



# CARM NEWS *February 2019*

## RECENT IMPACT

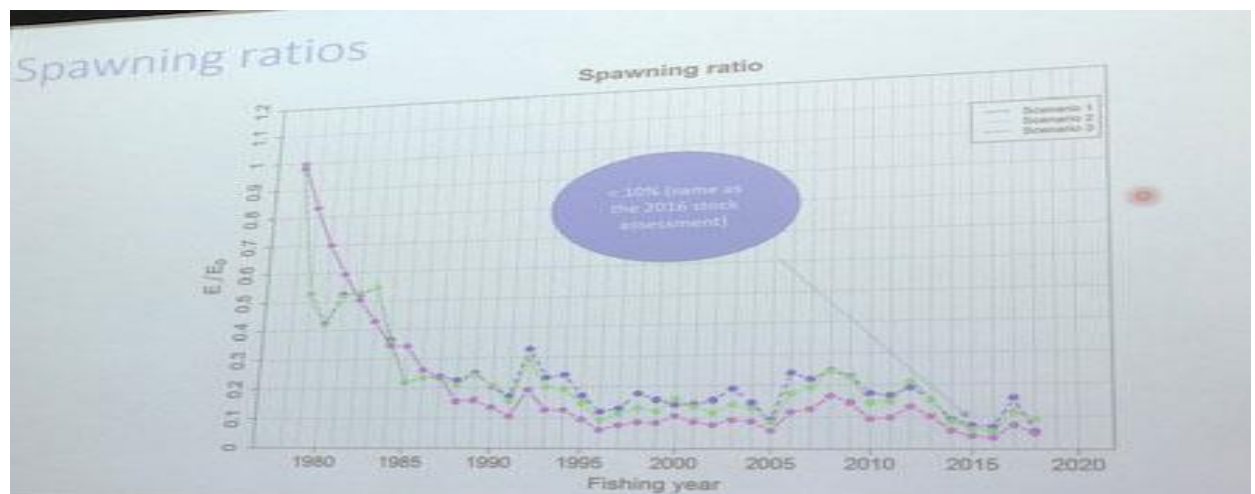


**Matthew Holden** was invited to speak at the **Universitas 21 Early Career Researcher Workshop in Shanghai, China** and presented, "The benefit of demand reduction campaigns to reduce poaching".

Matthew was also invited to visit the **Forensic Conservation Laboratory at Hong Kong University** to collaborate and present an invited seminar. Hong Kong University is a world leader in illegal wildlife trade research and his invited seminar on using mathematics to prevent poached species

population declines was delivered to a packed room despite it being an academic break period. It was invigorating to be near the source of the action.

**Wen-Hsi Yang** and **Jerzy Filar** attended the Queensland Scallop Fishery Research, Second Steering Committee Meeting on Friday 14<sup>th</sup> December, 2018. Wen-Hsi presented his latest results.





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## CONGRATULATIONS

**Congratulations** go to **Maria Kleshnina** who received one of two honourable mentions for student talks at the recent AustMS Annual Conference in Adelaide, Australia. Maria presented a talk titled, "Learning advantages in evolutionary games" on 4<sup>th</sup> December, 2018.



*Photo: By Mark McGuinness (Victoria University of Wellington) Dr Masoud Kamgarpour with the AustMS BH Neumann Prize Winners. Joel Gibson (Joint prize winner), Honourable mentions to Maria Kleshnina and Timothy Roberts, Liam Hodgkinson (Joint prize winner).*

**Congratulations** to Anthony Richardson and Matthew Holden who were awarded funding in the recent round of Australian Research Council grants.

### **Anthony Richardson, ARC Discovery Project DP190102293 \$493,000.00**

**(Professor Anthony Richardson;** Associate Professor Julia Blanchard; Associate Professor David Schoeman; Professor Reginald Watson; Professor Iain Suthers; Adjunct Professor Derek Tittensor; Dr Andrew Lenton)

#### **Title**

Future fisheries under climate change: the missing role of zooplankton. This project aims to develop the first global ecosystem model with a more realistic representation of zooplankton. Fish are the main source of protein for 3 billion people, yet fish catches are declining. Current models of future fish biomass under climate change do not consider the complex role that zooplankton play in transferring energy from phytoplankton to fish. By resolving the link between phytoplankton and fish, this project will vastly improve estimates of future global fisheries production and regional variation. Such knowledge is vital for future food security in Australia and globally, and also to understand the role of zooplankton in carbon export in the ocean.





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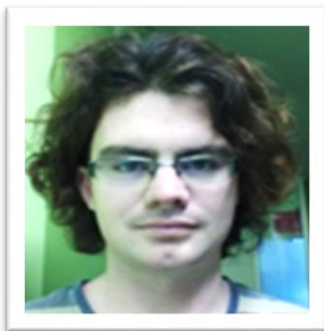
Congratulations Anthony Richardson who appears in the 2018 Global Highly Cited Researcher list (<https://hcr.clarivate.com/>). This list recognises researchers who have produced highly cited papers that rank in the top 1% for their field in 2018. Anthony shares a joint appointment between SMP and CSIRO and publishes on climate, ecology and biostatistics.

**Matthew Holden, ARC DECRA, DE190101416 \$329,538.00**

## **Title**

The value of model complexity for fisheries management. This project aims to quantify the benefits of using dynamic multi-species models for harvest decisions in the fishing industry. More than 99.8 per cent of fisheries are assessed using single-species models. Since fishers harvest multiple interacting species, not considering these interactions can lead to negative outcomes that reduce food security, eliminate human livelihoods, decrease economic production, and harm the environment. The project is expected to provide guidance for fisheries scientists on when to use multi-species models for management, improved decision making capacity to reduce the risk of fishery collapse, a new method for dynamic model validation in the face of limited data, and enhanced collaboration between modellers and applied agencies. By reducing the risk of ecosystem collapse through better use of complex and simple models. The project will provide major benefits for the environment, humans, and the economy, at national and global scales.

## FAREWELL



We farewell and best wishes to **Ryan Heneghan** who leaves The University of Queensland after submitting his thesis and taking up an International Postdoctoral Fellowship at the Autonomous University of Barcelona, Spain.



We also farewell **Maria Kleshnina** who has submitted her thesis and is taking up a prestigious IST plus Postdoctoral Research Fellowship at the Institute of Science and Technology in Vienna, Austria. This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 754411.



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## UPCOMING WORKSHOPS



### **Professor Anthony Richardson lecturing to a full-house at the R Workshop 2018**

The Introduction to R workshop was held on 5th February 2019 with Professor Anthony Richardson, Associate Professor Chris Brown and Associate Professor Dave Schoeman. Day 1 was ideal for those with little or even no experience with R but want to produce robust analyses and effective graphics. The trio then held the **Intermediate to R Workshop** from the **6th – 7th February 2019**. Days 2 and 3 were for intermediate users or beginners wanting to go beyond the basics. The focus throughout was on ecological applications and particularly marine habitats. Friday 8<sup>th</sup> they will run the ggplot / spatial analysis with R Workshop for the first time.

The attendees commented on the presenters being very good, enthusiastic, focused, able to keep the participants interested and providing clear explanations and excellent notes.

**Dr Bill Venables** conducted the Advanced R Workshop from 5th – 7th February 2019. The workshops will held again in 2020.



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## Satellite Workshop Applied<sup>2</sup> Probability

2 July, 2019 9am – 5pm

The 20<sup>th</sup> INFORMS Applied Probability Society Conference taking place at the Brisbane Convention Centre, Brisbane Australia, July 3-5, 2019. Commencing with the satellite workshop on July 2, organized by CARM dealing with concrete applications (Applied<sup>2</sup> Probability) taking place at The Global Change Institute, The University of Queensland, Brisbane.

**Workshop Theme: “Uncertainty Quantification Applications”.**

Registration is open <https://smp.uq.edu.au/event/session/4577> \$100 and \$45 students.

**We are currently looking for session organisers for the practical Applied**

**Probability topics:** The presentations must be based on real or synthetic data. Please contact CARM [carm@maths.uq.edu.au](mailto:carm@maths.uq.edu.au) or Jerzy Filar [j.filar@uq.edu.au](mailto:j.filar@uq.edu.au) with your expression of interest in organising a session. Work presented at the workshop can be considered for publication in the journal Stochastic Systems upon author request.

- Stochastic Operations Research
- Networks and Queues
- Health and Epidemics Models
- Ecology and Mathematical Biology
- Sustainable Fisheries
- Energy modelling and forecasting



**Raison D’être:** One of the unsolved mysteries of mathematical sciences is that branches which have their roots in applications and natural phenomena, over time, become progressively more theoretical. For instance, typically, there are very few numbers in papers nowadays published in Number Theory journals. It is not surprising that Applied Probability is also susceptible to this theorization trend which, arguably, merely points to the maturity and success of the subject. However, in recognition of the above, there is an emerging need for a forum where researchers encountering applied probability problems in the context of specific applications can discuss their experiences and challenges. A fascinating aspect of modelling random phenomena in applications is that different groups of end users may have very different attitudes towards uncertainty and risk. For instance, medical practitioners, fishermen and fire fighters all deal with stochasticity on regular basis but have very different needs and expectations of the quantitative tools designed to assist them.

- Stochastic Operations Research
- Networks and Queues
- Health and Epidemics Models
- Ecology and Mathematical Biology
- Sustainable Fisheries
- Energy modelling and forecasting

### Organizing Committee

Applied<sup>2</sup> Probability: Ivo Adan, Konstanin Avrachenkov, John Boland, Mark Fackrell, Jerzy Filar, David Goldberg, Matthew Holden, Roxanne Jemison, Ross McVinish, Joshua Ross.





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## PROJECTS

- FRDC Project titled, “Stock predictions and spatial population indicators for Australia's east coast.
- saucer scallop fishery” joint with M.F. O'Neill, A.J. Courtney, G. Leigh., M.M. Campbell (DAF) W-H, Yang., J.Filar (CARM).
- This project will undertake high spatial resolution analyses of fishing and environmental influences on the scallop population. Improvements to the scallop assessment model will be carried out to produce better predictions for management of the stock.
- AFMA funded project led by CSIRO titled, “Harvest strategies for the Torres Strait Finfish fishery”. Joint with T. Hutton (CSIRO) M.F. O'Neill., G. Leigh (DAF) A, Tobin (Tobin Fish Tales) K, Basford., J.Filar., M. Holden (CARM).
- The project will contribute to defensible and robust management decisions including the potential mechanisms for fishery expansion. It will assist in a development of a sustainable harvest strategy that is ratified by management agencies and Islanders.

## PUBLICATIONS 2019 and 2018

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2. Bohner, M., Torres, D, Streipert, A. (2019) Exact solution to a dynamic SIR model. *Nonlinear Anal. Hybrid Syst.* 32: 228 - 238.
3. Baker, C., **Holden, M.**, Plein, M., McCarthy, M., Possingham, H. (2018). Informing network management using fuzzy cognitive maps. *Biological Conservation*. 224: 122-128.
4. Ben-Tovim, D., Bogomolov, T., Filar, J., Hakendorf, P., Qin, S., Thompson, C. (2018). Hospital's instability wedges. *Health Systems* [EPub]
5. Beutel, T., Corbet, D., Hoffmann, M., Buck, S., **Kienzle, M.** (2018). Quantifying leucaena cultivation extent on grazing land. *The Rangeland Journal*. 40: 31-38.
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7. Bohner, M., Dannan, F., **Streipert, A.** (2018) A nonautonomous Beverton–Holt equation of higher order. *Journal of Mathematical Analysis and Applications*. 457(1): 114-133
8. Boss, E., Waite, A., Muller-Karger, F., Yamazaki, H., Wanninkhof, R., Sosik, H., Sloyan, B., **Richardson, A.**, Miloslavich, P., Karstensen, J., Gregori, G., Fennel, K., Claustre, H., Cornejo, M., Berman-Frank, I., Batten, S., Acinas, S. (2018). Beyond chlorophyll fluorescence: The time is right to expand biological measurements in ocean observing programs. *Limnology and Oceanography Bulletin*
9. Brackowski, A., **Holden, M.**, O'Bryan, C., Choi, C-Y., Gan, X., Beesley, N., Gao, Y., Allan, J., Tyrell, P., Stiles, D., Brehony, P., Meney, R., Brink, H., Takashina, N., Lin, M-C., Lin, H-Y., Rust, N.,



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10. Brito-Morales, I., Molinos, J.G., Schoeman, D.S., Burrows, M.T., Poloczanska, E.S., Brown, C.J., Ferrier, S., Harwood, T.D., Klein, C.J., McDonald-Madden, E., Moore, P.J., Pandolfi, J.M., Watson, J.E., Wenger, A.S., **Richardson, A.J.** Climate velocity can inform conservation in a warming world. *TREE* 33 (6): 441-457.
  11. Broadhurst, M., **Kienzie, M.**, Stewart, J. (2018). Natural and fishing mortalities affecting eastern sea garfish, *Hyporhamphus australis* inferred from age-frequency data using hazard functions. *Fisheries Research*. 198: 43-49
  12. Brown, M.V., van de Kamp,., Ostrowski, M., Seymour, J.R., Ingleton, T., Messer, L.F., Jeffries, T., Siboni, N., Laverock, B., Bibiloni-Isaksson, J., Nelson, T.M., Coman, F., Davies, C.H., Frampton, D., Rayner, M., Goossen, K., Rober, S., Homes, B., Abell, G.C.J., Craw, P., Kahlke, T., Li San Sow, S., McAllister, K., Windsor, J., Skuza, M., Crossing, R., Patten, N., Malthouse, P., van Ruth, P.D., Paulsen, I., Fuhrman, J.A., **Richardson, A.**, Koval, J., Bissett, A., Fitzgerald, A., Moltmann, T., Bodrossy, L. (2018). Systematic, continental scale temporal monitoring of marine pelagic microbiota by the Australian Marine Microbial Biodiversity Initiative. *Nature Scientific Data*. 5:180130.
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  15. Couturier, L.I.E., Newman, P., Jaine, F.R.A., Bennett, M.B., Venables, W.N., Cagua, E., Townsend, K.A., Weeks, S.J., **Richardson, A.J.** (2018). Variation in occupancy and habitat use of *Manta alfredi* at a major aggregation site. *Marine Ecology Progress Series*. 599: 125-145.
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  17. Dornelas et al., including **Richardson, A.J.** (2018). BioTIME: a database of biodiversity time series for the Anthropocene. *Global Ecology and Biogeography*. 27: 760-786
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  19. Dudgeon, C.L., Bansemar, C., Armstrong, A., Armstrong, A., Bennett, M.B., Bowden, D., **Richardson, A.J.**, Townsend, K.A., Hawkins, E. (In press, 2/2/2018) The role of citizen science photographic identification in understanding marine megafauna populations in Moreton Bay. *Moreton Bay Book*.



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20. Ejov, V., **Filar, J.**, Haythorpe, M., Roddick, J., Rossomakhine, S. (2018). A note on using the resistance-distance matrix to solve Hamiltonian cycle problem. *Ann Oper Res.* 261:393-399
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22. **Holden, M.**, Biggs, D., Brink, H., Bal, P., Rhodes, J., McDonald-Madden. (2018). Increase anti-poaching law-enforcement or reduce demand for wildlife products? A framework to guide strategic conservation investments. *Conservation Letters.* e12618
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26. **Leigh, G.M.**, Hearn, W.S. (2018). Nonparametric tests of double-tagging assumptions. *Fisheries Research.* 197: 45-49.
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28. Pagendam, D., Snoad, N., **Yang, W-H.**, Segoli, M., Ritchie, S., Trewin, B., Beebe, N. Improving estimates of Fried's Index from mating competitiveness experiments. *Journal of Agriculture, Biological, and Environmental Statistics.* doi: 10.1007/s13253-018-0333-x
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