CARM NEWS *May 2020*

RECENT IMPACT

The new FRDC project examining the impact on the abundance and population dynamics of Queensland fishery species – snapper, pearl perch, and spanner crab is underway.

CARM held the 1st Steering Committee meeting in April for the new FRDC project titled "Modelling environmental changes and effects on wild-caught species in Queensland". In the January 20 UQ News article "How do environmental factors impact Queensland's fisheries?" Professor Filar explained that CARM specialises in undertaking high quality research to best inform managers of our natural resources. The Steering Committee members and researchers attended the meeting via zoom due to the COVID-19 restrictions. The project team researchers appreciate the invaluable advice from this newly formed committee.

The deep ocean is warming slowly – but dramatic changes are ahead

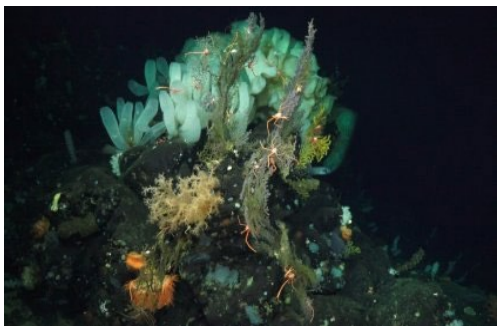

Image from the Schmidt Institute

PhD student Isaac Brito-Morales and Professor Anthony Richardson from CARM and the research team have their latest research published in Nature Climate Change. The international team challenged the notion that the deep ocean would be spared the worst of climate change. In particular, their findings found that the deep ocean marine species were also at risk similarly to surface marine species. To delve into how climate velocity and marine species are exposed the team combined estimates of climate velocity with AquaMaps data. They then intersected their data within the current global network of large marine protected areas (MPAs) to uncover the consequences. This took the form of calculating climate velocity with eleven climate models over the past 50 years and then for the rest of this century in four ocean depth zones. When considering ocean warming and exposure to marine species it is important to take into consideration the bathypelagic and abyssopelagic layers, the deep ocean, along with the surface and mesopelagic layers due to the distribution shift. The research has been featured in The Guardian, UQ News discussing "Climate change in deep oceans could be seven times faster by middle of century." For more details see the following reference.

Brito-Morales, I., Schoeman, D.S., Molinos, J.G., Burrows, M.T., Klein, C.J., Arafeh-Dalmau, N., **Richardson, A.J.** (2020). More than skin deep: accelerating exposure to climate change throughout the water column threatens marine biodiversity. *Nature Climate Change*, 80.

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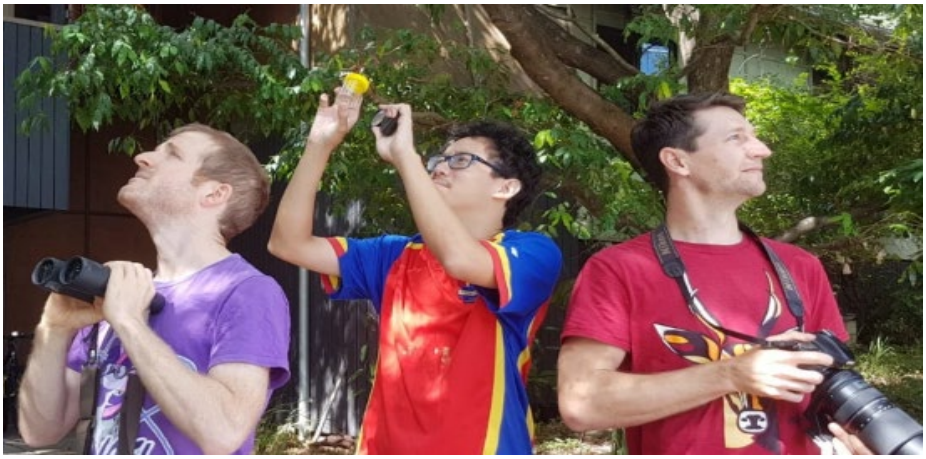
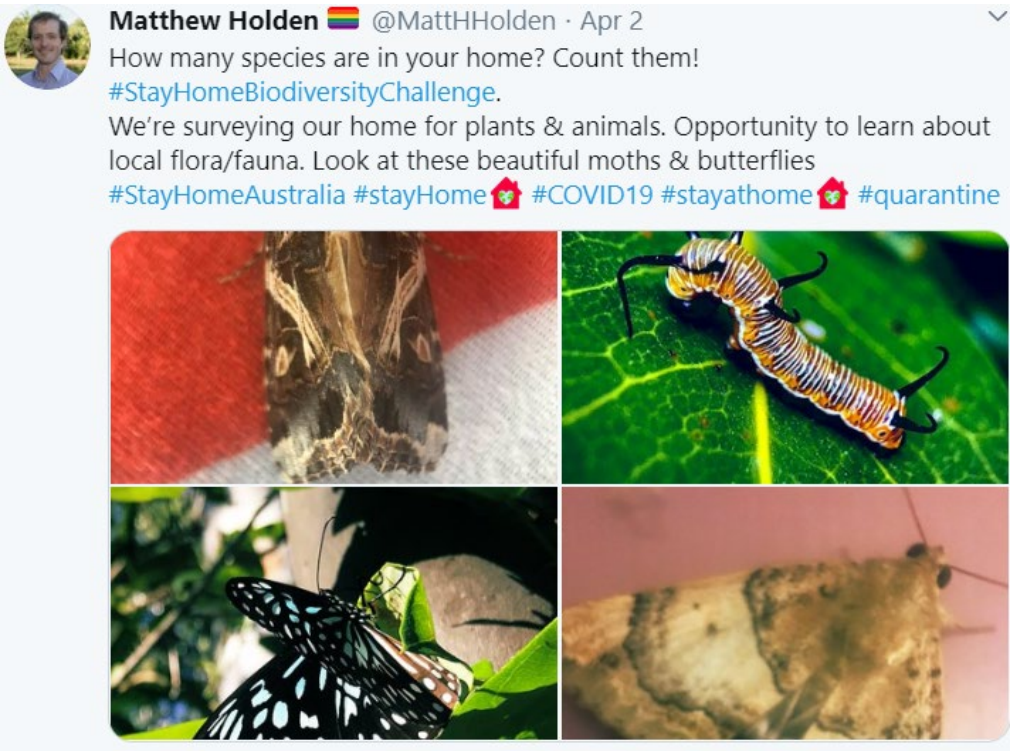
Staying at home during COVID-19



Dr Matthew Holden, Dr Russell Yong and Dr Andrew Rogers Credit: UQ

CARM researcher Matthew Holden has been featured in The Age and other media for finding novel ways of cataloguing species from his own home and backyard. Matthew along with housemates Russell and Andrew are encouraging others to explore their own environment and get involved by posting photos of species finds to social media via hashtag #stayhomebiodiversitychallenge.



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WELCOME TO CARM

CARM welcomes our latest PhD student Irene Richards. Irene who commenced in April with Anthony Richardson as her principal supervisor. Irene's project is titled, "Size spectrum ecosystem modelling of shelf ecosystems globally".

CARM welcomes the new FRDC Project Steering Committee

Sian Breen	Principal Fisheries Manager Fisheries Queensland
Ian Brown	Principal Fisheries Scientist, DAFF, Queensland [retired]
Nick Caputi	Department of Primary Industries and Regional Development (WA)
Peter Jones	Queensland Spanner Crab Fishery Spanner Crab Fishery Working Group
Randall Owens	Assistant Director — Sustainable Fishing and Partnerships Reef Education and Stewardship Great Barrier Reef Marine Park Authority
Lochie Reed	Member of the DAF, Queensland Rocky Reef working group
John Stewart	Principal Research Scientist Fisheries Research NSW Department of Primary Industries, Fisheries

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NEW PROJECTS

The FRDC 2019-013 project titled," Modelling environmental changes and effects on wild-caught species in Queensland" is now up and running. This is a joint UQ/CARM-DAF-AIMS project. The multidisciplinary research team includes **Jerzy Filar**, **Wen-Hsi Yang**, Nan Ye (UQ), Tony Courtney, Susannah Leahy, Matthew Campbell, Jonathan Mitchell (DAF) and Barbara Robson and Craig Steinberg (AIMS).

The 2020-2022 $365,000 ARC Discovery grant titled, "Partially observable MDP's, Monte Carlo methods, and sustainable fisheries´ with Chief Investigators Kroese, D., **Filar, J**., **Ye, N.,** Kurniawati, H., Bohner, M. research is now underway.

The 2020 FRDC Recreational Fishing Project will develop methods to estimate annual Queensland recreational harvest from existing Fisheries Queensland data in years when no statewide recreational surveys are conducted. The team consists of Jerzy Filar, Matt Holden, Manuela Mendiolar from CARM; Sue Helmke, Malcolm Pearce, James Webley, Tyson Martin and Michael O'Neill or George Leigh all from Fisheries Queensland.

PUBLICATIONS 2020

JOURNALS

1. Adams, M.P., Sisson, S.A., Helmstedt, K.J., Baker, C.M., **Holden, M.H**., Plein, M., Holloway, J., Mengersen, K.L., McDonald-Madden, E. (2020). Informing management decisions for ecological networks, using dynamic models calibrated to noisy time-series data, Ecology Letters, doi: 10.1111/ele.13465
2. **Armstrong, A.J., Armstrong, A.O**., Bennett, M.B., McGregor, F., Abrantes, K.G., Barnett, A., **Richardson, A.J**., Townsend, K.A., Dudgeon, C.L. (2020). The geographic distribution of reef and oceanic manta rays (*Mobula alfredi* and *Mobula birostris*) in Australian coastal waters, Journal of Fish Biology: 1-6
3. **Brito-Morales, I.,** Schoeman, D.S., Molinos, J.G., Burrows, M.T., Klein, C.J., Arafeh-Dalmau, N., **Richardson, A.J**. (2020). More than skin deep: accelerating exposure to climate change throughout the water column threatens marine biodiversity. Nature Climate Change, 80
4. **Filar, J.A., Qiao, Z., Streipert, S.** (2020). Risk sensitivity in Beverton-Holt fishery with multiplicative harvest, Natural Resource Modelling: e12257
5. Hallegraeff G, Eriksen R, Davies C, Slotwinski A, McEnnulty F, Coman F, Uribe-Palomino J, Tonks M, **Richardson AJ** (in press, 26/3/2020) The marine plankton dinoflagellate Tripos: sixty years of species level distributions in Australian waters. Australian Systematic Botany
6. O'Bryan, C., Allan, J., **Holden, M.,** Sanderson, C., Venter, O., Di Marco, M., McDonald-Madden, E., Watson, J. (2020). Intense human pressure is widespread across terrestrial vertebrate ranges, Global Ecology and Conservation 21: e00882

7. Robson, B.J., Skerratt, J., Baird, M.E., Davies, C., Herzfeld, M., Jones, E.M., Mongin, M., **Richardson, A.J**., Rizwi, F., Wild-Allen, K., Steven, A. (2020). Enhanced assessment of the eReefs biogeochemical model for the Great Barrier Reef using the Concept/State/Process/System model evaluation framework. Environmental Modelling and Software, 129

CONFERENCE PAPER

8. **Filar, J.A., Qiao, Z.,** Ye, N. (2019). POMDPs for sustainable fishery management, 23rd International Congress on Modelling and Simulation, Canberra, ACT, Australia, 1 to 6 December 2019, mssanz.org.au/modsim2019

TECHNICAL REPORTS WITH INDUSTRY PARTNERS

9. O'Neill, M. F. Lovett, R, Bessell-Browne, P., **Streipert, S.,** Leigh, G., Campbell, A. Northrop, A., Wortmann, J., Helidoniotis, F., **Yang, W-H., Holden, M.,** and French, S. (2020). Custom training and technical support for the fishery stock assessment software 'stock synthesis' , FRDC Project No. 2018-168, Fisheries Research and Development Corporation