship rat abundance but may explain why stoats did not increase. Therefore, areas at high elevation that previously were refuges from ship rats because they were cold, may no longer be protected. The often-distinctive alpine organisms that live there are now probably under more predation threat from ship rats than before, with this likely to still increase further in the future.

Harris HAL, Kelly D, Innes J, Allen RB 2022. Invasive species and thermal squeeze: distribution of two invasive predators and drivers of ship rat (*Rattus rattus*) invasion in mid-elevation *Fuscospora* forest. Biological Invasions, in press.



Cass Saddle, Craigieburn Forest Park (CC by 4.0) Image source: Michal Klajban

2. What roles can New Zealand native earthworms play in agricultural ecosystems?

Despite the impacts of earthworms on soil characteristics, the identities and roles of New Zealand native earthworms within New Zealand ecosystems are poorly understood. Native species were mostly displaced from soils developed for agriculture during New Zealand's pioneering phase, and now are predominantly restricted to native vegetation in forest reserves or marginal habitats. Native and exotic earthworm species do appear to coexist in some soils, however, so do native and exotic earthworms affect soils differently? Could native species fulfil soilenhancing roles in New Zealand agricultural soils? Kim et al (2022) have explored these questions by comparing the actions of native and exotic earthworms separately on typical pastoral soil using microcosms. Somewhat surprisingly, they found that the native earthworms were guite tolerant of agricultural soils, and modified soil properties in them more than exotic species, enhancing the bioavailability of a number of key soil nutrients (e.g., N, P, S, K, and Ca). They also suggested that the main cause of their original disappearance from agricultural soils was caused by soil disturbance, so populations of native species should expand into such soils if low tillage agriculture becomes more widespread. Finally, they advocate for increasing native plantings around or within farmland to increase the potential for native earthworm populations to persist and spread in these situations.

Kim Y-N, Robinson B, Boyer S, Zhong H, Lee K-A, Lee YB, Dickinson N 2022. Agroecology niche for New Zealand's native earthworms. Applied Soil Ecology 176: art. no. 104506.



Octochaetus multiporus, a New Zealand native earthworm Image source: Maria Minor and Alastair Robertson (from <u>www.soilbugs.massey.ac.nz</u>).

3. Gearing up for city living: pīwakawaka morph to fit the urban lifestyle

A key impact of humans on the environment is the creation of urban habitats. Such habitats alter local abiotic and biotic factors and create novel environmental conditions for the resident biota. This can include increased temperatures, modifications in available resources, introduction of many non-native species, and changes in key interactions such as predation. For those species able to tolerate urban conditions, will these changes in habitat be reflected in changes in morphology between urban and non-urban populations? Amiot et al. (2022) have considered this question for pīwakawaka (*Rhipidura fuliginosa*) living along an urban-rural gradient on the North Shore of Auckland. They compared morphology associated with feeding ecology and movement ability to escape predators. Their measurements show that urban piwakawaka have different shaped (stubbier) bills than their country cousins, but no differences in morphology associated with movement (e.g., wing and tail size and shape). Shorter, wider bills in urban piwakawaka may be a response to generally, larger invertebrate prey occurring in urban areas, or the need to forage on harder ground surfaces. Lack of evolution of morphology associated with avoiding predators may be because of similar predation pressure of adult piwakawaka along the gradient. Nevertheless, this study demonstrates that urbanisation can cause changes in bird niches with subsequent effects on species adaptation.

Amiot C, Harmange C, Ji W 2022. Morphological differences along a chronological gradient of urbanisation in an endemic insectivorous bird of New Zealand. Urban Ecosystems 25 (2): 465-475.



Pīwakawaka (*Rhipidura fuliginosa*) Image source: Bernard Spragg (CC by 1.0)

4. Reproductive biology of critically endangered tree revealed.

New Zealand has a highly endemic flora with over 400 threatened plant taxa. One of the most critically endangered of these threatened plants is Metrosideros bartlettii (rātā moehau), a tree that can grow up to 30m tall and is related to M. excelsa (pohutukawa) but with white flowers. Rata moehau was first discovered in 1975 as a species already in decline. Its natural distribution is now highly restricted to only c. 14 plants in three forest patches near Cape Reinga. Although trees flower profusely, some of the most concerning characteristics of these populations are the low to non-existent seed set and the almost complete absence of seedlings. van der Walt et al. (2022) have recently determined the reproductive biology of this species to help explain this reproductive failure. For this exercise, cultivated plants were used for which the source populations were known. On these trees, different pollination treatments were imposed to test for ability to self-pollinate, ability to cross-pollinate with pollen from a different genotype (=source population), and ability to form hybrids with pohutukawa. If seed was produced, germination and seedling development were followed to assess survival and vigour. From these experiments, rātā moehau was found to be highly self-incompatible, and

only seed from flowers cross-pollinated with pollen from plants from a different source population had high viability and produced vigorous seedlings. Although some seed was formed by hybridization with pōhutukawa, germinated hybrid seedlings failed to survive long. These results suggest that the distance between the three extant populations and perhaps the lack of suitable pollinators makes pollen interchange unlikely and could explain the lack of recent recruitment in the wild. It also suggests that conservation of rātā moehau is likely to require active intervention in the future to facilitate cross-pollination and enhance existing populations.

van der Walt K, Alderton-Moss J, Lehnebach CA 2022. Cross-pollination and pollen storage to assist conservation of *Metrosideros bartlettii* (Myrtaceae), a critically endangered tree from Aotearoa New Zealand. Pacific Conservation Biology, in press.



Rātā moehau (*Metrosideros bartlettii*) in flower. Image source: Bruce Burns

5. The once (and future?) forest type of central Otago

The centre of the South Island (central Otago) presents valleys with continental-style climates: hot in summer, cold in winter, and very dry. Although mostly treeless and dominated by grasslands and shrublands over human history, scattered subfossil charred logs, charcoal and other plant remains suggest that the prehuman vegetation of these landscapes was of low-density forest in some form. So, what was the forest composition and structure of central Otago vegetation immediately prior to human arrival? This guestion has been tackled over time by several palaeoecologists, with various reconstructions based on analyses of subfossil remains, pollen, and ecological modelling. Pole (2022) has now provided a further and fresh answer to this question based on plant microfossils (cuticle material) preserved under 115 rock overhangs in this region. These plant remains were probably moved into these rock shelters by moa bringing in roosting material, with moa coprolites associated with the vegetation deposits. Results of this analysis confirm the view that this landscape was more highly vegetated than now in pre-human times and suggest the existence of a low forest dominated by Sophora microphylla. This species was probably associated with other small trees, including Pittosporum tenuifolium and Pseudopanax ferox. Interestingly, Pole (2022) did not find any trace of conifers which have been suggested previously as major components of these extinct forests. It will be fascinating to see whether the past composition suggested by Pole (2022) are experimented with by restoration practitioners in this region; perhaps we will one day see hillsides of yellow flowering S. microphylla in spring here that once moa may have seen.

Pole M 2022. A vanished ecosystem: *Sophora microphylla* (kōwhai) dominated forest recorded in mid-late Holocene rock shelters in Central Otago, New Zealand. Palaeontologia Electronica 25 (1): art. no. a1.



Sophora microphylla near Cromwell, central Otago. Image source: John Barkla (CC by 4.0)

Publications in the current issue of NZ Journal of Ecology (volume 46, issue 2)

Research Article

Acoustic monitoring and occupancy analysis: cost-effective tools in reintroduction programmes for roroa-great spotted kiwi : 3466 Peter Jahn, James G. Ross, Darryl I. MacKenzie, Laura E. Molles

<u>Invasive rats consuming mountain flax nectar – resource competitors and possible pollinators?</u> : 3474 Marion L. Donald, Manpreet K. Dhami

<u>A partial skeleton provides evidence for the former occurrence of moa</u> <u>populations on Rakiura Stewart Island</u> : 3458 Alexander J. F. Verry, Matthew Schmidt, Nicolas J. Rawlence

<u>Genetic diversity and differentiation in the leaf litter weevil Geochus</u> <u>politus across an urban-rural gradient</u> : 3459 Talia Brav-Cubitt, Richard A. B. Leschen, Andrew J. Veale, Thomas R. Buckley

<u>Understanding farmer behaviour: A psychological approach to</u> <u>encouraging pro-biodiversity actions on-farm</u> : 3468 Bruce Small, Fleur J. F. Maseyk

<u>Growth and survival of transplanted black beech (Fuscospora solandri)</u> <u>seedlings on Motuareronui (Adele Island)</u> : 3469 Simon Moore, Ron Moorhouse, Graeme Elliott, Helen Lindsay

<u>Toxin-laced rat carcass baits for stoat elimination</u> : 3453 Margaret Nichols, Jennifer Dent, Alexandra Edwards

<u>Testing the effectiveness of integrated pest control at protecting whio</u> (Hymenolaimus malacorhynchos) from stoat (Mustela erminea) predation in beech forest (Nothofagaceae) : 3470 Kate E Steffens, Jason P Malham, Rebecca S Davies, Graeme P Elliott

At-sea foraging behaviour in Hutton's shearwater (Puffinus huttoni) as revealed by stable isotope analysis : 3462 Della G. Bennet, Travis W. Horton, Sharyn J. Goldstien, Lindsay Rowe, James V. Briskie

<u>A risk to the forestry industry? Invasive pines as hosts of foliar fungi and</u> <u>potential pathogens</u> : 3471 Georgia S. Steel, Ian A. Dickie, Sarah J. Sapsford Sounding out the nest: Unobtrusive localisation of North Island brown kiwi (Apteryx mantelli) incubation burrows : 3463 Susan Ellis, Stephen Marsland

Do mice matter? Impacts of house mice alone on invertebrates, seedlings and fungi at Sanctuary Mountain Maungatautari : 3472 Corinne Watts, John Innes, Deborah J. Wilson, Danny Thornburrow, Scott Bartlam, Neil Fitzgerald, Vanessa Cave, Mark Smale, Gary Barker, Mahajabeen Padamsee

<u>Burn probability mapping of Moutohorā (Whale Island), Bay of Plenty,</u> <u>Aotearoa New Zealand</u> : 3456 Brendon Christensen

<u>Attitudes and motivations of New Zealand conservation volunteers</u> : 3464 Aaron Heimann, Fabien Medvecky

<u>Future climates are predicted to alter the potential distributions of non-</u> <u>native conifer species in New Zealand</u> : 3473 Thomas R. Etherington, Duane A. Peltzer, Sarah V. Wyse

Moths can transfer pollen between flowers under experimental conditions : 3457 Max N. Buxton, Barbara J. Anderson, Janice M. Lord

<u>Thermal and physical characteristics of the nesting habitat of New</u> <u>Zealand's only endemic oviparous lizard</u> : 3465 Christopher K. Woolley, Kelly M. Hare, Vaughn Stenhouse, Nicola J. Nelson

Review Article

<u>Current knowledge and potential impacts of climate change on New</u> <u>Zealand's biological heritage</u> : 3467 Linda J. Keegan, Richard S. A. White, Cate Macinnis-Ng

<u>Kiwi translocation review: are we releasing enough birds and to the right</u> <u>places?</u>: 3454 Peter Jahn, E Fernando Cagua, Laura E Molles, James G Ross, Jennifer M Germano

<u>The biogeochemistry and ecological impact of Westland petrels</u> (<u>Procellaria westlandica</u>) on terrestrial ecosystems : 3455 David Hawke

Editorial

Implementing the Transparency and Openness Promotion Guidelines for data and code to support computational reproducibility within the New Zealand Journal of Ecology : 3460

Thomas R. Etherington, James M. R. Brock, George L. W. Perry, Sarah V. Wyse

Obituary

Ian Athol Edward Atkinson MSc (NZ) PhD (Hawaii) 1932–2019 : 3461 Mark C. Smale

Other recent publications on New Zealand ecology

Bruce Burns, University of Auckland

Apologies if I have missed your publication in my search. If I have, please send a citation to <u>b.burns@auckland.ac.nz</u> so I can include it in the next Ecotones.

- Alder A, Jeffs AG, Hillman JR 2022. The importance of stock selection for improving transplantation efficiency. Restoration Ecology 30 (4): art. no. e13561.
- Anderson M, Hartley S, Wittmer HU 2022. Distribution, density and habitat association of the Cook Strait click beetle (*Amychus granulatus* Coleoptera: Elateridae) on Te Pākeka/Maud Island, New Zealand. New Zealand Journal of Zoology, in press.
- Andrews CE, Anderson SH, van der Walt K, Thorogood R, Ewen JG 2022. Evaluating the success of functional restoration after reintroduction of a lost avian pollinator. Conservation Biology, in press.
- Armstrong DP, Boulton RL, McArthur N, Govella S, Gorman N, Pike R, Richard Y 2022. Using experimental reintroductions to resolve the roles of habitat quality and metapopulation dynamics on patch occupancy in fragmented landscapes. Conservation Biology 36 (3): art. no. e13843.
- Arranz V, Liggins L, Aguirre JD 2022. Metabarcoding hyperdiverse kelp holdfast communities on temperate reefs: An experimental approach to inform future studies. Environmental DNA 4 (3): 492-509.
- Atalah J, South PM, Briscoe DK, Vennell R 2022. Inferring parental areas of juvenile mussels using hydrodynamic modelling. Aquaculture 555: art. no. 738227.
- Ausseil A-GE, Greenhalgh S, Booth P, Lavorel S, Collins A 2022. A novel approach to identify and prioritize the connections between nature and people's well-being in New Zealand. Frontiers in Environmental Science 10: art. no. 782229.

Bastos AP, Nelson XJ, Taylor AH 2022. From the lab to the wild: how can captive studies aid the conservation of kea (*Nestor notabilis*)? Current Opinion in Behavioral Sciences 45: art. no. 101131.

Biessy L, Pearman JK, Waters S, Vandergoes MJ, Wood SA 2022. Metagenomic insights to the functional potential of sediment microbial communities in freshwater lakes. Metabarcoding and Metagenomics 6: 59-74.

Boyce P, Bhattacharyya J, Linklater W 2022. The need for formal reflexivity in conservation science. Conservation Biology 36 (2): art. no. e13840.

Brand SC, Jeffs AG 2022. The potential for proliferation of an invasive fanworm due to harvesting in mussel aquaculture. Aquaculture 552: art. no. 738027.

Carpenter J, Monks A, Innes J, Griffiths J 2022. Pushing the limits: ship rat (*Rattus rattus*) population dynamics across an elevational gradient in response to mast seeding and supplementary feeding. Biological Invasions, in press.

Carroll EL, Dunshea G, Ott PH, Valenzuela LO, Baker CS, Childerhouse SJ, Gaggiotti OE, Flores PAC, Groch K, Gröcke DR, Hindell MA, Lundquist D, Oliveira LR, Rowntree V, Sironi M, Newsome SD 2022. Variation in δ 13C and δ 15N values of mothers and their calves across southern right whale nursery grounds: The effects of nutritional stress? Marine Mammal Science 38 (2): 486-499.

Cook B, Mulgan N 2022. Targeted mop up and robust response tools can achieve and maintain possum freedom on the mainland. Animals 12 (7): art. no. 921.

- Costan C-A, Godsoe WK, Bufford JL, Marris JWM, Hulme PE 2022. Can the enemy release hypothesis explain the success of *Rumex* (Polygonaceae) species in an introduced range? Biological Invasions, in press.
- Cui X, Paterson AM, Perry GL, Wyse SV, Alam MA, Huang C, Zhou S, Xiao L, Lai C, He F, Cao D, Marshall K, Curran TJ 2022. Intraspecific variation in shoot flammability in *Dracophyllum rosmarinifolium* is not predicted by habitat environmental conditions. Forest Ecosystems 9: art. no. 100017.
- Dencer-Brown AM, Jarvis RM, Alfaro AC, Milne S 2022. The mixed methods practical sustainability research framework: an illustration from research on the creeping problem of coastal complexity and mangrove management. Journal of Mixed Methods Research 16 (2): 242-259.
- Diantina S, McGill C, Millner J, Nadarajan J, Pritchard HW, Colville L, Clavijo McCormick A 2022. Seed viability and fatty acid profiles of five orchid species before and after ageing. Plant Biology 24 (1): 168-175.
- Dodd S, Shah F, Kimberley M, Somchit C, Hood I 2022. Differentiating individuals of *Armillaria* species in New Zealand forests. New Zealand Journal of Forestry Science 52, in press.

- Dollery R, Bowie MH, Dickinson NM 2022. The ecological importance of moss ground cover in dry shrubland restoration within an irrigated agricultural landscape matrix. Ecology and Evolution 12 (4): art. no. e8843.
- Effah E, Min Tun K, Rangiwananga N, McCormick AC 2022. Mānuka clones differ in their volatile profiles: potential implications for plant defence, pollinator attraction and bee products. Agronomy 12 (1): art. no. 169.
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