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RECENT IMPACT



Wen-Hsi Yang measuring scallops from the survey

The reactivated scallop survey in Queensland ocean waters was completed in October 2017. The last ten-year scallop survey conducted 11 years ago. The assessment in 2016 showed that scallop abundance were at a historic low level and confirmed that reactivating the survey was necessary and crucial to provide details of the scallop population characteristics such as density and size frequency. These observations will help investigate the decrease in scallop abundance and improve future stock assessments. With anticipation and anxiety I participated in the survey last month. I experienced many “firsts” on this trip such as measuring a number of scallops; living at sea on a fishing trawler (with unavoidable seasickness); sea fishing (thanks Mark McLennan of the Department of Agriculture and Fisheries (DAF) for teaching me how to start fishing); sleeping on unsmooth and bumpy “wavelets”; releasing captured sea snakes back to sea. Measuring and recording the size of scallops, two species of bugs (i.e., mud and Moreton Bay bugs) and blue swimmer crabs is an uneasy task at sea! However, I enjoyed the trip in spite of seasickness. I would like to thank Mark McLennan, as well as Terry, Wynn and Storm, the skipper and crews, for taking care of me and introducing “mint candy” to me. More importantly, I would also like to thank Tony Courtney and Matthew Campbell of DAF for putting a lot of effort into the preparation of this year’s survey. Tony Courtney carefully designed the survey and checked every element before the start, to ensure that it ran smoothly and safely. – Wen-Hsi Yang



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Gate entrance to White Eagle Memorial Preserve. (Credit: Jodie Buller)



Matt Holden bakes a cake representing his conservation burial research.

Matthew Holden's paper describing the potential for human burials to fund the conservation of threatened species was featured in Public Now, Pacific Standard, Brisbane Times, IFLScience, Sydney Morning Herald, ABC Southern Queensland and the UQ News and published in Conservation Letters. Perhaps, part of the secret to the survival of critically endangered wildlife could lie beyond the grave?



The University of Queensland, School of Mathematics and Physics Hyperbolic Reef

Professor Jerzy Filar and CARM affiliate Associate Professor Diane Donovan featured as panellists in the BrisScience event at The Edge, State Library of Queensland. "Mother nature inspiring science" was a public event that engaged some 300 audience members. The discussions revolved around how to use maths and physics to better understand nature and minimise the impact of large scale technologies on our environment. The UQ School of Mathematics and Physics displayed their crocheted hyperbolic geometry reef at the event which helped concretely demonstrate the mathematical ideas. Further concepts of "The beautiful math of coral" can be seen on the TED2009 with Margaret Wertheim https://www.ted.com/talks/margaret_wertheim_crochets_the_coral_reef



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L-R Matthew Holden, Joanne Wortmann, Pia Bessell-Browne , Robyn Lovett, Sabrina Streipert, Amanda Northrop, Michael O’Neill

Matthew Holden and Sabrina Streipert attended the Department of Agriculture and Fisheries (DAF) two day stock assessment workshop/training and from 20 – 21 November 2017 held in Nambour.

NEW 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.

On a more basic research level, the recently awarded ARC Discovery project entitled “Time consistency, risk mitigations and partially observable systems” will involve J. Filar’s collaboration with SMP colleagues Y. Nazarathy and T. Taimre and distinguished international partner investigators: V.S. Borkar from IIT Bombay and M. Mandjes from The University of Amsterdam.



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WELCOME



CARM welcomes **Dr Sabrina Streipert who joins CARM as a lecturer.** Sabrina received a Diplom (Master) in Mathematical Economics from the University of Ulm and a Master of Applied Mathematics from the Missouri University of Science and Technology (MST). Her PhD research at MST focused on the analysis of dynamical systems on time scales with applications in population dynamics and epidemiology. After receiving her PhD in Applied Mathematics in 2015, she became a Research Associate in the Department of Psychiatry at the University of Wisconsin-Madison, working on the mathematical theory of Consciousness. In October 2017, she joined the Centre for Applications in Natural Resource Mathematics (CARM) at the University of Queensland.

VISITORS TO CARM



CARM welcomed **Dr Shaowen Qin** who spent 12 weeks at CARM as a part of her Outside Studies Program (OSP). Shaowen is a Senior lecturer, School of Computer Science, Engineering and Mathematics, Flinders University.



Dr Vladimir Ejov, Strategic Associate Professor of Mathematics of the School of Computer Science, Engineering and Mathematics, Flinders University visits CARM from 29th October to November 3rd, 2017.

Vladimir Ejov obtained PhD in Mathematics (Mathematical Analysis, Complex Analysis) in 1986 at Moscow State University. Before taking up a position at the University of Adelaide in 1995 worked at MPI Bonn and at Oklahoma State University. He moved to UniSA in 2000, where started working with Jerzy Filar in the area of Combinatorial Optimisation. In 2012 he moved to Flinders University, where he serves as Acting Director of Flinders Mathematical Sciences Laboratory (FMSL).



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FORTHCOMING STATISTICAL META-ANALYSIS SHORT COURSE

Presented by: Professor Bimal Sinha

Date: Wed 11 Apr, 2018 from 9:30 am - 5:00 pm

Venue: Building 14 Room 132, St Lucia Campus, The University of Queensland

Professor Bimal Sinha from the Department of Mathematics & Statistics, University of Maryland, Baltimore County will deliver the SMA short course. Advance notice of short course with registration details to follow. Please email carm@maths.uq.edu.au for further details.

Statistical meta-analysis deals with a variety of sophisticated statistical methods to efficiently combine the results of several studies all with a common target. Examples of such studies abound in the literature. Some common application areas include gender studies in education, EPA studies of effects of second hand smoking on women, and controlled or comparative trials in medicine and epidemiology. The target unknown parameter in meta-analysis is often referred to as EFFECT SIZE. Some common examples are: difference of two means, difference or ratio of two proportions, correlation coefficient, odds ratio, etc. In this course, we will first describe the basic concepts of effect size for continuous measurements as well as qualitative attributes and their estimation/test/confidence interval construction. Next, statistical methods of combination of tests and estimates of effect size from various independent studies will be explained. This will be followed by a discussion of tests for homogeneity of effect sizes, fixed versus random effects model of meta-analysis, combination of Gallup polls, meta-analysis of binary data, meta-regression, and publication bias. The common data situation in meta-analysis is the availability of only published data like effect size estimate plus standard error or effect size estimate plus confidence interval. Many real data sets of this type will be presented and analyzed covering the fields of educational research and health sciences. Some computational aspects of meta-analysis using standard statistical software R will be briefly mentioned. No computer demonstration will be given.

R WORKSHOPS

The next R Workshops will be held on the 5th – 7th February 2018 at Lucia Campus. Please email carm@maths.uq.edu.au to place your name on the notification list for registrations and further information.

Introduction to R:

5th February 2018 (Associate Professor Anthony J. Richardson and Associate Professor Dave Schoeman)

Day 1 is ideal if you have had little or even no experience with R and want to produce robust analyses and effective graphics

Intermediate to R:

6th – 7th February 2018 (Associate Professor Anthony J. Richardson and Associate Professor Dave Schoeman)

Days 2 and 3 are ideal for intermediate users or beginners wanting to go beyond the basics. The focus throughout is on ecological applications, particularly marine

Advanced R:

5th – 7th February 2018 (Dr. Bill Venables)



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Workshop on Applications in Natural Resource Mathematics (WANRM)



CARM Students Maria Kleshnina and Phil Dyer presenting at the WANRM workshop

Workshop on Applications in Natural Resource Mathematics (WANRM)

Global Change Institute, Level 2, Room 275, University of Queensland, St Lucia. 3-5 October, 2017



Centre for Applications in Natural Resource Mathematics



Keynote Speakers	Organising Committee
<ul style="list-style-type: none"> • Richard Barker, University of Otago • Michel De Lara, École des Ponts ParisTech • Deborah (Dvora) Hart, NOAA, Woods Hole • John Norbury, Oxford University • Roger Cropp, Griffith University, Nathan • Trevor Hutton, CSIRO, CMAR • George Leigh, DAF, Brisbane • Eva Plaganyi, CSIRO CMAR • Jason Sharples, UNSW 	<ul style="list-style-type: none"> • Clare McGrory, Conference Director • Jerzy Filar, Director of CARM • John Hearne, RMIT • Joshua Ross, University of Adelaide • Wen-Hsi Yang, Research Fellow CARM • Sharon Lee, University of Queensland • Matthew Holden, Research Fellow, CARM • Roxanne Jemison, Conference Manager

The workshop was extremely successful. It brought together several diverse groups of researchers including (but not limited to): (i) university based mathematicians and statisticians at all levels of seniority, (ii) university based ecologists and environmental scientists and (iii) government agency



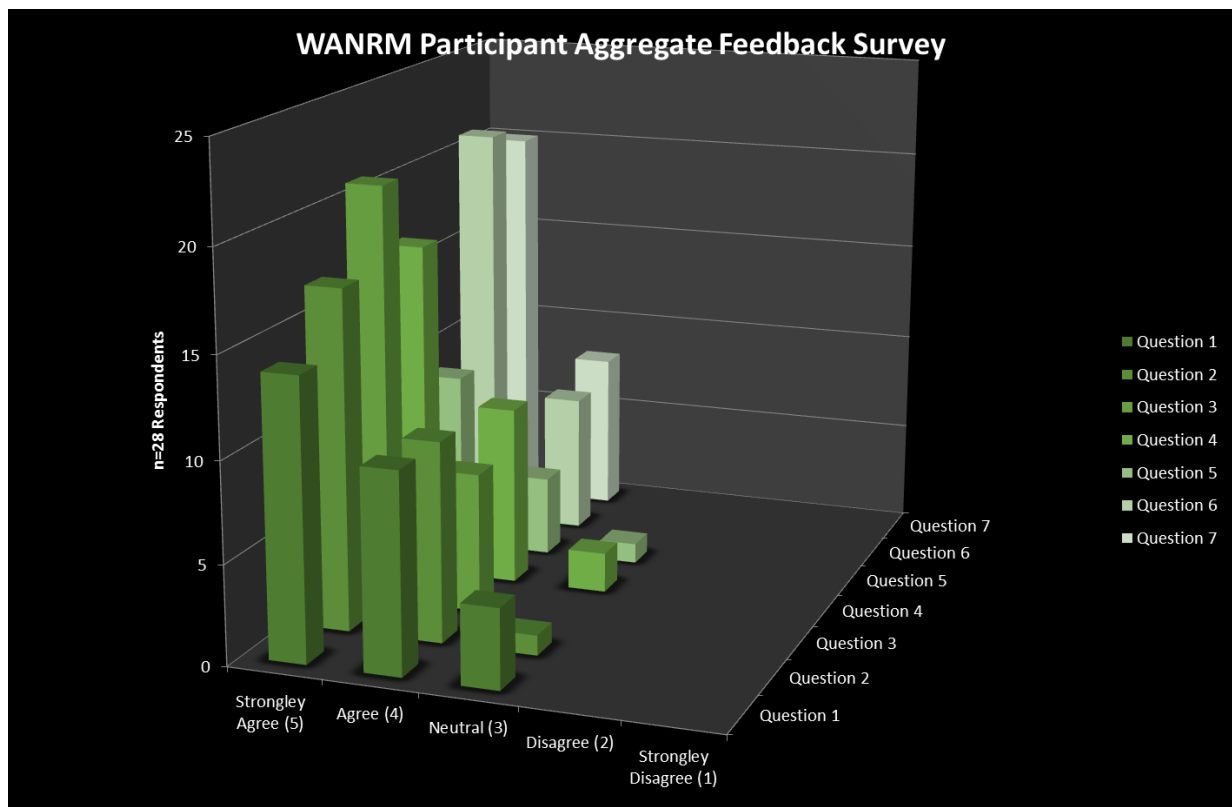
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biologists, ecologists and modellers. There were many lively discussions during and after presentations and many new research ideas were floated.

The workshop objectives were well met in the following sense:

- A. Practitioners became aware of a vast array of sophisticated mathematical and statistical tools that can be brought to bear to capture the many complexities of natural resource phenomena that need to be modelled.
- B. Conversely, mathematical scientists and statisticians were exposed to the inherent complexity of natural resource problems such as fisheries, or bushfires, or marine ecosystems.
- C. Importantly, there were in depth discussions of the shortcomings of the existing modelling methodologies in view of the limitations of (a) understanding of the scientific domain of the underlying problems, and (b) available data and its quality.

Female attendance and participation were high. In particular, 26 (out of 56) participants were female and that included two female plenary/keynote speakers. Furthermore, 10 (out of 16) postgraduate students were female as were 5 (out of 15) early career researchers.



The post conference feedback survey returned positive responses to all questions on the content and the quality of the speakers and the following are three anonymous comments from the survey:



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1. I enjoyed participating in this event. And would like to thank the organisers for their ability to attract such a diverse range of academics from a variety of fields and organisations.
2. Fantastic novel methods for saving the environment!
3. This workshop is well organised. Speakers are knowledgeable. It is especially good for young researchers to attend. Warm and welcoming atmosphere.

Please visit the CARM website to view the WANRM legacy site.

<https://www.smp.uq.edu.au/CARM/conferences-and-workshops>

This event is supported by AMSI, AustMS, Global Change Institute and CARM.

PUBLICATIONS 2017

Arief, V., DeLacy, I., **Basford, K.**, Dieters, M. (2017). Application of a dendrogram seriation algorithm to extract pattern from plant breeding data. *Euphytica*. 213:85

Blanchard, J., Heneghan, R.H., Everett, J.D., Trebilco, R., **Richardson, A.J.** (2017). From bacteria to whales: Using functional size spectra to model marine ecosystems. *Trends in Ecology & Evolution*. 32:3: 174-186

Bennett, M.B., Coman, F., Townsend, K.T., Couturier, L.I.E., Jaine, F.R.A., **Richardson, A.J.** 2017. A historical and contemporary consideration of the diet of the reef manta ray, *Manta alfredi*, from the Great Barrier Reef, Australia. *Marine and Freshwater Research*. 68:993-997.

Berry, T.E., Osterrieder, S.K., Murray, D.C., Coghlan, M.L., **Richardson, A.J.**, Grealy, A.K., Stat, M., Bejder, L., Bunce, M. (2017). DNA metabarcoding for diet analysis and biodiversity: A case study using the endangered Australian sea lion (*Neophoca cinerea*). *Ecology and Evolution*. 7, 5435-5453

Ejov, V., **Filar, J.**, Roddick, J., Rossomakhine, S. (2017). A note on using the resistance-distance matrix to solve Hamilton Cycle Problem. *Annals of Operations Research*. DOI 10.1007/s10479-017-2571-7

Everett, J., Baird, M.E., Buchanan, P., Bulman, C., Davies, C., Downie, R., Griffiths, C., **Henegan, R.**, Kloser, R., Laiolo, L., Lara-Lopez, A., Lonzana-Montes, H., Matear, R., McEnnulty, F., Robson, B., Rochester, W., Skerratt, J., Smith, J., Strzelecki, J., Suthers, I., Swadling, K., van Ruth, P., **Richardson, A.** (2017). Modeling what we sample and sampling what we model: Challenges for zooplankton model assessment. *frontiers in Marine Science*. 4(77)

Rohner, C., Burgess, K., Rambahiniarison, J., Stewart, J., Ponzo, A., **Richardson, A.** (2017). Mobulid rays feed on euphausiids in the Bohol Sea. *R. Soc. open sci.* 4 161060

Holden, M., Butt, N., Chauvenet, A., Plein, M., Stringer, M., Chades, I. (2017). Academic conferences urgently need environmental policies. *Nature Ecology & Evolution*, 1-2 Correspondence paper

Holden, M., McDonald-Madden. (2017). Conservation from the grave: Human burials to fund the conservation of threatened species. *Conservation Letters*, doi: 10.1111/conl.12421