

ANNUAL REPORT

2015-2016



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Welcome and Introduction

We are pleased to present the 2015-16 annual report for the CSIRO-UTAS PhD Program in Quantitative Marine Science (QMS), now in its 1st year under the renewed 5-year commitment that began 1 July 2015, and in its 16th year of operation overall.

The purpose of the QMS program is to enhance the quality and number of Australian PhD graduates in quantitative marine science, and to develop scientists with skills appropriate for potential employment by CSIRO and other organisations in the quantitative marine science field.

Key Challenges, strategies and achievements

- UTAS funding for scholarships has been maintained but is increasingly difficult to expand capacity and partly dependant on leveraging additional investments. We have worked to identify sources of external scholarships for both domestic and international students, including encouraging inclusion of scholarships as line items in research grant proposals.
- Our enrolments are up to the highest number since the onset of the program. However, the program still attracts a higher number of international students than domestic students.
- We have rejuvenated the project offerings on the QMS website to better reflect current supervision expertise, attracting better quality applicants and removing older, irrelevant project content.
- QMS conference funding continues to provide skilling and networking opportunities for our candidates, such as speaking at international symposiums and conferences enhancing the QMS brand.

In summary, the program is functioning well and has reached its target capacity for 1015-2016. It has both significant opportunities and challenges in the coming year.

It is a great pleasure to be part of the program, and we are very proud of our students.

Sincerely



Peter Strutton, Director, QMS Program

Current Steering Committee Membership

- Peter Strutton (IMAS, Director/Chair)
- Zanna Chase (IMAS)
- Klaas Hartmann (IMAS)
- Richard Matear (CSIRO)
- Peter Thompson (CSIRO)
- Simon Wotherspoon (IMAS, ex-officio)

Statistic on Enrolments, Scholarships, Submissions and Graduations

Summary of student enrolments

The QMS Program was launched in 2004. Since then a total of 51 students have graduated from the Program, approximately 6 graduations per year.

Table 1: Enrolled students by year (incl. comparison of numbers of international and domestic students)

Financial Year	Number of Students	International	Domestic
2010-2011	3	2	1
2011-2012	9	6	3
2012-2013	6	4	2
2013-2014	3	3	0
2014-2015	10	6	4
2015-2016	15	11	4
Applications in Preparation	3	3	0

QMS Full Scholarships awarded 1 July 2015- 30 June 2016

Ajitha Cyriac (International)
Bella Blanche (Domestic)
Romain Forestier (International)
Kirianne Goossen (International)
Yannick Rousseau (International)

QMS Top-up Scholarships awarded 1 July 2015- 30 June 2016

Andrea Cranenburgh (Domestic) Asher Riaz (International)
Curtis Champion (Domestic) Damien Libaros (International)
Fabio Dias (International) Jessica Ericson (Domestic)
Luwei Yang (International) Ram Patel (International)
Richard Cottrell (International) Swan Li-San Sow (International)

Graduates 2015-2016

Name	Supervisors	Research Project
Alice Della Penna	Craig Johnson (UTAS) Tom Trull (CSIRO)	Living in a Fluid Dynamical System: How do marine predators respond to turbulence?
David Gwyther	Ben Galton-Fenzi (UTAS) John Church (CSIRO) John Hunter (UTAS) Jason Roberts (UTAS)	Investigating the Impact of Ocean Warming on Antarctic Ice Shelves
Scott Hadley	Catriona Mcleod (UTAS) Craig Johnson (UTAS) Karen Wild-Allen (CSIRO)	Alternative strategies for sustainable environmental management of nutrient loads in aquaculture
Emmanuel Laurenceau	Phil Boyd (UTAS) Tom Trull (CSIRO) Mathieu Mongin (CSIRO)	Ecosystem controls on Organic Carbon Sequestration from the Naturally Iron-fertilised Phytoplankton Bloom over the Kerguelen Plateau
Rafael Leon	Caleb Gardner (UTAS) Klaas Hartmann (UTAS) Wolfgang Stotz (UNC) John Tisdell (UTAS)	The effect of catch shares strength on management of marine resource
Camilla Novaglio	Stewart Frusher (UTAS) Tony Smith (CSIRO)	Quantitative and Qualitative Analysis on Historical Data to Determine the Most Reliable Baseline for Exploited Marine Communities, Considering Two Different
German Soler	Rick Stuart-Smith (UTAS) Graham Edgar (UTAS) Tony Smith (CSIRO) Russell Thomson (UTAS)	Influence of Environmental Covariates on Reef Food Webs
Viviane Vasconcellos de Menezes	Helen Phillips (UTAS) Andreas Schiller (CSIRO) Catia Domingues (CSIRO) Nathan Bindoff (UTAS)	The dynamics of remarkable near-surface eastward flows in the South Indian Ocean

Students submitted thesis 2016

Name	Supervisors	Research Project
Eva Cougnon	Ben Galton-Fenzi (UTAS) Steve Rintoul (CSIRO)	Quantifying the Impact of Glacial Melt Water on Antarctic Bottom Water
Felipe Briceno Jacques	Gretta Pecl (UTAS) Caleb Gardner (UTAS) Jeff Dambacher (CSIRO) Stewart Frusher (UTAS) Jessica Andre (UTAS)	Understanding Predation Risk in Fisheries: Octopus depredation in the southern rock lobster (<i>Jasus edwardsii</i>) fishery in Australia
Veronique Lago	Nathan Bindoff (UTAS) Susan Wejffels (CSIRO) Simon Marsland (UTAS) John Church (CSIRO)	Ocean Temperature and Salinity Responses to 50 Year Changes in Surface Conditions
Cesar Penaherrera-Palma	Jayson Semmens (UTAS) Alistair Hobday (CSIRO)	Abundance, Distribution and Conservation Value of Sharks in the Galapagos Marine Reserve
Nick Perkins	Neville Barrett (UTAS) Scott Foster (CSIRO) Keith Hayes (CSIRO)	The Effect of Collection and Scoring Methods on Inferences for Analyses of AUV Data

Summary of Graduates

The QMS Program was launched in 2004. Since then a total of 51 students have graduated from the Program, approximately 6 per year. By the conclusion of 2016 we expect the total number of graduates to increase by 5.

Table 2: Graduations by year

Year	Number of students
2008	3
2009	10
2010	8
2011	5
2012	5
2013	9
2014	3
2015	5
2016	3
Total	51

Overview of current student projects

Student	Started	Citizenship	Scholarship	Topic	Primary Supervisor	CSIRO Supervisor
Hugo Bastos de Oliveira	2/12/2013	Int	SWB	Study of the Southern Australia coastal upwelling through modelling and data assimilation	Coleman, Richard	Oke, Peter
Ana Berger	15/12/2014	Int	IMAS	Variability and dynamics of the Indonesian Throughflow	Nikurashin, Maxim	Wejffels, Susan; Sloyan, Bernadette
Bella Blanche	8/02/2016	Domestic	QMS	Detecting human influence in global ocean salinity patterns	Hobbs, Will	Wejffels, Susan
Pearse Buchanan	1/11/2014	Domestic	APA	Ocean Deoxygenation: A paleo-modelling perspective	Chase, Zanna	Matear, Richard
Claudio Castillo Jordan	11/02/2013	Int	BECAS	Disentangling the Climate Change Impacts on Productivity and Availability in Two Macrurus Species off Tasmania and Patagonian Waters off Chile	Frusher, Stewart	Tuck, Jeff
Curtis Champion	1/02/2016	Domestic	APA	Responses to Warming Waters: Range extension in marine fishes from South-East Australia	Tracey, Sean	Hobday, Alistair
Richard Cottrell	16/03/2016	Permanent Resident	IMAS	Bridging the Land-Sea Divide: Links, Interactions and Trade-Offs for Food Security and Biodiversity	Blanchard, Julia	Fulton, Beth
Andrea Cranenburgh	1/03/2016	Domestic	APA	How do Standing Meanders Brake the Antarctic Circumpolar Current?	Phillips, Helen	Rintoul, Stephen
Ajitha Cyriac	18/11/2015	Int	QMS	Eastward Flows, Ocean Mixing and Air-Sea Interaction in the Southeast Indian Ocean	Phillips, Helen	Feng, Ming
Ross Daley	12/09/2011	Domestic	TGRS	Developing Conservation Management Strategies for Vulnerable Deepwater Sharks off Southeast Australia	Semmens, Jayson	Hobday, Alistair
Fabio Dias	24/08/2015	Int	TGRS	Testing of Climate Models and Sea Level Rise Projections using Observations of Ocean Heat Uptake	Domingues, Catia;	Rintoul, Stephen
Jessica Ericson	15/10/2015	Domestic	APA	Mapping the lipid content and composition of Antarctic krill across space and time: A quantitative approach to estimating krill recruitment in the present and future Southern Ocean	Virtue, Patti	Nichols, Peter
Romain Forestier	1/04/2016	Int	QMS	Modelling biodiversity related ecosystem processes as a Complex Adaptive System	Blanchard, Julia	Fulton, Beth
Kirianne Goossen	18/01/2016	Int	QMS	Microbial oceanography of Australian Coastal Waters	Bowman, John	Bodrossy, Lev
Madeline Green	23/02/2015	Domestic	QMS	Population Connectivity of Sharks in the Western South Pacific	Tracey, Sean	Appleyard, Sharon; White, William
Vicki Hamilton	24/07/2012	Domestic	IMAS	Energetic Variability in Sperm Whales and Relationships with the Marine Environment	Hindell, Mark	Evans, Karen

Thibaut Houitte de La Chesnais	27/11/2014	Int	QMS	The Role of Cephalopods in the Structure and Functioning of Marine Ecosystems	Pecl, Gretta	Fulton, Beth
Damien Libaros	28/08/2015	Int	IMAS	Untangling the Key Physical Processes Responsible for Ocean Warming Under Antarctic Ice Shelves	Klocker, Andreas	Legresy, Benoit
Pamela Michael	4/02/2013	Int	IMAS	Potential Impacts of Climate Change on the Dynamics and Distribution of Tuna, Major Industrial Pelagic Longline Fleets and Consequent Interactions with Threatened Albatrosses: A first application to the Indian Ocean	Strutton, Peter	Hobday, Alistair
Amy Nau	2/06/2015	Permanent Resident	TGRS	Mapping the Middle: Analysis of the water column using acoustic and optical methodologies	Lucieer, Vanessa	Martin, Tara
Ram Patel	2/03/2016	Int	TGRS	The Physical and Bio-Optical Structure of Southern Ocean Eddies in Observations and Models	Phillips, Helen	Lenton, Andrew
Samantha Peel	27/01/2015	Domestic	TGRS	Statistical Issues for Mapping Biodiversity in the Southern Ocean	Hill, Nicole	Foster, Scott
Javier Porobic	26/11/2014	Int	TGRS	An ecosystem based management framework for the Juan Fernandez ridge fisheries	Frusher, Stewart	Fulton, Beth
Asher Riaz	6/07/2015	Int	IMAS	Closing the Energy Cycle in Global Ocean Models	Klocker, Andreas	O'Kane, Terence
Nicholas Roden	14/03/2011	Int	APA	Acidification and Carbonate Chemistry of Shelf Waters in the Australian Antarctic Territory	Virtue, Patti	Trull, Tom
Lauren Roman	23/02/2015	Domestic	APA	Population Level Effects of the Ingestion of Marine Debris by Seabirds	Hindell, Mark	Hardesty, Denise; Wilcox, Chris
Yannick Rousseau	10/08/2015	Int	QMS	Predicting the future of global seafood production	Watson, Reg	Fulton, Beth
Serena Schroeter	30/03/2015	Domestic	QMS	The response of Antarctic sea ice to anthropogenic climate change, from model and satellite observations	Hobbs, William	Matear, Richard
Gabriela Semolini Pilo	15/12/2013	Int	CAPES/ IMAS	Eddies Tridimensional Structure and their Role in Oceanic Mass and Heat Distribution	Coleman, Richard	Oke, Peter
Alessandro Silvano	29/09/2015	Int	APA	Observations of Ocean - Ice Shelf Interaction at the Totten Glacier	Williams, Guy	Rintoul, Stephen
Swan Li-San Sow	29/09/2015	Int	TGRS	Microbial Oceanography of the Different Water Masses of the Southern Ocean	Boyd, Philip	Trull, Tom
Samantha Twiname	27/10/2014	Domestic	APA	Mechanistic approaches to understanding climate driven range shifts: using thermal performance to predict the outcome of predator-prey and competitive	Pecl, Gretta	Hobday, Alistair
Roxana Vasile	9/12/2013	Int	QMS	Rock Lobster Larval Dispersal Modelling	Hartmann, Klaas	Hobday, Alistair
Luwei Yang	14/10/2015	Int	IMAS	Internal waves and mixing in the Southern Ocean	Nikurashin, Maxim	Sloyan, Bernadette

QMS sponsored Conference Travel

QMS has funded \$8500.00 in travel funding so far in 2015/2016. Students who have been awarded funds in the first two rounds of 2016 are listed below:

- **Madeline Green:** 2016 American Elasmobranch Society, New Orleans, USA
- **Nicholas Perkins:** 2016 International Statistical Ecology Conference, Seattle, USA
- **Javier Porobic:** 2016 Symposium: Understanding the Marine Socio-Ecological Systems, Brest, France
- **Fabio Dias:** 2016 CLIVAR Open Science Conference, Qingdao, China

QMS supported Write-up scholarship

Table 3: QMS Write-Up Scholarship Recipients

Name	Date started	Amount Awarded
Camilla Novaglio	23/11/15	\$8,000
German Soler	15/2/16	\$8,000
Viviane Vasconcellos de Menezes	24/8/15	\$8,000
David Gwyther	1/7/15	\$8,000
Veronique Lago	8/10/15	\$8,000
Nick Perkins	9/5/16	\$8,000
Eva Cougnon	28/6/16	\$8,000

QMS Supervisors

Table 3: CSIRO and UTAS Supervisors involved in the QMS Program

UTAS Supervisor	Number of current students	CSIRO Supervisors	Number of current students	Supervisors from other institutions	Number of current students
Andre, Jessica	1	Appleyard, Sharon	1	Brown, Mark (UNSW)	1
Barrett, Neville	1	Bodrossy, Lev	1	Cirano, Mauro (FURD)	1
Bindoff, Nathaniel	7	Church, John	2	Hogg, Andrew (ANU)	1
Blanchard, Julia	2	Dambacher, Jeffrey	1	Massom, Rob (AAD)	1
Bowman, John	1	Evans, Karen	1	Shadwick, Liz (VIMS)	1
Boyd, Phillip	1	Feng, Ming	2		
Coleman, Richard	2	Foster, Scott	2		
Chase, Zanna	1	Fulton, Beth	5		
Crawford, Christine	1	Hayes, Keith	1		
Domingues, Catia	1	Hobday, Alistair	5		
Edgar, Graham	1	Legresy, Benoit	1		
Frusher, Stewart	4	Lenton, Andrew	1		
Galton-Fenzi, Ben	3	Marsland, Simon	2		
Gardner, Caleb	2	Matear, Richard	1		
Hartmann, Klaas	2	Nichols, Peter	1		
Hill, Nicole	2	O'Kane, Terence	1		
Hindell, Mark	4	Oke, Peter	2		
Holbrook, Neil	1	Rintoul, Stephen	4		
Hunter, John	2	Schiller, Andreas	1		
Johnson, Craig	2	Sloyan, Bernadette	2		
Kaur, Mandeep	1	Smith, Tony	1		
King, Matt	1	Tilbrook, Bronte	1		
Klocker, Andreas	2	Trull, Thomas	3		

Lucieer, Vanessa	1	Tuck, Geoff	2
MacLeod, Catriona	2	Wijffels, Susan	3
Michael, Kelvin	1	Wilcox, Chris	1
Nichols, Peter	1		
Nikurashin, Max	4		
Oliver, Eric	1		
Pecl, Gretta	4		
Phillips, Helen	3		
Phipps, Steven	1		
Roberts, Jason	1		
Semmens, Jayson	2		
Strutton, Peter	2		
Stuart-Smith, Rick	1		
Swadling, Kerrie	1		
Thomson, Russell	1		
Tracey, Sean	5		
Virtue, Patti	2		
Watson, Chris	1		
Watson, Reg	2		
Williams, Guy	3		

Summary of QMS Teaching (Unit Breakdown)

Table 4: Units taught in 2015

Unit	Teaching Staff UTAS	Teaching Staff CSIRO
QMS510 Introduction to Quantitative Marine Science: R and Matlab	Simon Wotherspoon	
QMS512 Marine Biogeochemistry	Zanna Chase Pete Strutton	Mathieu Mongin
QMS514 Structure and Function of Marine and Antarctic Ecosystems	Craig Johnson	Beth Fulton Jeff Dambacher Rich Little
QMS517 Data Analysis Methods	Simon Wotherspoon Nicole Hill	

Table 5: Units taught in 2016

Unit	Teaching Staff UTAS	Teaching Staff CSIRO
QMS510 Introduction to Quantitative Marine Science: R and Matlab	Simon Wotherspoon	
QMS511 Physical Oceanography	Maxim Nikurashin	
QMS514 Structure and Function of Marine Ecosystems	Julia Blanchard	Beth Fulton Jeff Dambacher Rich Little
QMS515 Techniques in Marine Remote Sensing	Kelvin Michael	
QMS516 Management Strategy Evaluation and Risk Assessment	Klaas Hartmann Paul Burch	
QMS517 Data Analysis Methods	Simon Wotherspoon Nicole Hill	

QMS Student publications – 2014-2016

QMS student authors are indicated in bold. Publications have been included until one year after graduation to allow for delays in the publication process.

- **Buchanan, PJ** and Beckley, LE, “Chaetognaths of the Leeuwin Current system: oceanographic conditions drive epi-pelagic zoogeography in the south-east Indian Ocean”, *Hydrobiologia* 763, pp 81-96. (2016)
- Wallis, JR, Swadling, KM Everett, JD Suthers, IM Jones, H **Buchanan**, PJ Crawford, CM James, LC Johnson, R Meiners, KM Virtue, P Westwood, K Kawaguchi, S “Zooplankton abundance and biomass size spectra in the East Antarctic sea-ice zone during the winter–spring transition” *Deep Sea Research Part II* , Available online 20 October 2015. (2015)
- **Daley, RK.**, A. Williams, M. Green, B. Barker, and P. Brodie. Can marine reserves conserve vulnerable sharks in the deep sea? A case study of *Centrophorus zeehaani* (Centrophoridae), examined with acoustic telemetry. *Deep-Sea Research II* 115 pp. 127-136 (2015)
- McLean, D. L., M. Green, E. S. Harvey, A. Williams, R. K. **Daley**, and K. J. Graham. Comparison of baited longlines and baited underwater cameras for assessing the composition of continental slope deepwater fish assemblages off southeast Australia. *Deep-Sea Research I* 98 pp. 10–20. (2015)
- Hernández, S., RK. **Daley**, T. Walker, M. Braccini, A. Varela, MP. Francis, and PA. Ritchie. Demographic history and the South Pacific dispersal barrier for school shark (*Galeorhinus galeus*) inferred by mitochondrial DNA and microsatellite DNA mark. *Fisheries Research* 167 pp. 132 – 142, (2015)
- **Della Penna**, A., De Monte, S., Kestenare, E., Guinet, C., & d’Ovidio, F. Quasi-planktonic behavior of foraging top marine predators. *Scientific reports*, 5. (2015)
- d’Ovidio, F., **Della Penna**, A., Trull, T. W., Nencioli, F., Pujol, M. I., Rio, M. H., ... & Blain, S. The biogeochemical structuring role of horizontal stirring: Lagrangian perspectives on iron delivery downstream of the Kerguelen plateau. *Biogeosciences*, 12(19), 5567-5581. (2015)
- Bon, C., **Della Penna**, A., d’Ovidio, F., Arnould, J. Y., Poupart, T., & Bost, C. A. Influence of oceanographic structures on foraging strategies: Macaroni penguins at Crozet Islands. *Movement Ecology*, 3(1), 1. (2015)
- Grenier, M., **Della Penna**, A., & Trull, T. W. Autonomous profiling float observations of the high-biomass plume downstream of the Kerguelen Plateau in the Southern Ocean. *Biogeosciences*, 12(9), 2707-2735. (2015)
- **Gwyther, DE** and Galton-Fenzi, B Hunter, JR and Roberts, Jason, “Simulated melt rates for the Totten and Dalton ice shelves”, *Ocean Science*, 10 (3) pp. 267–279. (2014)
- **Laurenceau, E** Trull, T Davies, DM De La Rocha, C and Blain, S, “Phytoplankton morphology controls on marine snow sinking velocity”, *Marine Ecology Progress Series*, 520 pp. 35-56. (2015)

- Emery, TJ Tisdell, J Green, BS Hartmann, K Gardner, C and **Leon, R**, "An experimental analysis of assignment problems and economic rent dissipation in quota managed fisheries", *Ocean and Coastal Management*, 106 pp. 10-28. (2015)
- **Leon, R** Gardner, C van Putten, I and Hartmann, K, "Changes in the lease and permanent sale quota markets of a rock lobster fishery in response to stock abundance", *ICES Journal of Marine Science* (11 January - advance access) pp. 1-10. (2015)
- **Perkins, NR.**, Foster, SD., Hill, NA. and Barrett, NS. "Image subsampling and point scoring approaches for large-scale marine benthic monitoring programs ", *Estuarine Coastal and Shelf Science* **176** pp. 36-46. (2016)
- **Perkins, NR** Hill, NA Foster, SD and Barrett, NS, "Altered niche of an ecologically significant urchin species, *Centrostephanus rodgersii*, in its extended range revealed using an Autonomous Underwater Vehicle", *Estuarine, Coastal and Shelf Science*, 155 pp. 56-65. (2015)
- **Pilo, GS** Oke, PR Rykova, T Coleman, R and Ridgway, K, Do East Australian Current anticyclonic eddies leave the Tasman Sea? *Journal of Geophysical Research*, 120 pp. 8099-8114 (2015)
- Stuart-Smith, RD Bates, AE Lefcheck, JS Duffy, JE Baker, SC Thomson, RJ Stuart-Smith, JF Hill, NA Kininmonth, SJ Airoidi, L Becerro, MA Campbell, SJ Dawson, TP Navarrete, SA **Soler, G** Strain, EMA Willis, TJ and Edgar, GJ, "The potential of trait-based approaches to contribute to marine conservation", *Marine Policy*, 51 pp. 148-150. (2015)