Notable Papers

Publications in peer-reviewed journals were one of the highest priority outputs for the AntEco programme. The list below highlights the major publications.

Major Papers

A) Spatial ecology

Jansen, J., Hill, N.A., Dunstan, P.K., McKinlay, J., Sumner, M.D., Post, A.L., ... & Johnson, C.R. (2018). Abundance and richness of key Antarctic seafloor fauna correlates with modelled food availability. *Nature Ecology & Evolution*, **2(1),** 71. https://doi.org/10.1038/s41559-017-0392-3

> This work explores the strength of pelagic–benthic coupling along the East Antarctic shelf and its dependence on both physical processes and the types of benthic organisms considered.

B) Molecular Ecology & Evolution

Strugnell, J.M., Pedro, J., Wilson, N.G. (2018). Dating Antarctic ice sheet collapse: proposing a molecular genetic approach. *Quaternary Science Reviews.* https://doi.org/10.1016/j.quascirev.2017.11.014

> This perspective piece sets out an ecological genetics method to help resolve when the West Antarctic Ice Shelf last collapsed.

Biersma E.M., Jackson J., Hyvönen, J., Koskinen, S., Linse K., Griffiths H. & Convey. P. (2017). Global movements in bipolar moss species. *Royal Society Open Science* **4**: 170147. https://doi.org/10.1098/rsos.170147

> First use of molecular biological approaches to document and estimate timing of (rare) bipolar dispersal events into and from both Polar Regions over multimillion-year timescales in a major bipolar moss genus.

C) Ecoinformatics & systems biology

Archer, S.D.J., *et al.* (2019). Airborne microbial transport limitation to isolated Antarctic soil habitats. *Nature Microbiology*. https://doi.org/10.1038/s41564-019-0370-4

> This paper demonstrates, for the first time, there is evidence for very limited local aerial transport of soil particles and their associated microbiomes in Antarctica, which has implications for local microbiome endemicity in Antarctic Dry Valleys.

D) Paleoecology

Roberts, S.J., Monien, P., Foster, L.C., Loftfield, J., et al. (2017). Past penguin colony responses to explosive volcanism on the Antarctic Peninsula. *Nature Communications*, **8**. 16 pp. https://doi.org/10.1038/ncomms14914

Amesbury, M.J., Roland, T.P, Royles, J., Hodgson, D.A., Convey, P., Griffiths, H. & Charman. D.J. (2017). Widespread biological response to rapid warming on the Antarctic Peninsula. *Current Biology* **27**, 1616-1622, https://doi.org/10.1016/j.cub.2017.04.034

Paper using palaeobiological evidence from moss peat cores and contained microbiota to infer wide scale responses over time to climate change across the entire Antarctic Peninsula.

E) Impacts, trends & conservation

Griffiths, H. J., Meijers, A. J., & Bracegirdle, T. J. (2017). More losers than winners in a century of future Southern Ocean seafloor warming. *Nature Climate Change*, ***7*(10)**, 749. https://doi.org/10.1038/nclimate3377

This work provides insights into the potential impacts of climate change on benthic species and communities in the Southern Ocean. It uses data collected for the SCAR Biogeographic Atlas to form the basis of the analyses.

Lee, J.R., Raymond, B., Bracegirdle, T.J., Chadès, I., Fuller, R.A., Shaw, J. D., & Terauds, A. (2017). Climate change drives expansion of Antarctic ice-free habitat. *Nature*, **547(7661)**, 49. https://doi.org/10.1038/nature22996

The authors find that isolated ice-free areas will coalesce over the twenty-first century due to climate change. While the effects on biodiversity are uncertain, they hypothesize that changes could eventually lead to increasing biotic homogenization, the extinction of less-competitive species and the spread of invasive species.

Other Notable Papers

2019

Bokhorst, S., Convey, P., & Aerts, R. (2019). Nitrogen Inputs by Marine Vertebrates Drive Abundance and Richness in Antarctic Terrestrial Ecosystems. *Current Biology*. https://doi.org/10.1016/j.cub.2019.04.038

This is the first clear Antarctic documentation of the importance of fertilization of the terrestrial environment by top predators in determining the biodiversity of vegetation on land. The work is significant as it provides a proxy for distribution of Antarctic terrestrial diversity on both Peninsula and continent.

Hughes, K.A., Convey, P., Pertierra, L.R., Vega, G.C., Aragón, P., Olalla-Tárraga, M.Á. (2019). Human-mediated dispersal of terrestrial species between Antarctic biogeographic regions: A preliminary risk assessment. *Journal of Environmental Management* 232, 73-89. https://doi.org/10.1016/j.jenvman.2018.10.095

This paper strongly highlights of the risks and implications of human transfer, and is an illustration of the increasing use of climate and biological modelling in predicting future distributions of both native and non-native species.

Moles, J.; Avila, C.; Malaquías, M.A. (2019). Unmasking Antarctic cryptic lineages: novel evidence from philinoid snails (Gastropoda: Cephalaspidea). *Cladistics* 2019: 1-27. https://doi.org/10.1111/cla.12364

This paper investigated the diversification and biogeography of the molluscan genus Philine and detected restricted and grossly non-overlapping distributions suggesting allopatric speciation connected possibly to geographical or bathymetric isolation.

Morley, S.A., Barnes D.K.A. and Dunn, M.J. (2019). Predicting which species succeed in Climate-forced polar seas. *Frontiers in Marine Science* ***5***. https://doi.org/10.3389/fmars.2018.00507

This paper applied risk assessment techniques to polar species physiological capacities to identify their exposure to climate change and their vulnerability and found that more species that are likely to benefit from the near-future predicted change (the winners), especially predators and deposit feeders, whilst fewer species were scored at risk (the losers), although animals that feed on krill scored consistently as under the highest risk.

2018

Barnes, D. K., et al. (2018). Icebergs, sea ice, blue carbon and Antarctic climate feedbacks. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 376, 20170176. https://doi.org/10.1098/rsta.2017.0176

The dense and rich organisms of polar continental shelves are a major stock of Earth's blue carbon natural capital. Blue carbon is increasing in response to both sea ice losses and ice shelf disintegration and as such is one of the most powerful negative feedbacks on climate change. This paper is a first attempt to quantify the extent of this negative feedback, and societal value to polar nature.

Brasier, M, et al. (2018). Benthic biodiversity in the South Orkney Islands Southern Shelf Marine Protected Area. *Biodiversity* 19, 5-19. https://doi.org/10.1080/14888386.2018.1468821

This publication, featured in a special issue on marine protected areas, is the outcome of the SO-AntEco expedition to the South Orkney Islands MPA. The internationally authored paper was led by an early career researcher and is the first such assessment of an Antarctic MPA.

Chenuil, A, et al. (2018). Understanding processes at the origin of species flocks with a focus on the marine Antarctic fauna. *Biological Reviews* 93, 481-504. https://doi.org/10.1111/brv.12354

Species flocks fascinate evolutionary biologists who wonder whether such striking diversification can be driven by normal evolutionary processes. This paper uses the isolated fauna of Antarctica as a model to understand a complex and important set of questions about how the processes of evolution work.

Robinson, S.A., et al. (2018). Rapid change in East Antarctic terrestrial vegetation in response to regional drying. *Nature Climate Change*, 8 (10), pp. 879-884. https://doi.org/10.1038/s41558-018-0280-0

This paper demonstrates that rapid vegetation change is occurring in East Antarctica and that its mosses provide potentially important proxies for monitoring coastal climate change.

Strugnell, J. M., Pedro, J. B., & Wilson, N. G. (2018). Dating Antarctic ice sheet collapse: Proposing a molecular genetic approach. *Quaternary Science Reviews* 179, 153-157. https://doi.org/10.1016/j.quascirev.2017.11.014

This publication details how genetic signatures that are contained within benthic animals present in Antarctica today could be used to investigate the last time a historic seaway occurred across Antarctica - thereby resolving when the West Antarctic Ice Shelf last collapsed.

2017

Chown, S.L., Brooks, C.M., Terauds, A., Le Bohec, C., van Klaveren-Impagliazzo, C., Whittington, J.D., et al. (2017). Antarctica and the strategic plan for biodiversity. *PLoS Biology* **15(3)** e2001656. https://doi.org/10.1371/journal.pbio.2001656 .

Major paper outcome of the first Monaco Antarctic Biodiversity meeting, providing a key assessment of the status of Antarctica in relation to the Aichi Targets of the Kyoto Protocol.

Coetzee, B.W.T., Convey, P. & Chown, S.L. (2017). Expanding the protected area network in Antarctica is urgent and readily achievable. *Conservation Letters*. https://doi.org/10.1111/conl.12342

This piece considers the practicalities and urgency of expanding the current protected area system in Antarctica in a robust and representative manner.

Gutt ,J., Isla, E., Bertler, N., Bodeker, G.E., Bracegirdle, T.J., … Griffiths, H., … Strugnell, J., et al. (2017). Cross-disciplinarity in the advance of Antarctic ecosystem research. *Marine Genomics*. https://doi.org/10.1016/j.margen.2017.09.006

This perspective piece outlines the benefits of cross disciplinary Antarctic research and is the culmination of a cross program workshop.

Pecl, G.T., Araújo, M.B., Bell ,J.D., Blanchard, J., et al. (2017). Biodiversity redistribution under climate change: Impacts on ecosystems and human well-being. *Science*. 335: 6332, eaai9214 https://doi.org/10.1126/science.aai9214

Waller, C. L., Griffiths, H. J., Waluda, C. M., Thorpe, S. E., Loaiza, I., Moreno, B., ... & Hughes, K. A. (2017). Microplastics in the Antarctic marine system: An emerging area of research. *Science of the Total Environment*, *598*, 220-227. https://doi.org/10.1016/j.scitotenv.2017.03.283

This paper summarises all known plastic records (micro & macro) from the Southern Ocean and compares these data with estimated regional plastic inputs. Results show that much of the plastic is likely to have originated elsewhere.

2016

Hughes, K.A. and Ashton, G.V. (2016). Breaking the ice: the introduction of biofouling organisms to Antarctica on vessel hulls. *Aquatic Conservation: Marine and Freshwater Ecosystems*. 27: 158– 164. https://doi.org/10.1002/aqc.2625

Pearce, D.A., Alekhina, I.A., Terauds, A., Wilmotte, A., Quesada, A., et al. (2016). Aerobiology over Antarctica – a new initiative for atmospheric ecology. *Frontiers in Microbiology*, 7. https://doi.org/10.3389/fmicb.2016.00016

Xavier, J.C., Brandt , A., Ropert-Coudert, Y., Badhe, R., Gutt, J., Havermans, C., Jones, C., Costa, E.S., Lochte, K., Schloss, I.R., Kennicutt, M.C. II, Sutherland,W.J. (2016). Future Challenges in Southern Ocean Ecology Research. *Frontiers in Marine Sciences* 3:94. https://doi.org/10.3389/fmars.2016.00094

2015

Bennett, J.R., Shaw, J.D., Terauds, A., Smol, J.P., Aerts, R., et al., (2015). Polar lessons learned: informing long-term management based on shared threats in Arctic and Antarctic environments. *Frontiers in Ecology and the Environment*, pp. 1-27. ISSN 1540-9295. https://doi.org/10.1890/140315

Clark, G.F., Raymond, B., Riddle, M.J., Stark, J.S. & Johnston, E.L. (2015). Vulnerability of Antarctic shallow invertebrate- dominated ecosystems. *Austral Ecology.* https://doi.org/10.1111/aec.12237

Hughes, K.A., Perierra, L.R., Molina-Montenegro, M.A. & Convey, P. (2015). Biological invasions in terrestrial Antarctica: what is the current status and can we respond. *Biodiversity Conservation*. https://doi.org/10.1007/s10531-015-0896-6

Royles, J. & Griffiths, H. (2015). Invited review: climate change impacts in polar regions: lessons from Antarctic moss bank archives. *Global Change Biology*, 21: 1041-1057. https://doi.org/10.1111/gcb.12774

2014

Brandt, A. & Würzberg, L. (2014). Southern Ocean deep sea – a benthic view to pelagic processes. *Deep Sea Research II*: 108: 1-112. https://doi.org/10.1016/J.DSR2.2014.07.011

Connolly, S.R., et al. (2014). Commonness and rarity in the marine biosphere. *PNAS* 111: 8524-8529. https://doi.org/10.1073/pnas.1406664111

Constable, A.J., Melbourne-Thomas, J., Corney, S.P. et al. (2014). Climate change and Southern Ocean ecosystems I: How changes in physical habitats directly affect marine biota. *Global Change Biology* 1-22. https://doi.org/10.1111/gcb.12623

Convey, P., Chown, S.L., Clarke, A., Barnes, D.K.A., Bokhorst, S., Cummings, V., et al. (2014). The spatial structure of Antarctic biodiversity. *Ecological Monographs* 84: 203-244. https://doi.org/10.1890/12-2216.1

De Broyer, C., Koubbi, P., Griffiths, H.J., Raymond, B., Udekem d'Acoz, C. d', Van de Putte, A.P., Danis, B., David, B., Grant, S., Gutt, J., Held, C., Hosie, G., Huettmann, F., Post, A. & Ropert-Coudert, Y. (eds.). (2014). Biogeographic Atlas of the Southern Ocean. Scientific Committee on Antarctic Research, Cambridge, 510 pp. https://www.scar.org/scar-library/other-publications/occasional-publications/3501-biogeographic-atlas-of-the-southern-ocean-selected-chapters/

De Maayer, P., Anderson, D.E., Cary, S.C. and Cowan, D.A. (2014). Some like it cold: understanding the strategies of psychrophiles. *EMBO Reports* 15: 508-517. https://doi.org/10.1002/embr.201338170

Fraser, C. I., Terauds, A., Smellie, J. L., Convey, M. S., and Chown, S. L. (2014). Geothermal activity helps life survive glacial cycles. *PNAS* 15: 5634-5639. https://doi.org/10.1073/pnas.1321437111

González-Wevar, C.A., Chown, S.L., Morley, S., Coria, N., Saucéde, T., Poulin, E. (2014). Out of Antarctica: quaternary colonization of sub-Antarctic Marion Island by the limpet genus Nacella (Patellogastropoda: Nacellidae). *Polar Biology*, 39 (1), pp. 77-89. https://doi.org/10.1007/s00300-014-1620-9

Jörger, K.M., Schrödl, M., Schwabe, E., Würzberg, L., (2014). A glimpse into the deep of the Antarctic Polar Front – diversity and abundance of abyssal molluscs. *Deep-Sea Research II* 108, 93–100. https://doi.org/10.1016/j.dsr2.2014.08.003

Meyer-Löbbecke, A., Brandt, A., Brix, S., (2014). Diversity and abundance of deep-sea Isopoda along the Southern Polar Front: Results from the SYSTCO I and II expeditions. *Deep-Sea Research II* 108, 76–84. https://doi.org/10.1016/j.dsr2.2014.06.006

Núñez-Pons, L. and Avila, C. (2014). Defensive Metabolites from Antarctic Invertebrates: Does Energetic Content Interfere with Feeding Repellence? *Marine Drugs* 12:3770-3791. https://doi.org/10.3390/md12063770

Poulin, E., González-Wevar, C., Díaz, A., Gérard, K., & Hüne, M. (2014). Divergence between Antarctic and South American marine invertebrates: What molecular biology tells us about Scotia Arc geodynamics and the intensification of the Antarctic Circumpolar Current. *Global and Planetary Change*, 123, 392-399. https://doi.org/10.1016/j.gloplacha.2014.07.017

Raymond, B., Lea, M.-A., Patterson, T., Andrews-Goff, V., Sharples, R., et al. (2014). Important marine habitat off east Antarctica revealed by two decades of multi-species predator tracking. *Ecography* 38: 121-129. https://doi.org/10.1111/ecog.01021

Roads, E., Longton, R.E. and Convey, P. (2014). Millennial timescale regeneration in a moss from Antarctica. *Current Biology* 24: R222-R223. https://doi.org/10.1016/j.cub.2014.01.053

Schiaparelli, S., Ghiglione, C., Alvaro, M. C., Griffiths, H. J., & Linse, K. (2014). Diversity, abundance and composition in macrofaunal molluscs from the Ross Sea (Antarctica): results of fine-mesh sampling along a latitudinal gradient. *Polar Biology* 37(6), 859-877. https://doi.org/10.1007/s00300-014-1487-9

Shaw, J.D., Terauds, A., Riddle, M., Possingham, H.P. and Chown, S.L. (2014). Antarctica's protected areas are inadequate, unrepresentative and at risk. *PLoS Biology*. 12 (6) e1001888. https://doi.org/10.1371/journal.pbio.1001888

Terauds, A., Doube, J., McKinlay, J. and Springer, K. (2014). Using long-term population trends of an invasive herbivore to quantify the impact of management actions in the sub-Antarctic. *Polar Biology* 37: 833-843. https://doi.org/10.1007/s00300-014-1485-y

Zablocki, O., van Zyl, L., Adriaenssens, E. M., Rubagotti, E., Tuffin, M., Cary, S. C., & Cowan, D. (2014). High-level diversity of tailed Phages, eukaryote-associated viruses, and virophage-like elements in the metaviromes of Antarctic soils. *Applied and Environmental Microbiology*, 80(22), 6888-6897. https://doi.org/10.1128/AEM.01525-14

2013

Ghiglione, C., Alvaro, M. C., Griffiths, H.J., Linse, K. and Schiaparelli, S. (2013). Ross Sea Mollusca from the Latitudinal Gradient Program: R/V Italica 2004 Rauschert dredge samples. *ZooKeys* 341:37-48. https://doi.org/10.3897/zookeys.341.6031

Gokul, J.K., Valverde, A., Tuffin, M., Cary, S.C. and Cowan, D.A. (2013). Micro-eukaryotic diversity in hypolithons from Miers Valley, Antarctica. *Biology* 5: 331-340. https://doi.org/10.3390/biology2010331

Hughes, K.A., Cary, S.C., Cowan, D.A., Lovejoy, C., Vincent, W.F. and Wilmotte, A. (2013). Pristine Antarctica: threats and protection. *Antarctic Science* 25: 1. https://doi.org/10.1017/S0954102013000047

Kaiser, S., Brandao, S.N., Brix, S., Barnes, D.K.A., Bowden, D.A. et al. (2013). Patterns, processes and vulnerability of Southern Ocean benthos: a decadal leap in knowledge and understanding. *Marine Biology* 160: 2295-2317. https://doi.org/10.1007/s00227-013-2232-6

Linse, K., Griffiths, H.J., et al. (2013). The macro- and megabenthic fauna on the continental shelf of the eastern Amundsen Sea, Antarctica. *Continental Shelf Research*, 68. https://doi.org/10.1016/j.csr.2013.08.012

Makhalanyane, T.P., Valverde, A., Birkeland, N-K., Cary, S.C., Tuffin, I.M., Cowan, D.A. (2013). Evidence for successional development in Antarctic hypolithic bacterial communities. *ISME* 7: 2080-2090. https://doi.org/10.1038/ismej.2013.94