New Zealand
Marine Sciences Society
Annual Conference

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11-14 August 2014, Nelson

Shaping our Marine Future

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NEW ZEALAND MARINE SCIENCES SOCIETY

CAWTHRON INSTITUTE

Department of Conservation
Te Papa Atawhai

NIWA
Taihoro Nukurangi

Ministry for Primary Industries
Manatū Ahu Matua

‘At-a-glance’ conference schedule

Excursion Day - Monday Aug 11

0730	
0745	
0800	
0825	
0830	
0845	
0900	
0915	
0930	
0945	
1000	NIWA excursion at pre-arranged times
1015	
1030	
1045	
1100	
1115	
1130	
1145	
1200	
1215	
1230	
1245	
1300	
1315	
1330	
1345	
1400	Glenhaven excursion departs Cawthron Institute
1415	
1430	
1445	
1500	
1515	
1530	
1545	
1600	
1615	
1630	
1645	
1700	
1715	
1730	Conference Welcome reception at Cawthron Institute
1745	
1800	
1815	
1830	
1845	
1900	
1930	

Day 1 - Tuesday Aug 12 @ Rutherford Hotel

	Maitai 1	Riwaka	Waimea
0730	Registration		
0745			
0800			
0825			
0830			
0845	Powhiri		
0900	Nick Smith		
0915			
0930	Mary Livingston		
0945			
1000	Rob Murdoch		
1015			
1030	BREAK		
1045			
1100	Sustainable Seafood	Southern Oceans	Rocky Reefs
1115			
1130			
1145			
1200			
1215			
1230	LUNCH		
1245			
1300			
1315	Volker Kuntzsch		
1330			
1345	Transition		
1400	Sustainable Seafood	Toothfish	Rocky Reefs
1415			
1430			
1445			
1500			
1515			
1530	BREAK		
1545			
1600	Aquaculture	Ecology	Estuaries
1615			
1630			
1645			
1700			
1715			
1730			
1745			
1800	Cocktail & Poster Session To Free House Craft beer reception		
1815			
1830			
1845			
1900			
1930			

Day 2 - Wednesday Aug 13 @ Rutherford Hotel

	Maitai 1	Riwaka	Waimea
0730			
0745			
0800			
0825	Housekeeping	Physiology	Antropogenic Effects
0830	Rochelle Constantine		
0845			
0900	Alix Lefereie		
0915			
0930	Transition		
0945	Biosecurity		
1000			
1015			
1030			
1045			
1100		BREAK	
1115			
1130	Biosecurity	Changes in Marine Environment	Antropogenic Effects
1145			
1200			
1215			
1230			
1245			
1300	NZMSS AGM & AGM lunch		
1315			
1330			
1345			
1400			
1415	Biosecurity 3	Water Quality	Ecosystem Based Management
1430			
1445			
1500			
1515			
1530		BREAK	
1545	Vertebrates	Offshore Challenges	Ecosystem Based Management
1600			
1615			
1630			
1645			
1700			
1715			
1730			
1745			
1800	Transport to dinner departs Rutherford Hotel @ 6pm		
1815			
1830	Conference Dinner @ 6.30 - 11.30pm, Petite Fleur		
1845			
1900			
1930			

2014 NZMSS Conference programme

Tuesday August 12th

8.45am	Powhiri with **Harvey Ruru** (Maitai 1)		
9.00am	**Minister Nick Smith** (Maitai 1)		
9.30am	**Mary Livingston**, NZMSS President (Maitai 1)		
10.00am	**Rob Murdoch** (Maitai 1)		
10.30am	Morning Tea (Maitai 2)		
Rooms	Maitai 1	Riwaka	Waimea (upstairs)
Session	**Sustainable Seafood** *Sponsor Plant & Food Research* Chair Danette Olsen	**Southern Oceans** *Sponsor Antarctic New Zealand* Chair Steve Parker	**Rocky Reefs** **Chair Robyn Dunmore**
11.00am	**Kathleen Hofman** Electrospinning Marine Collagen	**Drew Lohrer** The processing of detrital algal food pulses by benthic soft-sediment communities in coastal Antarctica	**Tiffany Stephens** Mass-transfer gradients across kelp beds influence Macrocystis pyrifera growth over small spatial scales
11.15am	**Matt Miller** Opportunities for NZ marine oils	**Erik Behrens** Recent and future changes of Antarctic sea-ice related to oceanic changes	**S. Christine Hansen** Variation in secondary productivity of suspension feeders and the potential importance of kelp across a productivity gradient
11.30.am	**Ingrid Richter** Tunicate xenobiotic activated nuclear receptors: their application as sensor elements in high-throughput bioassays for marine microalgal biotoxins	**Aitana Forcen-Vazquez** Is the Campbell Plateau responding to the Tropics?	**Benjamin Hanns** How important is kelp detritus as a food source for suspension feeders on shallow reefs?
11.45.am	**Pamela Kane** Factors affecting catchability of the New Zealand rock lobster *Jasus edwardsii*	**Olga Shatova** Phytoplankton responses to seabird guano fertilization in the Southern Ocean	**Arie Spyksma** Differences in sea urchin morphology: induced by food or fear?
12.00pm	**Robert Major** First steps in developing chemoattractive baits for New Zealand scampi (*Metanephrops challengeri*)	**Phoebe Stewart-Sinclair** Dynamic prey communities in the NZ Subantarctic: major shifts in prey abundance and diet of NZ sea lions over two decades	**Joshua Richardson** Using unbaited remote video cameras to count reef fish
12.15pm		**Jim Roberts** Seasonal eating: the causes and consequences of a dynamic diet in NZ sea lions	**Evan Brown** Indirect effects of marine reserve protection on reef fish communities
12.30pm	Lunch (Maitai 2)		
13.15pm	**Volker Kuntzsch** (Maitai 1)		
13.45pm	Delegates move to general session rooms		
Session	**Sustainable Seafood** *Sponsor Plant & Food Research* Chair Danette Olsen	**Toothfish** Chair Steve Parker	**Rocky Reefs** Chair Robyn Dunmore
14.00pm	**Jeremy Cooper** Towards fine-scale monitoring of New Zealand's commercial paua fishery	**Matt Pinkerton** Ecological risk assessment and the fishery for Antarctic toothfish in the Ross Sea region	**Mads Thomsen** Ecological transitions in a rocky intertidal habitat cascade
14.15pm	**Tom McCowan** Translocation as a potential tool for greater utilisation of commercial paua (*Haliotis iris*) fisheries	**Regina Eisert** Who eats toothfish? Assessing risk to top predators in the Ross Sea region	**Rocio suarez jimenez** Is *Undaria pinnatifida* shaping the future of New Zealand's marine ecosystems?: Ecological implications for community structure and local food webs
14.30pm	**Catarina Silva** Using genetic markers for informing fisheries management and conservation - the case of New Zealand scallop	**Sophie Mormede** Development and use of spatially explicit population dynamics operating models for Antarctic toothfish in the Ross Sea region	**Paul South** The community ecology of co-occurring native and invasive canopy-forming algae
14.45pm	**Sophie Burgess** Developing an effective stock assessment model for the New Zealand scallop species, *Pecten novaezelandiae*	**Sarah Bury** Investigating the trophic ecology of Antarctic toothfish in the Ross Sea region using stable isotopes	**Anna Berthelsen** Changes in the structure and function of coralline turf-associated animal assemblages along an environmental gradient
15.00pm	**Lesley Bolton-Ritchie** Meeting the needs of recreation gatherers of shellfish	**Sophie Mormede** Towards spatially-explicit dynamics models of Antarctic toothfish (*Dissostichus mawsoni*) and two of its main prey (*macrouridae and channichthyidae*) on the slope of the Ross Sea Region	**Matthew Desmond** Underwater light environment and kelp forest community structure on a coastline modified by human activity and on a forested coastline reflecting a primeval baseline
15.15pm	**Eddy Dowle** DNA metabarcoding as a tool for monitoring environmental impact associated with fish-farming	**Sarah Bury** Latitudinal isotopic variability in phytoplankton signatures from New Zealand to Ross Sea informs trophic ecology and migrational pathways of Southern Ocean top predators	**Merle Bollen** Effects of intra- and interspecific competition on gametophytes of the invasive seaweed *Undaria pinnatifida*
15.30pm	Afternoon Tea (Maitai 2)		

Session	**Aquaculture** *Sponsor Kono NZ* Chair Danette Olsen	**Spatial Ecology** Chair Dominic McCarthy	**Estuaries** Chair Drew Lohrer
16.00pm	**Kevin Heasman** The New Zealand scampi (*Metanephrops challengeri*): A new aquaculture challenge	**Mark Gall** Remote sensing of New Zealand's territorial waters can map productivity, monitor turbidity and track change	**Michael Townsend** The promises and the pitfalls of ecosystem services
16.15pm	**Alicia King** Reproductive behaviour and performance in captive hapuku	**Sally Carson** Marine Metre Squared- an experiment in citizen-engaged science	**Vanessa Taikato** An investigation of benthic macrofaunal communities in an estuarine area adjacent to wastewater treatment ponds, Tauranga Harbour
16.30pm	**Nicholas Elliott** Using a novel molecular approach to explore sex differentiation in the yellowtail kingfish to improve its farming efficiency	**Jared Kibele** New tools and methods for cost effective mapping of temperate shallow subtidal reefs	**Rebecca Gladstone-Gallagher** Cross-boundary subsidies of macrophyte detritus influence soft sediment ecosystem function
16.45pm	**Jess Ericson** Bridging the gap: Opportunities for young scientists in aquaculture	**Malcolm Francis** White shark (*Carcharodon carcharias*) aggregations at Stewart Island - spatial and temporal habitat use	**Emily Douglas** Using sedimentary and eutrophication gradients to assess controls on estuary denitrification
17.00pm	**Steve Bird** How can fish health research benefit future aquaculture?	**Warrick Lyon** Kiwi ingenuity develops a new, cheap, and precise way to track shallow water sharks	**Jordan Cooper** Does seagrass provide a refuge from flow for juvenile snapper?
17.15pm	**Mark Camara** Strategies to overcome the effects of the ostreid herpes virus (OSHV-1) on the Pacific Oyster (*Crassostrea gigas*) industry in New Zealand	**Rebecca Lindsay** Fine-scale habitat use by humpback whales informs large-scale Marine Protected Area development in Oceania	**Nathania Brooke** Ichthyoplankton: a temporal study on larval fish in Tauranga Harbour
17.30pm	**Steve Urlich** Best practice guidelines for salmon farm management in the Marlborough Sounds	**Leena Riekkola** Mitigating collisions between large vessels and Bryde's whales in the Hauraki Gulf	**Julien Huteau** Physical and chemical properties of cockle shells from Tauranga Harbour environments: XRF, SEM and micro-structure
17.45pm	**Rich Ford** Researching the environmental impacts of aquaculture: where to next?	**Judy Rodda** Spatio-temporal visualizations of Hector's dolphin data from Te Waewae Bay, New Zealand	**Susanne E. Schüller** Spatial gradients of marine and terrestrial organic matter in sediments of two New Zealand fjords
18.00pm	Cocktail & poster reception (Maitai 2)		
19.00pm	Delegates depart to The Freehouse (own transport)		

Wednesday August 13th

8.25am	Housekeeping (Maitai 1)		
8.30am	**Rochelle Constantine** (Maitai 1)		
9.00am	**Alix LaFerriere**, 2013 NZMSS Research Award Recipient (Maitai 1)		
9.30am	Delegates move to general session rooms		
Rooms	Maitai 1	**Riwaka**	**Waimea (upstairs)**
Session	**Marine Biosecurity – Meeting biosecurity challenges** *Sponsor MPI* Chair Ken Grange	**Physiology** Chair Suzy Black	**Anthropogenic Effects** Chair Sharyn Goldstien
9.45am	**Andrew Bell** Science in New Zealand's Marine Biosecurity System	**Kirsty Smith** Local temperature tolerance in the native range of an invasive species suggests pre-adaptation to New Zealand conditions	**Sean Handley** Six centuries of benthic change, Nelson Bays, New Zealand
10.00am	**Tim Riding** Detecting marine invaders in the 21st century; New Zealand's marine biosecurity surveillance programs	**Angela Smith** Do elasmobranchs metabolise fats for fuel?	**Graham Rickard** Future Predictions from an Assessment of CMIP5 Global Biogeochemical Models for the New Zealand Exclusive Economic Zone (NZ EEZ)
10.15am	**Peter Lawless** Marine Biosecurity in the Top of the South	**Anna Kleinmans** Investigating the low O2 tolerance and likely response of Hapuku (*Polyprion oxygeneios*) to hypoxia	**Daniel Pratt** Detecting subtle shifts in ecosystem functioning in a heterogeneous estuarine environment
10.30am	**Javier Atalah** Development of augmentative biocontrol tools for managing pests on artificial and natural habitats	**Nick Tuckey** The cardio-respiratory physiology of spiny rock lobster (*Jasus edwardsii*) during rest, recovery, and emersion	**Sorrel O'Connell-Milne** Anthropogenic drivers of parasite loading in the clam *Austrovenus stutchburyi*
10.45am	**Kathy Walls** Searching for organisms that may, or may not, be there - response to a Mediterranean fan worm incursion into Waikawa Bay, Picton	**Esme Robinson** Snapper - spectral sensitivity of vision	**Craig Radford** A Noisy Threat: the impacts of noise on marine life
11.00am	Morning Tea (Maitai 2)		

Session	Marine Biosecurity – Meeting biosecurity challenges *Sponsor MPI* Chair Ken Grange	Changes in Environment Chair Abigail Smith	Anthropogenic Effects Chair Sharyn Goldstien
11.30am	**Matt Smith** Emergency surveillance for marine pests following grounding of the container vessel, Rena	**Nick Shears** Regional and seasonal variation in long-term warming trends in coastal waters around New Zealand	**Ashley Webby** Ecotoxicity of Rena heavy fuel oil, corexit 9500, and heavy fuel oil/corexit 9500 combinations to New Zealand fish
11.45am	**Jen Brunton & Richard Kinsey** Joint-agency response to *Undaria pinnatifida* in Fiordland	**Tracey Bates** The Influence of elevated seawater temperature on the physiology of a temperate marine sponge *Tethya bergquistae*	**Caleb McSweeney** The Future of Paua (*Haliotis iris*) for Motiti Island, post CV Rena
12.00pm	**Derek Richards & Rebecca McLeod** Development of a Marine Pathways Plan for a pest free Fiordland	**Anja Studer** Climate change and parasitism in New Zealand intertidal invertebrates: a cause for concern?	**Agnes M. Rouchon** Carry-over effects of low-level copper pollution on early life stages of kina (*Evechinus chloroticus*)
12.15pm	**Irene Middleton** Mediterranean fanworm (*Sabella spallanzanii*) in Northland: what have we learnt?	**Colin D. MacLeod** The combined effects of ocean acidification and parasitic infection on the New Zealand mud snail (*Zeacumantus subcarinatus*)	**David Culliford** Understanding effects from storm water run-off from port log marshalling areas on the marine life of Tauranga Harbour
12.30pm	**Edwin Ainley** Mission (im)possible - the highs and lows of attempting suppression of marine pests	**Darren Parsons** Responses of early stage kingfish (*Seriola lalandi*) larvae to increased acidification	**Esther Stuck** Extracellular pH changes as a consequence of Ocean Acidification
12.45pm	**Kate Schimanski** Understanding selective filters on non-indigenous species spread via hull-fouling.	**Jenny Hillman** Acropora Coral Architecture and its Effect on Two Damselfish Associates: A Comparison of Colony Size and Structural Complexity	**Richard Bulmer** Carbon sequestration in temperate mangrove: response to mangrove clearance
13.00pm	**AGM** with lunch for attendees (Maitai 1)- delegates not attending have free time		
Session	**Marine Biosecurity – Meeting biosecurity challenges** *Sponsor MPI* Chair Ken Grange	**Water Quality** Chair Hamish Wilson	**Ecosystem Based Management** *Sponsor Tasman District Council* Chair Chris Cornelisen
14.15pm	**Ashleigh Watts** Biofouling dynamics and local dispersal in an aquaculture system	**Marcus Cameron** The end of an era: What patterns have been revealed as 26 years of shellfish contaminant monitoring in Auckland comes to an end?	**Mark Morrison** The Kaipara Harbour; a key area for coastal fisheries
14.30pm	**Lauren Fletcher** Biological knowledge underpinning the management of marine pests in New Zealand	**Weimin Jiang** Application of remote sensing data to coastal monitoring of chlorophyll a in New Zealand	**Dana Clark** Quantifying, mapping and valuing marine and coastal ecosystem services in Nelson Bays
14.45pm	**Anastasija Zaiko** Metabarcoding approach in biodiversity and biosecurity surveys: a pilot study from the Baltic Sea	**Te Puea Dempsey** Toitu Te Moananui A Toi - Investigating the Water Quality on Otaiti (Astrolabe Reef) following the CV Rena grounding using DGT Samplers	**Emma Jones** New Zealand's continental shelf: its biogenic habitats revealed
15.00pm	**Xavier Pochon** Assessment of early biofouling communities using Next-Generation Sequencing	**Benjamin Knight** Resolving the role of hydrodynamics in Alexandrium bloom cessation events in a Queen Charlotte Sound embayment	**Dominic McCarthy** The Sea Change (Hauraki Gulf Marine Spatial Plan) Project - challenge, innovation and information
15.15pm	Afternoon Tea (Maitai 2)		
Session	**Vertebrates** Chair Matt Miller	**Offshore Challenges** Chair Alison MacDiarmid	**Ecosystem Based Management** *Sponsor Tasman District Council* Chair Chris Cornelisen
15.45pm	**Helen Neil** Maximum ages for black oreo and smooth oreo	**Malcolm Clark** Science requirements for management of environmental effects of seabed mining; a need for information, collaboration and coordination	**Malcolm Green** Water flows downhill: preparing for change in coastal management as freshwater management is reformed
16.00pm	**Lucinda van Oosterom** The use of vocalisations as a contact call in schooling fish	**Mark Fitzpatrick** Research opportunities linked to, but not in support of, the growth in the offshore resources sector	**Mark Kaemingk** Going with the flow, or battling against the current?: Do larval Inanga prefer to remain in freshwater or travel out to sea?
16.15pm	**Melanie Orr** Elasmobranchs & undersea power cables	**Joanne Ellis** A review of environmental management frameworks for offshore mining	**Mike Hickford** Wandering whitebait: determining the natal source of inanga using otolith microchemistry
16.30pm	**Kate Johnson** Histology of the hindgut in marine herbivorous fishes	**Tara Anderson** Ecological drivers in offshore assemblages: The importance of habitat formers and bioengineers	**Eimear Egan** Insights into the "black box" of a widely dispersing Galaxiid. What can otolith microstructure reveal?
16.45pm	**Selena McMillan** The role of hindgut microbes in protein supply to the marine herbivorous fish, *Kyphosus sydneyanus*	**Helen Neil** Building up a baseline environmental database associated with Petroleum and Mining industrial marine activity in line with the Exclusive Economic Zone Act 2012 - An Example from the Pegasus Basin	**Philipp Neubauer** Bayesian estimation of predator diet composition from fatty acids and stable isotopes
17.00pm	**Paul Caiger** Phenotypic diversity in a reef fish across an exposure gradient		**David Middleton** Data, evidence, and ecosystems management
18.00pm	Transport to dinner departs Rutherford Hotel		
18.30pm-midnight	Conference Dinner at Petite Fleur, Seifried Estate *Buses staggered on return to Rutherford Hotel*		

Thursday August 14th

8.45am	Breakfast courtesy of DOC (Maitai 2)		
9.25am	Housekeeping		
9.30am	John Booth (Maitai 1)		
10.00am	Peter Talley (Maitai 1)		
10.30am	Delegates move to general session rooms		
Rooms	**Maitai 1**	**Riwaka**	**Waimea (upstairs)**
Session	**Science at the interface of food production, ecosystem conservation and economic growth: future fishers** *Sponsor MPI* Chair Paul Creswell	**Invertebrates** Chair Helen Mussely	**Conservation & Biodiversity** Chair Andrew Baxter
10.45am	**Annie Galland** Demographics of a deep sea shark	**Sam Mc Cormack** The chemotaxonomy of marine sub-tidal invertebrates	**Stephen Brown** Benthic Community Response to artificial enhancement of soft sediment habitat
11.00am	**Meredith Lowe** Finding paradise? Is seagrass the utopia for small snapper: a tail of undersea meadows and roving small fish packs	**Nikki Webb** Chemical ecology and bioactivity of New Zealand marine sponge, Cliona celata	**Phil Ross** Kapiti Island Marine Reserve 21st birthday survey: 90's flashbacks and trophic cascades in the 21st century
11.15am	**Alex Thompson** Valuing fishing grounds and the cost of displaced fishing	**Kathryn Lister** Environmental pollutants induce oxidative stress, altering reproductive output and maternal antioxidant loading in temperate and Antarctic sea urchins	**Norliana Rosli** Are benthic standing stocks and diversity greater in canyon and seamount than open slope habitats?
11.30am	**Jacob Hore** Electronic Monitoring in a New Zealand Fisheries Context	**Jan Hesse** Does the removal of large lobsters (Jasus edwardsii) affect their recruitment into reefs?	**Mark Wilcox** Re-establishment of soft-sediment mussel beds in the Hauraki Gulf
11.45am	**Darcy Webber** Bayesian Inference of Computationally Expensive Fisheries Models	**Kendall Gadomski** Temporal and spatial reproductive patterns of the toheroa, Paphies ventricosa, at Oreti Beach, Southland, New Zealand	**Sydney Harris** Marine Soundscape Ecology: A New Mechanism for Biodiversity Measurement
12.00pm	**Matt Pinkerton** Ecosystem modeling of the Chatham Rise: the food-web structure of New Zealand's most productive ocean region	**Hanieh Saeedi** A morphology of razor clams (Bivalvia: Solenidae) anatomy	**Deanna Clement** Twelve nautical miles and beyond – Hector's dolphin abundance and distribution revisited
12.15pm	**Brenton A. Twist** Modelling habitat preferences of the scallop *Pecten novaezealandiae* within Paterson Inlet, Stewart Island	**Hanieh Saeedi** Global biodiversity and biogeography of razor clams (Bivalvia: Solenidae)	**Phil Ross** Larval dispersal v. early aquaculture: alternative explanations for the population structure and dynamics of toheroa
12.30pm	Lunch		
Session	**Sedimentation** Chair Tara Anderson	**Invertebrates** Chair Helen Mussely	**Conservation & Biodiversity** Chair Andrew Baxter
13.15pm	**Chris Battershill** Continental Shelf Sponge Gardens and Benthic Pelagic Coupling: Where does all the carbon go when the habitat is lost through sedimentation?	**Emma Newcombe & Aroha Spinks** Kaimoana from Hōkio to Ōtaki: A hapū-centered study of shellfish on Horowhenua beaches	**Peter Lawless** Kaikoura Community Led Coastal Management
13.30pm	**Iain MacDonald** Memory-loss: Using Lagrangian measurements of flocculation dynamics and turbulence to remove antecedent influences on sediment in motion	**Anna Wood** Bryozoan patch-reefs and macroinvertebrate biodiversity on the New Zealand continental shelf	**Erin Spencer** Community Based Management of Invasive Lionfish in the Florida Keys
13.45pm	**Scott Nodder** Organic enrichment & sedimentation in deep-sea pockmarks & depressions, south Chatham Rise	**Abigail Smith** Growth and Calcification in Bryozoans	**Brittany Graham** Drilling back through time to determine the factors for the decline in New Zealand sea lions
14.00pm	Delegates move to plenary session		
14.15pm	**Alison MacDiarmid** (Maitai 1)		
14.45pm	Conclusion		
15.15pm	Awards & prize draw		
15:30pm	Conference concluded		


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Welcome from NZMSS President

It is my great pleasure as President to welcome everyone to this year's New Zealand Marine Sciences Society Annual Meeting "Shaping our Marine Future" 2014. New Zealand is a maritime nation and we have multiple interests in how we view the sea, be it from cultural, recreational, spiritual, commercial, heritage or environmental perspectives. We also pride ourselves in our research and scientific successes, which appear at times to occur against the odds. There have been pockets of tremendous achievement and breakthroughs which have enabled the NZ marine research community to maintain international status. Examples include the iron limiting experiments; our role in CCAMLR; plate tectonics and international deepsea drilling research, our fisheries modelling expertise, lead roles in the Census of Marine Life, marine biosecurity, and ocean acidification to name but a few.

However, like many other OECD countries, we do have a highly fragmented governance structure across government and the marine sector, with little unity on prioritisation for marine research or strategic direction. True, we have one of the largest EEZ's per capita in the world, and marine research, particularly further offshore, presents a challenge both cost-wise and logistically. It is high time that we made progress. The current funding system through departmental votes and competitive funding has resulted in agencies sticking to their core area of responsibility and provided little opportunity or incentives for synergies or leveraging across common interests. The disconnect between tertiary science funding (TEC) and government agency votes (MPI, LINZ, DOC, MfE, MBIE) and the overall shrinking pool of funding has further exacerbated the difficulties in making more progress across such a large area of sea.

We are hurtling towards developing the marine economy, with new pieces of legislation now in place to ensure that we take an informed approach to our decision-making. But how can we do any of this if the information does not exist?

It really is time for the science community to step up and commit to a strategic approach that provides us with that information. This will improve collaboration across the country. Remaining in our silos with a judgemental and adversarial stance will not help us to reach across to find the common ground in our science needs, or communicate to the country what the limits to the marine system might be. It will simply serve to perpetuate the current melee, and lead to eventual embarrassment as we let our international obligations slide and are unable to maintain our reputation as a sustainable and environmentally aware economic entity.

Thank you so much for coming. I look forward to vigorous discussion and active follow through on this important issue that we need to debate as a country.

I hope that you find time to enjoy the conference and the environs of Nelson while you are here!

Mary Livingston President, NZMSS 2014

2014 Nelson Organising Committee

This event would not have been possible without the valuable assistance of the following individuals on the 2014 organising committee:

Chris Cornelisen (Co-Chair), Cawthron Institute

Danette Olsen (Co-Chair), Plant & Food Research

Ken Grange (Co-Chair), NIWA

Tara Anderson, NIWA

Jenny Mclean, NIWA

Robyn Dunmore, Cawthron Institute

Helen Mussely, Cawthron Institute

Matthew Miller, Plant & Food Research

Suzanne Black, Plant & Food Research

Hamish Wilson, Ministry for Primary Industries

Paul Creswell, Ministry for Primary Industries

Mark Burdass, Nelson Marlborough Institute of Technology

Event Manager:

Kerry South, South Events

Kerry@southevents.co.nz

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SOUTHEVENTS

Event supporters

NEW ZEALAND MARINE SCIENCES SOCIETY
TE HUNGA MĀTAI MOANA O AOTEAROA

This event is brought to you by the New Zealand Marine Sciences Society. Its principal aims are to encourage and assist marine science and related research across a wide range of disciplines in New Zealand and to foster communication among those with an interest in marine science. On behalf of NZMSS we would like to thank the event sponsors for their generous support.

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Important information

Conference venue

The conference will be held at the Rutherford Hotel (27 Nile Street W) in Nelson. Access to the venue is either off Nile Street into the conference foyer or through the main hotel lobby. Some activities will take place in alternative locations so please read the full details of the excursions and social activities you plan to attend. Notably, the conference Welcome Reception sponsored by Cawthron Institute, will take place in their new EnviroTech Wing at 5.30pm Monday August 11th (98 Halifax Street). The conference dinner on Wednesday August 12th will take place at Petite Fleur on the Seifried Estate at 6.30pm (Cnr State HWY 60 and Redwood Road).

Conference Hotel- Rutherford Hotel Nelson
27 Nile Street West, Trafalgar Square, Ph. 0800 368 888,
enquiries@rutherfordhotel.co.nz

Parking

Day car-parking at the Rutherford Hotel for conference delegates is free. While there is free off-site city parking available these spaces are subject to time limitations.

Registration desk

The registration desk is located in the conference foyer adjacent to the Maitai 2 room. Access is either through the hotel lobby or from Nile Street. Delegates are asked to check-in upon arrival if they did not pick up their conference packs at the Welcome Reception (5.30pm Monday at Cawthron Institute). On-site registration will be available. The desk will open at 7.30am Tuesday and will be manned during breaks. If assistance is not available at the desk please direct your inquiry to an organiser identified by a blue name tag and for off-site assistance phone the event manager. Messages and lost property can also be collected at the desk.

Notices

Daily updates or notices related to the day's most current programme will be available in the conference foyer near the registration desk and included in the day's housekeeping announcements.

Emergency & event contact information

Emergency: Dial 111

Urgent & after hours care: Located at 98 Waimea Road next to the Nelson Hospital and open 8am-10pm daily. Phone (03) 546 8881.

Evacuation: In event of a fire at the Rutherford Hotel please use your nearest exit marked with a green sign and assemble on the front lawn of the Hotel.

Event Manager: Kerry South, South Events, Ph. +64 21 024 77 554
Event email: conference@nzmss.org

Catering

Teas and lunches will be provided in the Maitai 2 room amongst the sponsor and poster displays and is located adjacent to the plenary room (Maitai 1). Teas and lunches are provided throughout the event with the exception of Wednesday's lunch which will only be for those attending the AGM. This year the conference brings you something different courtesy of Principal Sponsor Department of Conservation. Thursday, the final day of the conference, will begin with a breakfast prior to the first speaker of the day.

All caterers have been provided dietary information from registration and every attempt has been made to meet all the dietary needs of delegates. Please let the event manager or organisers know if you have any questions or need assistance.

Transport

Included in delegate registration fees is transport to Wednesday's conference dinner sponsored by NIWA at Petite Fleur, Seifried Estate. Delegates are asked to arrange their own transport in relation to the Cawthron Institute Welcome Reception and craft beer session at The Free House. These events may also be within walking distance for some delegates. The event manager is happy to facilitate taxi pickups at all events.

The Nelson Airport is located just 8km from Nelson's city centre. Shuttles or taxis are available to take you between local destinations.

Nelson City Taxis Phone (03) 548 8225: www.nelsontaxis.co.nz
Nelson Bays Cabs Phone (03) 541 8294: www.nelsonbaycabs.com
Super Shuttle Freephone 0800 SHUTTLE: www.supershuttle.co.nz
Nelson Shuttles Phone (027) 447 4818: www.nelsonshuttles.com
Nelson Tasman (http://www.nelsonnz.com/)
Nelson i-Site located at the Corner of Trafalgar & Halifax Street
Phone 03 548 2304: nelsoncity@nelsonnz.com

Internet access

Guest Wifi is provided to delegates courtesy of NZMSS at no charge within the conference facilities of the Rutherford Hotel.

Login: conference
Password: marine

Don't forget!

Valuables should not be left unattended at any time.

Please turn off your mobile phones during conference sessions. No recording of presentations is permitted.

Name badges should be worn at all conference events and will be required for admittance to the conference dinner. Be sure to pick yours up at the check-in desk at the Welcome Reception Monday or at the Rutherford Hotel on any conference day morning along with your conference folder.

Sustainability

Recycle, reduce, reuse! Delegates are asked to assist organisers in increasing the sustainability of this event by using the appropriate bins provided for waste and recyclables.

Presenters' information

Please familiarise yourself with the following information before your scheduled presentation time.

Talks

Each talk is allocated 15 minutes (10 + 5 minutes for questions) Please ensure your presentation is uploaded at least two breaks in advance of your presentation time. To upload your presentation, please go to the room you are presenting in during a break with your presentation on a USB memory stick or CD. **A volunteer or audio visual technician will be available to assist you from 8-8.30am Tuesday & Wednesday and during the second half of breaks.**

Each room features standard audio-visual equipment, including white screens, data projector, lectern and computer. If you have videos or animations in your presentation, please ensure you have embedded the files in your presentation and copied and transferred the video file together with your PowerPoint presentation. WMV or AVI file types are recommended. APPLE MAC USERS – please ensure your presentation is capable of running on Windows. Alternatively, you may want to use your Mac laptop to run your presentation. If so, please bring the adequate adapters necessary for transferring Mac visual data to a Windows PC.

Posters

Please bring your posters to the Maitai 2 area and place in the designated location at the beginning of the conference as they will be on display throughout the event. Presenters are encouraged to make themselves available near their poster at the cocktail & poster reception occurring on Tuesday evening following the end of the day's presentations. Posters should be A0 size in landscape orientation or smaller.

Chairpersons

Thank you for your assistance. Please ensure that you received an information sheet with your conference pack or from the registration desk.

Judges

If you are willing to assist with judging student presentations please see the registration desk. Judging will take place throughout the conference and decisions will be made during Thursday's lunch time prior to the conclusion of the event.

Awards

The following student awards will be presented at the conclusion of the conference:

- Best oral presentation courtesy of NZMSS ($500)
- Talk runner up courtesy Sir Peter Blake ($350)
- Best poster presentation courtesy of NZMSS ($500)
- Best talk relevant to the Seafood Industry courtesy of Plant & Food Research ($400)
- Best student talk making the best use of quantitative methodology courtesy of MPI ($400)
- Best student poster making the best use of quantitative methodology courtesy of MPI ($400)
- Best visually presented student poster presentation courtesy of New Zealand Journal of Marine and Freshwater Research ($280)*
- Encouragement award for student presentation in Marine Ecology
- Encouragement award for student presentation in "Shaping our Marine Future"
    - Encouragement award recipients will be awarded one of two donated books courtesy of Craig Potton Publishing: Moa by Quinn Berentson or Dolphins of Aotearoa by Raewyn Peart

Plenary speakers

Minister Nick Smith

Dr Nick Smith was born and educated in North Canterbury in a bridge construction business family. He subsequently completed a first-class honours degree in civil engineering and a PhD in landslides at Canterbury University.

Nick was politically active from a young age and influenced by a year as an AFS scholar to Delaware, USA. He became a district councillor while studying and has held many offices in Young Nationals and in the senior National Party prior to being selected as the National candidate for Tasman in 1989.

He won the Tasman seat in 1990 and 1993, and following the introduction of MMP, Nelson in 1996, 1999, 2002, 2005, and 2008, despite both having a long previous history as Labour areas.

Nick has held 12 Ministerial portfolios in the Bolger, Shipley and Key Cabinets, covering Conservation, Building and Construction, Housing, Education, Immigration, Corrections, Social Welfare, Treaty Negotiations, Environment, ACC, Climate Change and Local Government.

Mary Livingston

Mary came to Wellington from the UK in 1976 as a post-graduate marine zoology student and here she has stayed, fully ensconced as a marine scientist in this wonderful part of the planet. In fact she has spent virtually all her adult life in this country and feels very much a kiwi, even if her accent gives her away! During her early career, she worked as a scientist with the former fisheries research division of MAF which later morphed into NIWA, and her research focussed on the biology of middle depth fish species such as hoki, hake, ling and silver warehou.

More recently she hung up her gumboots and moved back to government for a job that looks at fisheries related research needs from a much broader perspective such as multiple-use effects on marine biodiversity, and the potential effects of ocean acidification and climate change effects on the marine ecosystem and fisheries productivity. Marine research and its ongoing progress in New Zealand is her passion.

Rob Murdoch

Rob has over 30 years of experience in science. After completing a PhD in biological oceanography at the Portobello Marine Laboratory, University of Otago, he joined the New Zealand Oceanographic Institute (now the National Institute of Water and Atmospheric Research, NIWA) as a research scientist. His research interests have included zooplankton and fish larvae ecology, marine primary production, seabird ecology and benthic ecology. He has been involved in a range of consultancy projects that have included offshore oil and gas development to marine reserve surveys, and consents for coastal developments and aquaculture. Rob is currently the NIWA General Manager Research and has been a member of the NIWA Executive since 1998. He is also responsible for overseeing the management and operation of NIWA's deepwater and coastal research vessels.

Volker Kuntzsch

Volker has a distinguished international career in the fishing industry spanning 25 years. He was formerly the President of Nippon Suisan (USA) and President and CEO of King and Price Seafood Corp in Brunswick, Georgia, USA. His former appointments include Global Marketing Director for Nippon Suisan Kaisha Limited, Tokyo, Managing Director of Hangana Seafood, Namibia and senior roles with Unilever Europe in Germany and the United Kingdom.

Volker was educated in South Africa; he gained a Master of Science from the University of Stellenbosch.

Volker's experience in creating awareness of seafood sustainability includes development of Marine Stewardship Council certification of key fisheries and he played a key role in the early accreditation of the New Zealand hoki fishery.


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Rochelle Constantine

Rochelle completed her PhD in behavioural ecology at the University of Auckland in 2002. In 2011, she took up a position as Senior Lecturer in the School of Biological Sciences and now runs the Marine Mammal Ecology Group. She uses an inter-disciplinary approach to answering questions about cetacean ecology and collaborates widely to try and resolve some of the conservation issues facing cetaceans from the tropics to Antarctica. Her current research projects are focused on understanding the distribution and abundance of the Hauraki Gulf mega-fauna, Bryde's whale ecology and foraging behaviour, minimising Bryde's whale ship-strike mortality, determining the links between the endangered Oceania humpback whale breeding and feeding grounds, evaluating the long-term effects of tourism on the declining population of bottlenose dolphins in the Bay of Islands and understanding Maui's and Hector's dolphin population genetics. As a consequence of the breadth of her research she is a member of several international scientific panels overseeing cetacean research and conservation programmes. She is currently the Director of the Joint Graduate School in Coastal and Marine Science – a NIWA and University of Auckland initiative.

Alix LaFerriere

Recipient of the 2013 NZMSS Student Research Grant

Alix LaFerriere is a PhD candidate with Professor Jonathan Gardner at Victoria University Wellington. She received her Bachelors in Science from Simmons College in the US (1998) and afterwards spent several years teaching marine biology to 4th-12th grade students at the Catalina Island Marine Institute in California. From here, she proceeded offshore and worked as an Oceanographer for the Sea Education Association sampling in the Atlantic and Pacific Oceans. She obtained her MSc in Marine Biology from the University of Oregon in 2008, where she studied Langmuir Circulation as a larval dispersal mechanism. After completing her degree, Alix worked on shellfish and invasive species for the South Slough National Estuarine Research Reserve in the State of Oregon. Alix most recent position was the Marine Reserve Project Leader for the Oregon Department of Fish and Wildlife, where she was charged with the design and implementation of a biological monitoring program for a new marine reserve system. In 2012, Alix started her PhD at Victoria University Wellington. Her research is focused on investigating the spatial distribution and habitat associations of black-foot paua (*Haliotis iris*) populations within the context of New Zealand marine reserves. Alix is specifically interested in examining habitat characteristics and demographic processes that may underlie observed patterns of variation in abundance, individual size and growth.

John Booth

2012 NZMSS Award Recipient

John Booth was, until returning north a few years back, a shellfish research scientist with NIWA in Wellington, with particular interest in spiny lobsters. He now lives at Te Rawhiti in the eastern Bay of Islands where he spends too much of his time supporting local biodiversity-restoration projects; whenever there's the sniff of a chance he's writing about the changed nature of the ecology of the marine waters of the Bay.

Peter Talley

Peter has worked in the Fishing Industry for just over 50 years, picking up the reins of the family business when his father died at a comparatively young age.

From a small fish shop, Peter and his family have built a food business spanning fish, frozen vegetables, meat, and dairy products into the largest, diversified food group in the country providing employment for over 6,000 New Zealanders in 19 strategically sited food processing plants throughout New Zealand.

Fishing Industry

Over time, Peter has held various roles within the fishing industry.

President – Former NZ Fishing Industry Association (NZFIA)

Board Member – Seafood Industry Council (SeaFIC)

Chairman – SeaFIC Policy Council

When the NZ Fishing Industry 'came of age' in the late eighties and early nineties following the introduction of the Quota Management System, Talley's along with others took a leap of faith and invested in factory trawlers of a size previously only seen here in the form of foreign charter vessels.

By constantly investing in new technology, processes, and crew training, the Talley vessels have far outstripped the performance of foreign vessels in all respects whilst being fully crewed by New Zealanders.

Talley's are today the 3rd largest seafood company in New Zealand following Sanford and Sealord.

AFFCO – a 100% owned subsidiary of the Talley Group is the 3rd largest meat processor/exporter.

OCD – Open Country Dairy Ltd (70% TGL shareholding) is the 2nd largest dairy exporter and processor in New Zealand. OCD operates 4 milk powder plants plus a state of the art cheese factory.

Alison MacDiarmid

2013 NZMSS Award Recipient

Dr Alison MacDiarmid is a Principal Scientist of Marine Ecology at NIWA, Wellington where she has worked for the last two decades. While her background was in spiny lobster ecology and reproductive biology her interests have expanded in recent years. She led a just completed multi-disciplinary project describing the historical ecology of New Zealand shelf systems, was lead author of a government report assessing anthropogenic threats to New Zealand marine habitats, and recently completed a collaborative book chapter on New Zealand marine ecosystem services with NIWA colleagues. Alison is co-convener of the Oceans Past V Conference to be held in Tallinn, Estonia in May 2015.

Excursions & social functions

Excursions- Monday 11 August

Glenhaven Aquaculture Excursion @ 2PM, $20 per ticket

Get a tour of the facilities and research activities out at the Glenhaven Aquaculture Centre! This will include a walk out to the adjacent Boulder Bank with a presentation on its origin and geology by Dr Mike Johnston. And of course afternoon tea! Add your ticket on during registration. Tickets are $20 each and include return transport from the Cawthron Institute (98 Halifax St, Nelson) which departs at 2pm and gets back in time for the Welcome Reception at 5.30pm (also at the Cawthron Institute).

Multi-beam and ROV excursion aboard the NIWA coastal vessel Ikatere (pre-arranged)

NIWA
Taihoro Nukurangi

Join NIWA on a 2-hour voyage to explore the bathymetry and sea floor features around Haulashore Island and along the Boulder Bank. Each voyage will be limited to eight people. This is an exciting opportunity to see first-hand the 3-D capabilities of state-of-the-art seabed mapping.

Conference social schedule

Welcome reception @ Cawthron Institute
Kindly sponsored by Cawthron Institute

CAWTHRON INSTITUTE

5.30pm Monday 11 August 2014
98 Halifax St, The Wood, Nelson

Settle in to Cawthron Institute's new EnviroTech wing before the opening day of the conference and enjoy an opportunity to catch up with old acquaintances and meet new ones! Beverages and canapés will include some lovely seafood from Sanford and Kono NZ. You can also enjoy wine tastings courtesy of Supporting Sponsor Kono NZ. Registration packs and name tags can also be picked up at this time.

Cocktail & Poster Reception @ Rutherford Hotel Nelson

6.00pm Tuesday 12 August
Trafalgar Square, 27 Nile Street West, Nelson

Set in the city centre near Nelson's landmark cathedral, the Rutherford Hotel Nelson has updated its conference facilities since NZMSS visited it last in 2005. Delegates can relax and enjoy drinks and canapés while catching up after the day's presentations in the Maitai 2 room where poster presentations are on display.

Craft beer evening @ The Free House

7.00pm Tuesday 12 August 2014
95 Collingwood Street, Nelson

The Free House is a converted church turned pub that will provide a cosy venue to enjoy craft beers and nibbles in following the poster reception. You can even bring a takeaway in with you! Awarded the "Best Pub Nelson-Tasman Region 2013 SOBA Award" it has no tie to a single brewery so offers a plethora of beer choice. Located less than 1km from the Rutherford Hotel (an 8 minute walk away) and across from a building with a giant squid mural- you won't be able to miss it! Nibbles only provided.

Conference dinner @ Petite Fleur, Seifried Estate
Kindly sponsored by NIWA

NIWA
Taihoro Nukurangi

6.30pm Wednesday 13 August 2014
Cnr State HWY 60 and Redwood Road, Appleby, Richmond

Set in the tranquil surrounds of Seifried Estate winery and vineyard, Petite Fleur will have its open fireplace roaring and ready to meet delegates as they gather following the close of conference day two. **Don't forget your "Marine Future" headwear for the dinner! Get your inspiration from Nelson's WearableArt Gallery and be in to win a prize!** Bus transport will depart the Rutherford Hotel at 6pm with buses returning on a staggered departure following dessert. Petite Fleur is located just 20 minutes from Nelson City and has plenty of parking. Look for Rabbit Island Turnoff.

Breakfast @ Rutherford Hotel Nelson (Maitai 2)
Kindly sponsored by Department of Conservation

Department of Conservation
Te Papa Atawhai

8.45-9.30am Thursday 14 August
Trafalgar Square, 27 Nile Street West, Nelson

Big night? Start the day off right with breakfast courtesy of DOC and a more relaxed start to the day's programme. Once you've had a coffee or three along with some lovely items from the Rutherford's chefs you'll be perked up and ready to enjoy a presentation from the 2012 NZMSS Award Recipient John Booth.

Thank you major student sponsor Ministry for Primary Industries for assisting NZMSS with subsidising student registration fees for this event.

Ministry for Primary Industries
Manatū Ahu Matua


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Abstracts

Tues Aug 12th / 0900 / Maitai 1

Minister Nick Smith

Tues Aug 12th / 0930 / Maitai 1

Mary Livingston, Ministry for Primary Industries

During my career as a marine scientist, I have seen many sides of decision-making processes and research prioritisation for marine science within my area and across government. It deeply concerns me that New Zealand's commitment to progressing and completing marine research initiatives about the huge area of coastline and ocean that we are responsible for has been so weak.

Under-investment in baseline data collection and characterisation, mapping of the seabed, taxonomy, valuation of natural capital and ecosystem services, functional ecology, and lack of support for key research infrastructure continues, despite the desire to develop the marine economy within environmental limits or constraints. Even in fisheries where scientific assessment of stock status is an ongoing component for the Quota Management System, the commitment to research to address environmental issues that will keep New Zealand at the top of its game has been wanting.

So what is going on? As we all know, New Zealand has a very large EEZ with significant resources in it. We also hold a significant number of marine world heritage locations, and a plethora of marine fauna and flora that is second to none. While we know that our economy is small by world standards, it has also been known for a decade or more that we would soon be at the point where government would seek to expand the marine economy. To do so without harming our environmental reputation and undermining the economy as a whole would require investment and long-term commitment to ensuring that we have the essential information. Baseline characterisation of the marine environment, marine biodiversity and ecosystem services, as well as national monitoring have long been identified as important and necessary fundamental information required to fulfil such an undertaking. Yet initiatives such as Ocean Survey 20/20 that set out to fill such information gaps and prepare us for sustainable decision-making, were underfunded and, since the economic downturn in 2008, have been all but dropped.

It is not only about the money. The mechanism for identifying nationally important marine research is all but absent and we are in the situation whereby there is almost a complete lack of strategic guidance on where the country wants to be in 20 years time with respect to marine resource use, and the steps that must be taken to get there without completely polarising the nation, violating our international agreements and ruining our international trading reputation in the process. Since the brief foray into Ocean Policy some 15 years ago, there has been very little advancement. Science cannot provide all the answers, however, the contribution of our craft is essential if New Zealand wants to benefit its people by careful and considered use of its natural endowment. Not all activities are bad, but the scale of them and their combined effects do need to be considered and understood.

Acknowledging the power of positive thinking over the negative, my plenary talk will focus on what is happening, rather than what is not. The Natural Resource Sector (http://nrs.mfe.govt.nz/) has requested agencies to develop a National Marine Research Strategy. MBIE is about to invest in a marine based National Science Challenge, "Sustainable Seas", also with a strategic plan. A group across agencies headed up by MPI has been working on the national strategy, while NIWA has been working largely with CRIs and Universities for the Science Challenge. The Environment Defence Society has also been working on developing an Ocean Forum (similar to the Land and Water Forum) while the McGuinness Institute in Wellington has begun some work on strategic thinking about our oceans as well (One Ocean). I hope that these steps signal progress and represent a change in our thinking as a nation, and as a science community, but there is a lot of work to do.


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Tues Aug 12th / 1000 / Maitai 1

Rob Murdoch, NIWA, General Manager of Research

Rob will discuss the recent and on-going proposals around the National Science Challenges.

Tues Aug 12th / 1100 / Maitai 1

Kathleen Hofman, Plant & Food Research

Bronwyn Hall
Plant & Food Research

Electrospinning Marine Collagen

Differences at the molecular level between collagens from marine and mammalian sources result in significantly different stability and functional properties for these proteins. To capture economic value for the NZ marine industry, we need to understand the molecular structures and behaviours of fish collagens and explore applications that exploit the uniqueness of these proteins. One such application is electrospinning. Electrospinning re-organizes solubilised polymers to create new, nanometre-scale fibres that can be used in a wide range of industrial and medical applications. Collagen has been investigated as a biological source material for electrospun fibres. As a major component of the extracellular matrix, collagen is particularly desirable as a biomaterial for the formation of scaffolds and for other medical applications. Due to the nature of the intra-molecular bonds that stabilise hoki skin collagen, it is readily soluble in acid providing a ready supply of intact protein molecules. This is a significant advantage over mammalian collagen sources. We will present our investigation into the electropsinning of different hoki collagen formats and show how the molecular structure of the source material influences fibre formation. We found that denatured whole chains of hoki skin collagen are readily electrospun into uniform fibres.

* Indicates first author if not presenter

Tues Aug 12th / 1100 / Riwaka

Drew Lohrer, NIWA

Vonda Cummings, Neill Barr
NIWA

The processing of detrital algal food pulses by benthic soft-sediment communities in coastal Antarctica.

Coastal marine ecosystems in the Ross Sea, Antarctica, are dynamic and diverse, with distinct zones of primary production and secondary consumption. In spring, microalgal films growing on the underside of sea ice dominate system productivity. Underlying seafloor sediments are areas of net consumption, though they may influence productivity by resupplying inorganic nutrients. We tested the connections between benthic and under-ice zones, and their likely responses to stressors, in experiments at Cape Evans (Ross Island) in November 2013. After manipulating seawater temperature and pH in under-ice chambers by +0.5 C and -0.3 pH units, respectively (simulating realistic Antarctic environmental futures), the productivity of the under-ice algae was reduced and the rate of algal sloughing to the sea floor was increased. By injecting concentrated doses of fresh algal detritus into four benthic chambers (paired with four controls), we simulated changes to the rate of detrital algal rain to the sea floor and observed concomitant shifts in rates of oxygen consumption and nutrient release. These observations represent some of the first explorations of the functional linkages between ecosystem components in ice-covered coastal marine habitats. Quantifying the connectivity between these ecosystem components is imperative if we are to predict responses to environmental change.

Tues Aug 12th / 1100 / Waimea

Tiffany Stephens, University of Otago

Chris Hepburn
University of Otago

Mass-transfer gradients across kelp beds influence *Macrocystis pyrifera* growth over small spatial scales

Nitrogen is essential for algal productivity but often reaches limiting concentrations in temperate ecosystems. Increased water motion enhances nitrogen uptake by decreasing the thickness of the diffusion boundary layer around algal tissue, allowing for increased nitrogen mass-transfer. *Macrocystis pyrifera* forms large beds that span the water column and can alter the surrounding physical environment by creating bed-wide boundaries that may reduce current and wave propagation to the bed interior; reduced water motion may decrease mass-transfer rates and alter nitrogen uptake. We investigated whether a mass-transfer gradient across *Macrocystis* beds exists by identifying three bed types that experience different water motion intensities (open, shoreline exterior and shoreline interior) and whether this gradient influences *Macrocystis* productivity low nitrogen (summer) and high nitrogen (winter) conditions. Gypsum dissolution suggested that mass-transfer significantly increased across beds; open bed dissolution rates were approximately 6.0% higher than the shoreline exterior, which exhibited mean dissolution rates 17.4% higher than the shoreline interior. Summer kelp growth, pigmentation, tissue %N and C:N paralleled mass-transfer, where exterior kelp exhibited higher values than interior kelp. The same trends did not exist during winter, when ambient nitrogen concentrations were high, suggesting that mass-transfer is an important mechanism for nitrogen acquisition during limitation events.

Tues Aug 12th / 1115 / Maitai 1

Matt Miller, Plant & Food Research

Opportunities for NZ marine oils

The scientific understanding behind the beneficial health effects of a diet rich in marine oils, in particular n-3 long chain polyunsaturated fatty acids (n-3 LC-PUFAs), has increased in recent years. Marine oils are important dietary sources of n-3 LC-PUFAs, being especially rich in two of the most important fatty acids of this class, EPA (eicosapentaenoic acid; 20:5n-3) and DHA (docosahexaenoic acid; 22:6n-3). However, there are major issues with supply and demand of omega 3s; increasing demand from novel nutraceutical products and the aquaculture industry has coincided with a shortage of supply being exacerbated by the major fish oil species being managed under reduced catch quotas. Quite simply, current production of marine oils does not provide enough EPA and DHA to meet today's demand. There is huge opportunity in New Zealand not only to increase marine oil production by fully optimised extraction of the resource and through development of novel oil sources, but also to improve its quality. New Zealand has unique omega 3-rich oil sources, including hoki (Macruronus novaezelandiae) and Greenshell™ mussel (Perna canaliculus). This talk will highlight some of the key benefits of omega 3 oil, describe the New Zealand industry, and draw attention to the opportunities available.

Tues Aug 12th / 1115 / Riwaka

Erik Behrens, NIWA

O. Morgenstern, G. Rickard, S. Chiswell
NIWA

Recent and future changes of Antarctic sea-ice related to oceanic changes

This study is based on a sequence of state of the art coupled ocean-atmosphere simulations with HADGEM. We are investigating the driving mechanisms for ocean and sea-ice variability in the Southern Ocean on decadal and multidecadal timescales. Simulations with the emission scenario RCP 6.0 also allows us also to address future changes in this region. We link changes of the Antarctic bottom water (AABW) production, atmospheric induced, to large scale changes in the horizontal flow field, in particular the subpolar gyres in the Ross and Weddell Sea. A strengthening of these gyres, as a results of larger AABW formation, goes along with a sea-ice divergence, leading to positive sea-ice concentrations over this region. Local declining sea ice concentrations can be linked to changes in the near surface circulation and associated heat transport. The future projection scenarios suggest an overall reduction of the AABW production of ~2 Sv by 2100 and a progressing sea ice decline. Changes in the large ocean circulation and sea ice cover have strong implications for biogeochemical processes.

Tues Aug 12th / 1115 / Waimea

S. Christine Hansen, The University of Auckland, Leigh Marine Lab

Christie Yorke[1], Robert Miller[2], Nick Shears[3]
[1]University of California Santa Barbara, [2]University of California Santa Barbara, [3]The University of Auckland

Variation in secondary productivity of suspension feeders and the potential importance of kelp across a productivity gradient

Coastal secondary production of suspension feeders is largely driven by phytoplankton primary production, but kelp-derived organic carbon in the form of small particulate detritus may also contribute to the diets of suspension feeders. Kelp and phytoplankton production co-vary across the Hauraki Gulf, with higher phytoplankton concentrations in the inner Gulf, and higher biomass of kelp in the outer Gulf. These opposing gradients provide an opportunity to investigate the relative importance of phytoplankton versus kelp detritus for suspension feeder growth and productivity. We use the ShellSIM model to assess spatial and temporal patterns in growth of the oyster, *Crassostrea gigas*, and the mussel, *Perna canaliculus*, throughout the Hauraki Gulf. ShellSIM allows us to partition the relative effects of phytoplankton abundance, detrital abundance, and temperature on growth, thus revealing the potential scope for kelp detrital influence across the Gulf. These results will be compared with stable isotope values to determine whether isotope composition is consistent with potential kelp detrital contributions. Given that water quality, temperature and the distribution of kelp forests are likely to vary with climate change, understanding the trade-off between phytoplankton and kelp in consumers' diets across a gradient in their availability should provide insights into changes in secondary productivity.

Tues Aug 12th / 1130 / Maitai 1

Ingrid Richter, Cawthron Institute & Victoria University of Wellington

Andrew E. Fidler
Cawthron Institute

Tunicate xenobiotic activated nuclear receptors: their application as sensor elements in high-throughput bioassays for marine microalgal biotoxins

Xenobiotic activated nuclear receptors (XANRs) regulate transcription of genes involved in metazoan detoxification pathways. The filter-feeding Tunicates (phylum Chordata) are of particular interest as they form the sister clade to the Vertebrata. The ligand-binding domain (LBD) of tunicate XANRs may have adaptively evolved to bind marine bioactive compounds, including microalgal biotoxins. We utilised tunicate XANRs as 'sensor elements' in high-throughput bioassays for microalgal biotoxins. The recombinant yeast strains containing the XANR LBDs of two tunicates, Ciona intestinalis (Ci) and Botryllus schlosseri (Bs), were exposed to both natural and synthetic chemicals (n = 40). Of five microalgal biotoxins tested, three activated both bioassays at nanomolar concentrations: okadaic acid (CiEC50 26 nM, BsEC50 16 nM), pectenotoxin-11 (CiEC50 883 nM, BsEC50 553 nM), and portimine (CiEC50 130 nM, BsEC50 74 nM). Among all agonists, microalgal biotoxins were more potent (i.e. EC50 values 2 - 3 orders of magnitude lower) than synthetic compounds, which is consistent with the hypothesis that tunicate XANRs have adaptively evolved to bind commonly encountered natural toxins. Given the large number of tunicate species, occupying a wide range of ecological niches, we propose that tunicate XANRs may act as 'pre-shaped' sensor elements suitable for detection of marine bioactive compounds including microalgal biotoxins.

Tues Aug 12th / 1130 / Riwaka

Aitana Forcen-Vazquez, Victoria Univeristy of Wellington & NIWA

Michael J.M. Williams[1], Melissa Bowen[2], Lionel Carter[3]
[1]NIWA; [2]The University of Auckland, [3]Victoria University of Wellington

Is the Campbell Plateau responding to the Tropics?

The Campbell Plateau, south of New Zealand is influenced by both the subtropical and subantarctic fronts and is therefore a region that is sensitive to influences from both the north and the south. It also plays an important role in New Zealand regional climate and may have a significant impact on fluctuations in fish stocks and marine mammal populations. Investigating the changes in the long-term oceanographic structure over the Campbell Plateau will lead us to understand variability on both seasonal and inter-annual time scales. Satellite collected Sea Surface Height (SSH) data and Sea Surface Temperature (SST) from the last two decades are investigated to understand long-term variability over the Campbell Plateau. Links to atmospheric processes are assessed by correlating with the Southern Oscillation Index (SOI) and Southern Annual Mode (SAM). Preliminary results show a positive trend in SSH of 5.2 cm per decade. Strong seasonality and inter-annual variability in SST anomalies are presented, reaching a maximum anomaly of 1°C warmer between 1987 and 1988, with a homogenous spatial behavior across the plateau. A significant correlation with SOI and no correlation with SAM suggest a stronger influence of the tropics on the long-term variability on the plateau.

Tues Aug 12th / 1130 / Waimea

Benjamin Hanns, The University of Auckland

Nick T. Shears
The University of Auckland

How important is kelp detritus as a food source for suspension feeders on shallow reefs?

High productivity and a turbulent environment result in kelp forests producing large amounts of detritus via tissue erosion and dislodgment. Consequently, kelp detritus is thought to play an important role fueling reef secondary production. This study investigated the level of kelp detritus utilization in benthic suspension feeders in the Hauraki Gulf via stable isotope analysis, employing a laboratory and field approach. Experiments were carried out, where the availability of kelp detritus to a variety of suspension feeders was manipulated, and suspension feeders were collected from multiple sites and depths. Dietary contributions were quantified via a 3-source mixing-model. The sources for the mixing model included a novel approach, via the inclusion of POM as a food source alongside *E. radiata* and phytoplankton. Experimental addition of kelp detritus did not enhance growth in tested suspension feeders and isotope analysis provided no evidence that kelp particulate was a dominant dietary contributor for any of the species examined. Based on field collections the contribution of E. radiata varied among species, sites, and depths. The greatest contribution (~41%) was found in deeper water for the sponge *Ancorina alata* and the ascidian *Cnemidocarpa bicornuta*. Overall, the contribution of *E. radiata* to suspension feeder diets was found to be lower than previously thought.

Tues Aug 12th / 1145 / Maitai 1

Pamela Kane, The University of Auckland

Factors affecting catchability of the New Zealand rock lobster *Jasus edwardsii*

Studies investigating catchability through modelling research catches and investigations into animal behaviour in relation to traps have been conducted for other rock lobster species overseas, but no specific studies have been documented in New Zealand. Rock lobster catchability depends on the probability of animals encountering, entering and being retained in traps. Research overseas suggests that catchability may vary with habitat and season, and also lobster size, sex, sexual maturity, and in relation to lobster interactions with existing trap occupants. Factors affecting the catchability of the New Zealand rock lobster Jasus edwardsii fishery are undertaken in this study using baited traps fitted with cameras to record animal / trap interactions, and all catches are measured, sex recorded, and animals released unharmed. Preliminary findings inform us on the factors that affect a lobster's decision to enter a trap and explain observed patterns in catches through understanding the factors driving these patterns. The area over which a trap attracts animals and how trap catches relate to local animal abundance are also observed, and are tied into existing diver based lobster monitoring programs within local marine reserves (Cape Rodney to Okakari Point Marine Reserve and Tawharanui Marine Park).

Tues Aug 12th / 1145 / Riwaka

Olga Shatova, University of Otago

Stephen Wing, Linn Hoffmann, Melanie Gault-Ringold, Lucy Jack
University of Otago

Phytoplankton responses to seabird guano fertilization in the Southern Ocean

Large congregations of seabirds in the coastal regions of the Southern Ocean result in delivery of guano-derived micro- and macronutrients to coastal waters that enhances phytoplankton productivity. Over austral summers of 2012, 2013 and 2014 we performed a series of guano-enrichment phytoplankton incubation experiments in three water masses in the Southern Ocean: Antarctic waters of the Ross Sea and sub-Antarctic waters offshore the Otago Peninsula, both iron-limited in summer, and in the subtropical frontal zone offshore from the Snares Islands, which is generally micronutrient-replete. Water samples were enriched with a guano stock solution with known concentrations of Fe and macronutrients. Phytoplankton biomass increased significantly in guano-treated samples in all incubations. Comparative treatments with Fe and macronutrients showed that macronutrients are primarily responsible for the enhancement of the phytoplankton growth in the subtropical frontal zone, while a combination of micro- and macronutrients in guano is likely responsible for phytoplankton response in sub-Antarctic waters in late summer. Phytoplankton response to guano was dominated by Prymnesiophytes in sub-Antarctic and sub-Tropical waters, and by diatoms - in the Ross Sea. Our study uncovers the effects of seabird guano on phytoplankton productivity and emphasizes the importance of seabirds as nutrient vectors in marine ecosystems.

Tues Aug 12th / 1145 / Waimea

Arie Spyksma, The University of Auckland

Richard B. Taylor, Nick T. Shears
The University of Auckland

Differences in sea urchin morphology: induced by food or fear?

Sea urchins (*Evechinus chloroticus*) inside two north-eastern New Zealand marine reserves have thicker and stronger tests than comparably-sized individuals in adjacent fished areas, potentially making them more resistant to crushing predators like snapper. Stronger tests inside the reserves could be due to selection against individuals with weaker tests, or they could be induced in response to predator cues or a greater availability of food (kelp). To assess whether food availability, predator cues or both, influence test thickness and strength, juvenile urchins (<30mm) were maintained in outdoor tanks for 6 months under different combinations of food availability and predator cues. Well-fed urchins grew thicker, more crush-resistant tests and had longer spines than similar-sized individuals on a restricted diet, but predator cues had no effect on these putative defensive features. Implications of this result for sea urchin-predator relationships in the field will be discussed in the light of my previous work showing that cryptic behaviour in sea urchins is induced by predator cues, but not food supply.

Tues Aug 12th / 1200 / Maitai 1

Robert Major, The University of Auckland

Andrew Jeffs[1], Shaun Ogilvie[2]
[1]The University of Auckland, [2]Cawthron Institute

First steps in developing chemoattractive baits for New Zealand scampi (*Metanephrops challengeri*)

New Zealand scampi (*Metanephrops challengeri*) are a commercially important crustacean that is caught around NZ using bottom trawls. Trawling results in large quantities of by-catch, damages the seafloor and the captured scampi. New potting technology is being developed to improve the sustainability and efficiency of the scampi fishery. An integral part of potting fisheries is using species-specific baits. This research aims to investigate the chemosensory systems of New Zealand scampi as a first step toward developing effective chemoattractant baits for use in a scampi-potting fishery. The presentation will review current knowledge of crustacean chemoattractants and their application to the scampi fishery. Preliminary results used to create a scampi behavioural model will be discussed. Future directions for the study include validation of results in sea-trials and behavioural experiments using a y-choice flume. How these results will be integrated into the scampi-potting fishery to improve efficiency and sustainability will then be explored.

Tues Aug 12th / 1200 / Riwaka

Phoebe Stewart-Sinclair, Massey University

Jim Roberts[1], Laureline Meynier[2]
[1]NIWA, [2]Massey University

Dynamic prey communities in the NZ Subantarctic: major shifts in prey abundance and diet of NZ sea lions over two decades

The New Zealand (NZ) sea lion (Phocarctos hookeri) is listed as "nationally critical" under the NZ threat classification system and "vulnerable in decline" by IUCN. Pup production at the Auckland Islands has declined by approximately 50% since 1998. We used scat and regurgitate samples collected at breeding rookeries of the Auckland Islands to assess for changes in summer diet from 1995 to 2013. We found that large prey including hoki (Macruronus novaezelandiae) and giant octopus (Enteroctopus zealandicus) appear to have replaced over time by smaller prey taxa including opalfish (Hemerocoetes sp.) and oblique-banded rattail (*Coelorinchus aspercephalus*). Arrow squid (Ommastrephidae) and smaller octopus species (Octopus sp.) have increased in the diet over the period of time in which the population has declined. Subsequently, a decline in the ratio of fish to cephalopod in the diet of NZ sea lions may have caused a long-term shift in diet quality. We found that that annual frequency of occurrence (%FO) in samples was positively correlated with commerical fishery catch per unit effort (CPUE, a proxy for local prey abundance) for a number of key prey taxa. These results indicate that NZ sea lions of the NZ Subantarctic have adapted their foraging behaviour to broad-scale shifts in prey community structure. As with other marine apex predators, major shifts in diet may have consequences for foraging efficiency, reproductive success, survival and population trajectory.

Tues Aug 12th / 1200 / Waimea

Joshua Richardson, The University of Auckland, Leigh Marine Lab

Richard B. Taylor, Nicholas T. Shears
The University of Auckland

Using unbaited remote video cameras to count reef fish

Diver surveys and baited underwater video (BUV) are widely used to count reef fishes, but both methods potentially underestimate the relative abundance of individuals in areas where they are wary of humans and their associated technology. This could lead to the exaggeration of apparent differences in the densities of exploited fishes between reserves and adjacent fished areas. In an attempt to improve upon current monitoring methods, we developed and tested an unbaited "stealth" video camera in a small camouflaged housing. It is left on the seafloor for several hours to passively record fish that swim in front of it, under the assumption that within a short time after deployment fish will not recognise the camera as a foreign object and thus will not be attracted to or repelled by it. The length of each fish captured by the video is estimated from its relative eye size, removing the need for stereo photography. We surveyed snapper inside and outside the Cape Rodney to Okakari Point Marine Reserve in northeastern New Zealand using the "stealth" camera, diver surveys and BUV, and compared the magnitudes of the marine reserve effect obtained by each method.

Tues Aug 12th / 1215 / Riwaka

Jim Roberts, NIWA

Phoebe Stewart-Sinclair,Laureline Meynier
Massey University

Seasonal eating: the causes and consequences of a dynamic diet in NZ sea lions

NZ sea lions are a key predator of the NZ Subantarctic, a region with strong variation in climate and prey species distribution. We review the evidence for seasonal variation in the foraging and diet of NZ sea lions and other otariid species. We also present an assessment of diet variation at Sandy Bay, Auckland Islands over the first few weeks of the pupping/early lactation period. We found evidence for abrupt shifts in diet composition that may indicate switches in foraging strategy during a critical period in the reproductive cycle. This research suggests that seasonal diet assessments will greatly improve our ability to identify mechanisms by which nutritional stress may affect the productivity of NZ sea lions.

Tues Aug 12th / 1215 / Waimea

Evan Brown, The University of Auckland, Leigh Marine Laboratory

Richard B. Taylor, Nick T. Shears
The University of Auckland

Indirect effects of marine reserve protection on reef fish communities

Protection from fishing within marine reserves typically results in increased densities and body sizes of exploited fishes and invertebrates. Trophic cascades initiated by these species can lead to large-scale habitat changes within reserves. For example, within the Cape Rodney to Okakari Point (Leigh) Marine Reserve in northeastern New Zealand, predation on sea urchins by snapper and lobster has led to the large-scale replacement of the urchin barrens zone by kelp forest. How these changes in habitats have affected the wider reef fish community and non-harvested species in particular has not been examined. For example, species of fish that are associated with urchin barrens may be expected to have declined within the marine reserve, whereas species associated with kelp may have increased. We use both historic and current data on the abundance of fish and the prevalence of habitats inside and outside the Leigh Marine Reserve to assess how reef fish communities may be indirectly affected by marine reserve protection.

Tues Aug 12th / 1315 / Maitai 1

Volker Kuntzsch, Sanford Limited, Chief Executive

Providing insight into the global seafood industry and aspirations for the future.

Tues Aug 12th / 1400 / Maitai 1

Jeremy Cooper, Paua Industry Council Ltd.

Philip Neubauer*, Edward R. Abraham
Dragonfly Science

Towards fine-scale monitoring of New Zealand's commercial paua fishery

Paua (*Haiotis iris*) meta-populations are considered discrete over scales of kilometers, with limited dispersal linking individual sub-populations. The New Zealand paua fishery, on the other hand, is managed on large spatial scales (QMAs) which encompass a potentially large number of individual stocks. To overcome this scale mismatch, the paua GPS dive-logger data collection programme was initiated with the goal of achieving monitoring of the fishery at biologically relevant spatial and temporal scales. Here, we provide a first description of the data-logger programme and associated data. Using Bayesian linear mixed models, we investigated the relationship between logger derived data on the harvest activity and catches, both at large scales (QMA level) and reef scales. Our models showed strong effects of dive parameters (i.e., depth and dive time) on catches, and allowed us to partition catch variance to demonstrate a hierarchy from dominant diver effects to fine scale spatial differences. Our analysis suggests that the logger program will allow for monitoring of local depletion and temporal trends on fine spatial scales, and may considerably improve current indices of abundance for paua populations around New Zealand.

Tues Aug 12th / 1400 / Riwaka

Matt Pinkerton, NIWA

Ecological risk assessment and the fishery for Antarctic toothfish in the Ross Sea region

In general, we do not understand enough about the dynamics of marine ecosystems to be confident that we can predict how systems will change in response to fishing. Here, an ecological risk-based framework is applied to the Ross Sea toothfish fishery. Fisheries in the Southern Ocean are managed according to the three principles of Article II of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR): (1) maintain stable recruitment of the target species; (2) maintain ecological relationships between harvested, dependent and related species; (3) ensure changes in the marine ecosystem due to fishing are reversible over two or three decades. Toothfish are the major finfish resource currently exploited in the Southern Ocean, with only krill exceeding the catch in recent years. There are two species of toothfish in the Southern Ocean, but Antarctic toothfish (*Dissostichus mawsoni*) predominates south of 65°S, and this species has been the focus of a New Zealand-led fishery in the Ross Sea region since 1997. The risk-based approach presented can help to identify and prioritise issues associated with fishing for toothfish in the Ross Sea region that may lead to the conservation principles of CCAMLR Article II being contravened.

Tues Aug 12th / 1400 / Waimea

Mads Thomsen, University of Canterbury, Marine Ecology Research Group

Isis Metcalfe, Paul South, David R Schiel
University of Canterbury

Ecological transitions in a rocky intertidal habitat cascade

Habitat cascades, which occur through sequences of biogenic habitat-formation or modification, are poorly understood. Habitat cascades have mainly been documented from forests, salt-marshes, mangroves and seagrass-beds, but are likely occur over a wide range of habitats. It is suspected that habitat cascades vary across ecological transition zones, for example along environmental gradients. Finally, habitat cascade studies have focused on facultative interactions between habitat-formers (where the secondary habitat-former can inhabit a variety of substrates). We address these research gaps testing if a habitat cascade - mediated by the obligate, epiphytic, secondary habitat-former *Notheia anomala* that only exists on the fucoid host *Hormosira banksii* - changes along ecological rocky intertidal transition zones. Initial data analyses indicate that the abundance of invertebrates are facilitated more by the epiphyte compared to the host, that this is related to the abundance of *Notheia*, and that the habitat-invertebrate relationship changes along elevation zones and across time periods. Thus, *Hormosira* has positive effects on many small invertebrates within and across ecological transition zones, but these positive effects are enhanced when *Notheia* occurs as an epiphyte. This form of habitat cascade is common in terrestrial environments but is only beginning to be understood in the marine environment.

Tues Aug 12th / 1415 / Maitai 1

Tom McCowan, Paua Industry Council Ltd.

Paul A. Breen[1], Tim McLeod[2]
[1]Breen Consulting, [2]PauaMAC7

Translocation as a potential tool for greater utilisation of commercial paua (*Haliotis iris*) fisheries

Translocation aims to maximise the sustainable utilisation of commercial paua fisheries by moving paua from slow-growing (stunted) populations to areas that promote faster growth. We explored the utility of translocation as a management tool in PAU7 (Marlborough) with a tag-recapture experiment aiming to determine the effects of site and density on paua growth. Growth and density of paua were measured at stunted sites, fast-growing sites, and in paua that were translocated from stunted to fast-growing sites. Annualised growth increments of recaptured individuals from all sites were determined and a model was used to estimate growth curves for paua from each 'treatment'. These estimates showed strong significant differences in growth between each treatment. Translocated paua grew faster than paua from stunted sites, but not as fast as paua in fast-growing sites. The effects of density on paua growth could not be determined because they were confounded by differences in growth between sites. These results suggest that translocation could increase the likelihood of 'stunted' paua reaching minimum harvestable size, thus enhancing the utilisation of the fishery. The survival rates of translocated paua, and the effects of translocation on stunted populations must be investigated before this tool is implemented on larger scales.

Tues Aug 12th / 1415 / Riwaka

Regina Eisert, University of Canterbury

Matt Pinkerton[1], Leigh Torres[2]
[1]NIWA Wellington, [2]Oregon State University

Who eats toothfish? Assessing risk to top predators in the Ross Sea region

There is presently debate whether the fishery for Antarctic toothfish (*Dissostichus mawsoni)* in the Ross Sea may adversely affect top predators such as Weddell seals (*Leptonychotes weddellii*) and killer whales (*Orcinus orca*), but available evidence remains inconclusive. Although both Weddell seals and killer whales consume toothfish in the Ross Sea, their dependence on toothfish as prey is not known; consequently, effects of the fishery on these predators cannot be assessed. Nutritional analysis of Ross Sea prey suggests that toothfish may represent a unique high-energy resource for Weddell seals and killer whales that cannot be adequately replaced by other available prey, specifically during periods of high energy demand, such as lactation and the post-breeding recovery of body weight and condition. The ecotype C killer whale common in the Ross Sea is considered a fish specialist and may depend on toothfish. Estimated energy contents and biomass densities of alternative prey (Antarctic silverfish, cryopelagic fish) appear insufficient to explain the evolutionary development of a fish-eating ecotype, or support (seasonal) populations of killer whales in the Ross Sea. We present preliminary results from an NZARI-funded project on the trophic ecology of seals and killer whales in the Ross Sea, and outline future research directions.

Tues Aug 12th / 1415 / Waimea

Rocio suarez jimenez, University of Otago

Chris D. Hepburn[1], Glenn A. Hyndes[2], Rebecca J. McLeod[3], Richard B. Taylor[4], Catriona L. Hurd[5]
[1]University of Otago, [2]Edith Cowan University, [3]University of Otago, [4]The Auckland of University, [5]University of Tasmania

Is *Undaria pinnatifida* shaping the future of New Zealand's marine ecosystems?: Ecological implications for community structure and local food webs

The Asian kelp, *Undaria pinnatifida* (Harvey) Suringar, considered to be one of the world's most invasive species, is now well established around the New Zealand coastline. However, ecological implications for marine ecosystems remain largely unknown. Our goal was to identify the ecological role(s) that *U. pinnatifida* plays in the New Zealand environment, and specifically how it affects community structure and benthic food webs. Information on the abundance of *U. pinnatifida* relative to native seaweed species on reefs in the subtidal and in drift washed up onto beaches was collected. Results showed that *U. pinnatifida* on invaded reefs can comprise up to ~50% of seaweed individuals per m^2 and up to 70 % of canopy cover. Similarly, nearby shores can receive drift seaweed composed of ≤20% biomass of *U. pinnatifida* per m^2. We hypothesised that *U. pinnatifida* provides food of a lower quality that native seaweeds, and is a poorer habitat. Feeding assays showed that the four common subtidal grazers studied (*Aora typica, Batedotea elongata, Cookia sulcata, Haliotis iris*) consumed *U. pinnatitida* but usually preferred native species. Likewise, the beach consumer *Bellorchestia quoyana* (amphipod) consumed ~25% more biomass of native species than *U. pinnatifida*, but this difference could not be explained by macroalgae traits (C:N, organic content, protein content, calorific content) studied. Field studies revealed that *U. pinnatifida* provides a comparable habitat to morphologically simple native seaweeds such as *Xiphophora gladiata* and *Marginariella* spp., but hosts only 1/4 of the density of invertebrates compared to morphologically complex species such as *Carpophyllum* spp., *Cystophora* spp. and *Sargassum sinclarii*. These findings show that the factors controlling the ability of this invasive seaweed to modify native community structure and food webs are complex, and that knowledge of herbivore-identity, and the morphological, biomechanical and food quality of seaweeds, need to be taken into account.

Tues Aug 12th / 1430 / Maitai 1

Catarina Silva, Victoria University of Wellington

Jonathan P.A. Gardner
Victoria University of Wellington

Using genetic markers for informing fisheries management and conservation – the case of New Zealand scallop

The New Zealand scallop (*Pecten novaezelandiae*) is an endemic species supporting important commercial, recreational and customary fisheries. Despite their high value, stocks are declining and there is currently no information on the population genetic structure of this species. Population genetic studies provide valuable support in understanding the population dynamics of exploited species. Understanding the population genetic structure and connectivity of the New Zealand scallop will assist with sustainable management of this fishery. For this study, 12 new microsatellite genetic markers were developed and tested on samples collected in the Coromandel region. Preliminary results suggest that the population structure is limited, as would be expected for an organism that is a broadcast spawner with a relatively long pelagic larval duration (approximately 3 weeks). However, this also suggests that recruitment is highly dependent on the prevailing ocean currents, periodic changes and disturbances which can isolate habitats, retaining larvae and limiting connectivity. The results highlight the utility of the new genetic markers for understanding the current levels of variability within and between populations or stocks and emphasize the importance of using new information to adjust management plans.

Tues Aug 12th / 1430 / Riwaka

Sophie Mormede, NIWA

Alistair Dunn, Stuart Hanchet, Steve Parker
NIWA

Development and use of spatially explicit population dynamics operating models for Antarctic toothfish in the Ross Sea region

Spatially explicit age-structured operating models were developed for the Antarctic toothfish (*Dissostichus mawsoni*) population in the Ross Sea region. The operating models were developed as generalised Bayesian population models and were optimised by fitting to fishery-based observation data. Movement was parameterised using preference functions based on environmental layers. The spatial structure of the models was represented by dividing the Ross Sea region into 189 equal area (24,000 km^2) cells. Three different spatial assumptions concerning the underlying distribution of the population. These ranged from assuming that the stock was restricted to the 65 cells historically fished, to assuming that the stock occupied the entire Ross Sea region (all 189 cells). Estimates of movement rates were consistent with the results of tagging studies and fits to the observations were adequate. These operating models were then used to investigate the potential bias of the current single-area stock assessment. Simulations based on the three stock scenarios suggested that the current single-area stock assessment is biased low by 19-43%. They were also used to develop spatially explicit minimum realistic models that investigate the key relationships between that target fishery for Antarctic toothfish and its main prey species.

Tues Aug 12th / 1430 / Waimea

Paul South, University of Canterbury

Stacie A. Lilley, David R. Schiel
University of Canterbury

The community ecology of co-occurring native and invasive canopy-forming algae

The identity of canopy-forming species can determine community composition, dynamics and function. In the low zones of many southern rocky shores, the canopy-forming algae *Durvillaea antarctica* and *Undaria pinnatifida* are common community dominants. Here, we describe and compare a variety of diversity measures and community composition, in control plots (full canopy) of *Durvillaea* and *Undaria* and following reciprocal press removal experiments over 2.5 years. Generally species richness was greater in *Durvillaea* plots where removing the canopies had dramatic effects, including increases in abundance of many species. For example in the *Durvillaea* removal plots, the canopy formers *Cystophora* spp. and the invasive *Undaria* increased significantly. In contrast, we found few significant effects of removing *Undaria* on community composition (only 1 out of 13 tests during 2.5 years). Similarly, we only detected differences between control and removal plots of *Undaria* in one sub-canopy species on one occasion. Although *Durvillaea* and *Undaria* are classified as canopy forming species, only the former species has wide-ranging and long-lasting community impacts. The wide discrepancy between the impacts of these native and invasive species is likely due to species-specific traits such as perennial (*Durvillaea*) versus annual (*Undaria*) life histories and differences in size, biomass and morphologies. We show that these community effects drive patterns of ecosystem function in the intertidal zone.

Tues Aug 12th / 1445 / Maitai 1

Sophie Burgess, The University of Auckland & NIWA

Developing an effective stock assessment model for the New Zealand scallop species, *Pecten novaezelandiae*

Understanding population dynamics is imperative for effective fisheries assessment and management. The New Zealand scallop *Pecten novaezelandiae* is distributed in a number of areas, including in beds at Tasman Bay, Golden Bay, Marlborough Sounds, and the Coromandel and Northland coasts. *P. novaezelandiae* are highly productive, and are of high economic value. For the effective stock assessment of this species, certain biological parameters (e.g. growth, mortality and recruitment) should be included as inputs in the overall stock assessment model. The objective of the current study is to understand growth and mortality in the *P. novaezelandiae* population, and account for any spatial differences in these parameters when forming a stock assessment model for this species. Spat and clucker experiments will be employed to deliver such parameters. Understanding biological differences between stocks will in turn, allow more specific catch limits be set, resulting in better management overall. Recognising such aspects can improve our estimates of population dynamics for *P. novaezelandiae*, and consequently, assessment models can be specifically tailored to different stocks rather than the present situation where whole population averages are being applied. Theoretically, such information could also be exercised in the future stock assessment of other sedentary, spatially diverse marine invertebrate species.

Tues Aug 12th / 1445 / Riwaka

Sarah Bury, NIWA

Matt Pinkerton, Julie Brown, Jeff Forman, Anna Kilimnik
NIWA

Investigating the trophic ecology of Antarctic toothfish in the Ross Sea region using stable isotopes

We present information on the carbon and nitrogen stable isotopes of Antarctic toothfish (*Dissostichus mawsoni*) and its main prey items (especially grenadiers and icefish) in the Ross Sea region of the Southern Ocean. On the Ross Sea continental slope, toothfish are likely to be the predominant predator of smaller demersal fish. This region has also been the focus for commercial toothfish fishing in the Ross Sea region since 1997. Changing the abundance of a predator can cascade to lower trophic levels, so that understanding the long-term integrated diet of toothfish is critical to assessing the potential ecological impact of the fishery. Information on the diet of toothfish in the Ross Sea region has mainly been derived from studies of stomach content, which only gives insight into the latest predation event, provides no information on long-term assimilated diet and can be biased by different digestion rates of prey. The stable isotope analysis presented complements stomach content information by providing an integrated, long-term indication of trophic relationships between toothfish and its prey in the Ross Sea region.

Tues Aug 12th / 1445 / Waimea

Anna Berthelsen, The University of Auckland, Leigh Marine Laboratory

Judi E. Hewitt, Richard B. Taylor
NIWA

Changes in the structure and function of coralline turf-associated animal assemblages along an environmental gradient

Biological traits analysis is increasingly being used to examine the response of communities to natural and anthropogenic variation in environmental factors. We quantified the assemblage of small (1-8 mm) mobile invertebrates inhabiting subtidal coralline algal turf (*Corallina officinalis*) along an environmental gradient ranging from (1) relatively deep, wave-exposed sites with short turf containing a low proportion of fine sediment to (2) shallow wave-sheltered sites with taller turf containing a higher proportion of fine sediment. Turf fauna were diverse (118 taxa) and abundant (12,000-53,000 ind.m^{-2}), with assemblages dominated by amphipods and gastropods. Total abundances of animals were higher at the wave-exposed sites than at the sheltered sites. Although the proportional occurrences of some biological traits (related to feeding mode, size, reproductive mode, etc.) were associated with certain environmental variables, most of these displayed weak correlations with the overall gradient and an ordination grouped sites more clearly with respect to the gradient when individuals were classified taxonomically than when they were categorised by their biological traits.

Tues Aug 12th / 1500 / Maitai 1

Lesley Bolton-Ritchie, Canterbury Regional Council

Meeting the needs of recreation gatherers of shellfish

Being able to gather shellfish for consumption is a right of every New Zealander. In particular I am considering bivalve molluscs such as pipi, cockles, mussels, tuatua and surf clams. These species live in estuaries and in the coastal intertidal and nearshore zone. As such they can be exposed to a range of toxic and non-toxic contaminants from urban and rural environments, they can be influenced by activities within catchments, e.g. sediment from land use activities, faecal contamination from agricultural use/intensification and their presence and abundance can be influenced by habitat modification and the health of the ecosystem. In my presentation I address the issue of the importance of recreational shellfish gathering, use data collected by/for Environment Canterbury on contaminant loads in shellfish from Ihutai and Whakaraupo and point out what we don't know but what we really need to know to meet the needs of the people that collect shellfish to eat.

Tues Aug 12th / 1500 / Riwaka

Sophie Mormede, NIWA

Alistair Dunn, Matt Pinkerton, Stuart Hanchet, Steve Parker
NIWA

Towards spatially-explicit dynamics models of Antarctic toothfish (*Dissostichus mawsoni*) and two of its main prey (macrouridae and channichthyidae) on the slope of the Ross Sea Region

We develop a spatially explicit minimum realistic model for the Ross Sea toothfish fishery that investigates the key relationships between the target species Antarctic toothfish (*Dissostichus mawsoni*) and the bycatch species: Macrourids and Channichthyiids (icefish) – which are also the main prey species of toothfish. Although toothfish and its main prey species have differing spatial distributions and life history characteristics, a simple predator-prey suitability model captures many of the key population scale dynamics of these species. The model is age-based and consists of a 20 areas. It includes ontogenetic movement of toothfish and movement of the associated prey species, natural mortality, predation mortality and fishing mortality. We compare two predation functions: the Holling type II equation and a prey-suitability predation function based on an assumed consumption rate. We then compare the predicted population changes against available abundance data. This model shows that the predation release from the fishery on toothfish is greater than the direct fishing mortality on the prey species. It provides a useful tool for evaluating potential impacts of the fishery on key prey species. Such models are also useful for assessing and designing monitoring tools of fish species associated with the toothfish fishery, and to inform management decisions.

Tues Aug 12th / 1500 / Waimea

Matthew Desmond, University of Otago

Christopher Hepburn, Danial Pritchard
University of Otago

Underwater light environment and kelp forest community structure on a coastline modified by human activity and on a forested coastline reflecting a primeval baseline.

Reduced light availability has the potential to alter macroalgal distribution, community composition and productivity and thus reduce habitat and energy provision by macroalgae to coastal food webs. We compared the underwater light environment of shallow subtidal rocky reef habitat on a coastline modified by human activities with a coastline of forested catchments reflective of those that covered areas of the modified habitat prior to colonisation by humans. Key metrics describing the availability of photosynthetically active radiation (PAR) were determined over 295 days and were related to macroalgal zonation, community composition and standing biomass patterns collected seasonally in each region. Our results suggest macroalgae on coasts with unmodified catchments are likely to be providing more energy and habitat to higher trophic levels, indicted by greater biomass, larger size and increased depth distribution when compared to sites along coasts modified by human activity. This study provides evidence which suggests that commonly used metrics such as species diversity and density are not as sensitive as direct measures of biomass when detecting the effects of light limitation within macroalgal communities. We also highlight the potential that sites in Southern New Zealand hold for teasing apart natural and anthropogenic changes in the underwater light environment.

Tues Aug 12th / 1515 / Maitai 1

Susie Wood, Cawthron Institute

Xavier Pochon*[1], Eddy Dowle[2], Nigel Keeley[2], Franck Lejzerowicz[3], Philippe Esling[4], Jan Pawlowski[3]
[1]Cawthron Institute, [2]The University of Waikato, [3]University of Geneva, [4]Université Pierre et Marie Curie

DNA metabarcoding as a tool for monitoring environmental impact associated with fish-farming

Metabarcoding applies the principle of DNA barcoding to estimate species richness in environmental samples. Recently, the use of DNA barcodes was prompted by the development of next-generation sequencing (NGS). Several NGS-based studies revealed an astonishing diversity of marine eukaryotes. However, the practical applications of metabarcoding in biomonitoring, especially in aquaculture, are still relatively limited. In New Zealand, the health of marine benthic ecosystems around salmon farms is currently monitored using an Enrichment State (ES) index. This index includes microscopic assessment of macrobenthic infauna which requires taxonomic expertise, is time consuming and expensive. Here, we used NGS-based metabarcoding approaches to assess the impact associated with salmon farms on communities of benthic foraminifera, which are known to be abundant, diverse and highly responsive to environmental perturbations. Our study revealed that changes in foraminiferal community correlate predictably with the ES index between samples collected across environmental impact gradients. The metatranscriptomic (RNA) data also identified key bio-indicator species, which will be used to develop a Foraminifera Community Index (FCI). Based on this proof-of-concept study, we concluded that metabarcoding using foraminifera has potential to become a new promising tool for environmental surveys of fish-farming and other aquaculture activities.

Tues Aug 12th / 1515 / Riwaka

Sarah Bury, NIWA

Matt H. Pinkerton[1], Brittany Graham[1], Leigh Torres[2], Nick Gales[3], Mike Double[3], Rochelle Constantine[4], Jill Schwarz[5], Mark Gall[1], Katie StJohnGlew[6], Julie C.S. Brown[1]
[1]NIWA, [2]Department of Fisheries and Wildlife, United States, [3]Australian Marine Mammal Centre, [4]The University of Auckland, [5]Plymouth University, [6]University of Southampton

Latitudinal isotopic variability in phytoplankton signatures from New Zealand to Ross Sea informs trophic ecology and migrational pathways of Southern Ocean top predators.

A joint collaborative venture between National Institute of Water and Atmospheric Research (NIWA) and Australian Antarctic Division (AAD) resulted in the New Zealand-Australian Antarctic Whale Expedition research voyage (2010). Latitudinal phytoplankton transects were collected from New Zealand to the Ross Sea shelf and along the shelf edge. Measurements of underway temperature, salinity, chlorophyll a, HPLC, and flourometry enabled key oceanographic features to be identified and variations in phytoplankton isotopic values to be interpreted. A Southern Ocean carbon isoscape, derived from the phytoplankton data, is enabling Antarctic toothfish and Humpback whale movements to be interpreted in the context of tagging data. A nitrogen isoscape is providing baseline isotope values to inform trophic studies of Ross Sea top predators. These combined stable isotope dietary and migration data are facilitating an assessment of the impact of the Antarctic toothfish fishery on associated Ross Sea species and are informing conservation management of Humpback whales.

Tues Aug 12th / 1515 / Waimea

Merle Bollen, University of Bremen, Germany

Christopher D. Hepburn[1], Kai Bischof[2]
[1]University of Otago, [2]University of Bremen

Effects of intra- and interspecific competition on gametophytes of the invasive seaweed *Undaria pinnatifida*

The introduction of the Asian brown seaweed *Undaria pinnatifida* along European as well as South Pacific coastlines was associated with alterations of natural communities. In Otago Harbour, New Zealand, the invader is growing within stands of the native giant kelp *Macrocystis pyrifera*. Competition in kelps is not limited to the sporophyte generation but also depends on early successional stages, i.e. by the settlement of microscopic propagules. Therefore this study focused on interactions in very early life stages (< 10 day germlings) between *U. pinnatifida* and *M. pyrifera*. Growth was monitored for germlings grown a) in a mixed culture, b) on monoculture cover slips placed in the same medium with the respective other species and c) in direct vicinity of five-day-old intra- and interspecific germlings. Additionally, the effect of settling density was assessed. The pigmented body of *U. pinnatifida* germlings was consistently longer in the presence of interspecific germlings, and oogonia formation was enhanced by 5.8%. No such effect was observed for *M. pyrifera*. When placed in direct vicinity with other germlings or higher settling density germ tubes of both species were elongated. Results obtained suggest a competitive advantage for the germlings of *U. pinnatifida*.

Tues Aug 12th / 1600 / Maitai 1

Kevin Heasman, Cawthron Institute

Shaun Ogilvie[1], Helen Mussely[1], Andrew Jeffs[2]
[1]Cawthron Institute, [2]The University of Auckland

The New Zealand scampi (*Metanephrops challengeri*): A new aquaculture challenge

A new aquaculture programme investigating the potential of the New Zealand scampi (*Metanephrops challengeri*) was initiated in early 2014. This species has never been the subject of an aquaculture research programme, so there is limited understanding of the husbandry and behavioural requirements of the species in captivity. In this six year research programme, wild-caught scampi, 85% of which are females carrying fertilised eggs, have been harvested as broodstock for assessment in a purpose built land-based system. We have drawn on research carried out on similar species to design our systems and procedures. The recirculating aquaculture system was completed in March 2014 and is currently housing 50 wild-caught females in individual chambers. Each female is holding fertilised eggs at varying stages of development. Two methods have been used to obtain larvae. Firstly, leaving the females to tend to the eggs until they hatch, and secondly physically removing the eggs and rearing them in upweller systems. The eggs have hatched using both methods with the first larvae produced in April 2014. We will present early husbandry and behavioural information generated to date. *This research is part of a larger programme on the scampi fishery in New Zealand (see Major, R. this conference).

Tues Aug 12th / 1600 / Riwaka

Mark Gall, NIWA

Matt Pinkerton, Simon Wood
NIWA

Remote sensing of New Zealand's territorial waters can map productivity, monitor turbidity and track change

Coastal waters are hydro-dynamically and optically complex. Water sampling from vessels can provide high accuracy data, but has limited ability to assess or monitor large-scale patterns over long periods. Optically-instrumented moorings can provide a long-term observational capability but only at a single location. Satellite ocean colour data can complement these forms of in situ sampling by observing coloured material in coastal regions on large time and space scales, with high frequency (up to daily). The main coloured material in coastal waters — phytoplankton, non-algal particulate material (including sediment), and tannins (dissolved yellow colour) — have different optical (absorbing and scattering) properties. Earth-orbiting satellites have measured the colour of the water since 1997 making it possible to map the distributions, variability and change in these coloured water constituents to be determined. Such remotely-sensed spatial data can help management of New Zealand's territorial waters. However, the optical properties of phytoplankton, non-algal particles and tannin can also vary regionally, so that local bio-optical measurements are crucial to provide local tuning and validation of the satellite data products. In this presentation, we discuss progress towards a validated satellite observational capability for New Zealand territorial waters.

Tues Aug 12th / 1600 / Waimea

Michael Townsend, NIWA

Andrew M. Lohrer[1], Dana Clark[2], Judi E Hewitt[1], Carolyn J. Lundquist[1,3], Simon F. Thrush[3], Jo Ellis[2], Shane Geange[4]
[1]NIWA, [2]Cawthron Institute, [3]The University of Auckland, [4]Department of Conservation

The promises and the pitfalls of ecosystem services

'Ecosystem services' (ES) are important concepts for highlighting the benefits that people obtain from ecosystems. However, progress in application is challenging moving from a conceptual framework, to one that spatially applied and useful in terms of management. In this talk, we review the 'promises' and the 'pitfalls' of ecosystem services and the challenges ahead. We demonstrate how progress has been made to fill both knowledge and data gaps. We also discuss the value of working at the habitat scale. We show how we have used a matrix approach to assess habitats on their varying contributions to a range of ecosystem services, and the benefits this has for management and marine protection.

Tues Aug 12th / 1615 / Maitai 1

Alicia King, NIWA

J. E. Symonds, S. Walker, S. Pether
NIWA

Reproductive behaviour and performance in captive hapuku

The diversification of high-value farmed species will play an important part in future-proofing the competitiveness of New Zealand aquaculture in the global market. Hāpuku (*Polyprion oxygeneios*) has been identified as a prime candidate for commercial development due to its high growth rate and excellent flesh quality. As part of the ongoing hāpuku captive breeding programme at the National Institute of Water and Atmospheric Research (NIWA) Bream Bay Aquaculture facility, over 8,000 fertilised eggs have been genotyped for parentage analysis since 2009. This has allowed the individual-scale analyses of various reproductive behaviour/parameters and performance attributes of broodstock such as rates of fertilisation and hatching to be determined. Overall, considerable variation in relative genetic contribution, fecundity, spawning date and egg quality between individuals and years was detected. The relationships between these factors and reproductive performance, and how these relate to the goal of commercial production will be discussed.

Tues Aug 12th / 1615 / Riwaka

Sally Carson, University of Otago, Department of Marine Science

Jenny Rock
University of Otago

Marine Metre Squared –an experiment in citizen-engaged science

Citizen Science is the new wave of informal science education where participants have the opportunity to participate in scientific research to increase their knowledge, gain understanding of the nature of science, and/or develop their skills in the methods of science. Marine Metre Squared (Mm^2), a national citizen science initiative for long-term monitoring of the New Zealand seashore, also aims to facilitate partnerships that lead to improved coastal management. Schools, families, and communities are encouraged to get to know their seashore neighbours and collect scientific information that will help build a picture of the distribution and abundance of New Zealand's intertidal species. However field surveys are only the first stage in the project. Support and guidance from scientists to interpret the data, develop research questions and design further studies is needed to move the project from data donation to citizen-engaged science. Attitudes of marine scientists in NZ and worldwide towards citizen science have been surveyed to gauge potential involvement. Many identified concerns about the benefit of such projects to scientific research, while also acknowledging value to public understanding of science. Discussion will focus on key elements that scientists identified as important when designing citizen science projects and the challenges faced by the Marine Metre Squared project to engage both scientists and citizens.

Tues Aug 12th / 1615 / Waimea

Vanessa Taikato, The University of Waikato

Phil Ross[1], Chris Battershill[2], CaineTaiapa[2]
[1]The University of Waikato, [2]Manaaki Taha Moana

An investigation of benthic macrofaunal communities in an estuarine area adjacent to wastewater treatment ponds, Tauranga Harbour

The accidental discharge of wastewater into coastal waters is a ubiquitous problem. Where discharges do occur, they can have a number of effects on coastal ecosystems including the modification of habitats and biological communities. The Te Maunga WasteWater Treatment Plant is situated on the shores of Rangataua, a semi-enclosed embayment in the southernmost inlet of the Tauranga harbour. Since the establishment of oxidation ponds in the bay in 1974, accidental discharges and seepages of wastewater into Rangataua have been documented, following heavy rainfall events. Local hapu have witnessed the effects of the ponds on kaimoana, including the disappearance of important invertebrate and fish species. The aims of this research include the collection of information regarding the effects of waste water seepage on the ecology of Tauranga Harbour. This will be achieved through an assessment of the effects of waste water on benthic communities and sediment properties, with environmental indicators developed to assess the integrity of the receiving ecosystem. We also seek to better understand the consequences of waste water seepage for the collection of kaimoana. Faecal coliform counts will be measured in benthic fauna. Sampling will be conducted to examine influence of WWTP proximity and rainfall events on kaimoana contaminant levels.

Tues Aug 12th / 1630 / Maitai 1

Nicholas Elliott, The University of Waikato

Koen Mensink[1], Grant Broomfield[2], Jane Symonds[3], Steve Bird[4], Simon Muncaster[4]
[1]The University of Waikato, [2]Bay of Plenty Polytechnic, [3]NIWA, [4]Wageningen University

Using a novel molecular approach to explore sex differentiation in the yellowtail kingfish to improve its farming efficiency

With human demand for fish protein rising globally and increasing pressures on wild fish stocks, the importance of investigating alternative fish species for NZ aquaculture and the continuing improvement of current farming practices to make it more sustainable, is vital. Due to recent scientific developments, there are now techniques available to quickly determine genetic information and monitor the changes in the physiology of a fish placed under different conditions, to a level not previously possible. Yellowtail Kingfish (*Seriola lalandi*) has been recognised as a suitable candidate species for aquaculture in NZ due to its fast growth rate and high market demand, however there is a lot to be understood about the physiology of this species, which will prove invaluable to its future aquaculture. Using a novel approach, we have identified a number of important genes involved in the sex differentiation of this species and are now in the process of characterising these genes in kingfish larvae. These investigations will provide information on issues, such as sexually dimorphic growth rates, skewed sex ratios and the early onset of puberty and place NZ at the leading edge of molecular aquaculture research for this species.

Tues Aug 12th / 1630 / Riwaka

Jared Kibele, The University of Auckland, Leigh Marine Lab

Nick Shears
The University of Auckland

New tools and methods for cost effective mapping of temperate shallow subtidal reefs

Habitat maps are vital to resource management efforts as well as for many ecological studies. Maps of shallow subtidal habitats in New Zealand have previously been produced using a combination of methods and techniques that are typically costly, time consuming, and difficult to assess in terms of mapping accuracy. Automated classification of multispectral satellite imagery has the potential to produce habitat maps more quickly, more objectively, and at a lower cost than methods previously used in New Zealand. A set of free open source software tools and field methods will be described that are intended to make automated classification more accessible and cost effective. These tools and methods are currently being applied to WorldView-2 multispectral satellite imagery to map shallow subtidal habitats in the northern Hauraki Gulf and preliminary results from the Leigh Marine reserve and surrounding coast will be presented. This work will reduce the cost and complexity of producing ground validated habitat maps with accuracy assessment and will be of value to marine spatial planning initiatives and ecological studies in coastal regions worldwide.

Tues Aug 12th / 1630 / Waimea

Rebecca Gladstone-Gallagher, The University of Waikato

Conrad A. Pilditch[1], Carolyn J. Lundquist[2], Drew M. Lohrer[2], Ian Hogg[3]
[1]The University of Waikato, [2]NIWA, [3]The University of Waikato

Cross-boundary subsidies of macrophyte detritus influence soft sediment ecosystem function

Ecosystems are often connected by the transfer of organic material across their boundaries. In temperate estuaries, marine macrophytes produce substantial quantities of organic detritus that can be transported from growing sites by the tides to unvegetated soft sediment habitats. Anthropogenic changes in catchment land use are modifying the distributions of coastal marine vegetation and possibly the detrital subsidy they provide to soft sediments. To assess the role of macrophyte detritus in structuring soft sediment habitats, we added three detrital sources with differing decay rates (seagrass, mangrove and macroalgae litter) to plots (2 m^2), then monitored the effects on ecosystem function and structure. Benthic chambers were deployed 4, 17, and 46 days post- addition of 220 g m^{-2} of detritus to measure nutrient fluxes and benthic primary production, and on these dates we also assessed macrofaunal community structure and sediment properties. Preliminary results indicate that benthic ecosystem function (nutrient regeneration and primary production) of the sediments was stimulated by the detritus, and that detrital quality and decay rate controls the magnitude of the response. Our results highlight the importance of macrophyte detritus as a cross-boundary subsidy to benthic ecosystems, as well as the need to consider the connectivity among temperate estuarine habitats to maintain ecosystem function.

Tues Aug 12th / 1645 / Maitai 1

Jess Ericson, Kono NZ

Bridging the gap: Opportunities for young scientists in aquaculture

The pathway from thesis submission to employment is not always obvious for marine science graduates, and many students are left thinking 'what next?' as their two years of hard work hits the printer. This presentation follows one MSc graduate's path from university to employment within the aquaculture industry. It looks at the opportunities that can be available for young scientists in this realm, and the types of projects that can be undertaken as a scientist working for an aquaculture company. It demonstrates that work within the aquaculture industry provides an excellent pathway for students who are practical and enjoy a challenge, and those wanting to move on to further PhD study with innovative and exciting outcomes for industry.

Tues Aug 12th / 1645 / Riwaka

Malcolm Francis, NIWA

Clinton Duffy[1], Warrick Lyon[2]
[1]Department of Conservation, [2]NIWA

White shark (*Carcharodon carcharias*) aggregations at Stewart Island – spatial and temporal habitat use

Subadult and adult white sharks aggregate seasonally near pinniped colonies in several parts of the globe. The time spent there may represent the most vulnerable part of their otherwise migratory life cycle because of incidental mortality in fishing gear. White sharks were protected in New Zealand in 2007, but are subject to ongoing fishing mortality. We deployed electronic tags on white sharks at north-eastern Stewart Island to identify their temporal and spatial patterns of occupancy, and to inform management measures that aim to separate sharks from fishing effort. White sharks were present almost continuously from late summer to early winter, peaking in autumn (March-June). The population comprised mainly subadult and adult males and subadult females, with males predominating by 2.5:1. Large, mature females and juveniles smaller than 2.5 m long were rare. White shark abundance was greatest in the Titi Island group, and there was fine-scale spatial and temporal variability in abundance within the group. Sufficient information is now available to implement fisheries management measures such as a closed area and/or a closed season to increase the level of protection afforded to white sharks. The behaviour and dynamics of white sharks in other parts of New Zealand remain poorly understood.

Tues Aug 12th / 1645 / Waimea

Emily Douglas, The University of Waikato

Conrad Pilditch[1], Simon Thrush[2], Candida Savage[3], Louis Schipper[4]
[1]The University of Waikato, [2]The University of Auckland, [3]Univeristy of Otago, [4]The Univerisity of Waikato

Using sedimentary and eutrophication gradients to assess controls on estuary denitrification

One of the only ways to remove nitrogen from coastal ecosystems is denitrification. This biogeochemical process is mediated by both environmental conditions and resident macrofauna. We do not know to what extent these factors influence denitrification rates, however this is important because ecosystem changes are occurring as nutrient loading is increasing due to farming and land use intensification. Denitrification is the bacterial mediated conversion of bio-available nitrogen to inert nitrogen gas that occurs within sediments and confers resilience to eutrophication. Yet, we know little about how denitrification rates vary and its relationship to environmental drivers, partly because direct field measurements are difficult. We used a denitrification enzyme activity (DEA) assay to rapidly measure relative denitrification. We selected two estuaries with different nutrient loading and sampled sites across mud to sand gradients. Preliminary results show nitrogen-limitation even at the more eutrophic sites. In both the enriched and more pristine estuary there was a strong positive correlation between DEA and microalgae biomass. However, DEA was correlated with sediment organic matter and mud content only in the enriched estuary. Results of this survey indicate that denitrification rate can increase with nutrient loading offering the ecosystem resilience.

Tues Aug 12th / 1700 / Maitai 1

Steve Bird, The University of Waikato

Chris Battershill[1], Simon Muncaster[2]
[1]The University of Waikato, [2]Bay of Plenty Polytechnic

How can fish health research benefit future aquaculture?

For farmed fish, such as salmonids, there has been intense research carried out over the past three decades, with one of the primary purposes of increasing farming efficiency. Due to this, a lot has been learnt about aspects of fish health which can be applied to overcome production bottlenecks within a fish species. However, there is a lot we do not understand and a continued programme of research is essential for the future of the aquaculture industry globally. Previous studies have shown that fish have all the critical components required, in order to carry out similar immune responses to those found in humans. This presentation will look at how this information is being used to benefit aquaculture and will highlight aspects of fish health that still need to be understood. Also, it will look at current research using recently developed genetic and molecular techniques, which is increasing the quality of research being undertaken in fish, allowing detailed studies in existing and new species to be easily undertaken. Using these tools within the NZ aquaculture industry will prove invaluable in monitoring of fish health in response to disease, vaccinations, immunostimulants and stress.

Tues Aug 12th / 1700 / Riwaka

Warrick Lyon, The University of Auckland

Peter DeJoux
The University of Auckland

Kiwi ingenuity develops a new, cheap, and precise way to track shallow water sharks

The fine-scale movements of rig (*Mustelus lenticulatus*) have been recorded from a spawning site in a shallow water estuary using an innovative tracking system. This tracking system produces real-time, GPS accurate positioning, from replaceable tethered surface-floating tags. With real-time access to accurate positional data, tagged sharks can be located anytime and anywhere, tags can be retrieved from sharks before they leave the estuary, and tags swapped when batteries run low. This allows fine-scale positional data to be collected for as long as the sharks remain in their spawning area. This presentation will explain how this new tracking method has enabled the identification of movement patterns of adult rig.

Tues Aug 12th / 1700 / Waimea

Jordan Cooper, The Waikato University

Nick Ling[1], Darren Parsons[2], Conrad Pilditch[2]
[1]The Waikato University, [2]NIWA

Does seagrass provide a refuge from flow for juvenile snapper?

Many juvenile fish species are associated with structured habitats, potentially benefiting from reduced predation and competition as well as enhanced feeding opportunities. It is also possible that structured habitats may provide a refuge from flow. Juvenile snapper (*Pagrus auratus*) have been observed in close proximity to seagrass (*Zostera muelleri*) in New Zealand estuaries and we tested whether this association offered a refuge from flow. In an annular flume we exposed juvenile snapper (3-5 cm) to sequential increases in flow speed (approximately 1 body length per second every 15 minutes) in three treatments comprising 0, 50 and 100 % seagrass coverage, observed their behaviour and estimated critical swimming speed (i.e. the flow at which fish can no longer maintain position). A startle response was recorded at the end as an indicator of fatigue and from larger juveniles (7-10 cm) we extracted blood to determine stress levels (based on lactate, glucose, haemoglobin and haematocrit). Preliminary observations indicate juvenile snapper seek refuge from high flows in or on the leading edge of seagrass patches, consistent with an increase in critical swim speed with increasing seagrass coverage. Our results suggest an important energetic role of seagrass habitat for juvenile snapper during peak tidal flows.

Tues Aug 12th / 1715 / Maitai 1

Mark Camara, Cawthron Institute

Nick King[1], Henry Kaspar[1], Seiha Yen[2]
[1]Cawthron Institute, [2]The University of Auckland

Strategies to overcome the effects of the osteid herpes virus (OSHV-1) on the Pacific Oyster (*Crassostrea gigas*) industry in New Zealand

New Zealand's Pacific oyster industry experienced mass mortalities for the first time in autumn 2010. The following spring (Nov 2010), the micro-variant of the oyster herpes virus (OsHV-1 µ-var) was confirmed as the cause of these mortalities, and since then this virus has caused a marked reduction in New Zealand oyster production. Most growing areas lost 90% of the juvenile oysters, both farmed and wild. OsHV-1 now affects most oyster populations in the warmer North while the cooler Southern margin of the oyster's distribution has not shown mass mortalities or a prevalence of the virus. Recruitment failure of wild spat resulted in a shortage of spat for on-growing, and in response we have expanded hatchery spat production and imposed strict biosecurity measures. All hatchery-reared spat is tested for the virus by PCR before being cleared for movement. We have found that a strategy of growing hatchery spat to intermediate size (50mm) on mortality-free, sub-tidal farms in the South Island before final grow-out during the colder season in the North when the virus is absent or dormant can increase survival. However, selective breeding is the major long-term strategy to overcome the effect of OsHV-1, and the breeding objectives of the on-going family-based selection programme have been shifted from production and consumer traits to resilience against a range of stresses including the virus. The breeding programme also seeks to exploit natural selection in North Island oyster populations during several recent outbreaks of the virus using a walk-back selection strategy on large mixed-family seedlots. Formal genetic evaluations to estimate the heritability of OsHV-1 resilience and its genetic correlations with other economically important traits await more data on pedigreed individuals, but initial field trials using juveniles from the first and second generations of hatchery-spawned families found large differences in survival, supporting the hypothesis that resilience to OsHV-1 is under substantial genetic control and can be improved through selective breeding. With the aim of increasing the effectiveness of selective breeding for more resilient shellfish, we are also working towards developing laboratory-based challenges on larvae, juveniles and adults. With the complete genome of the Pacific oyster genome having been recently sequenced, we are also exploring the potential for using QTLs in marker-assisted or whole genome selection.

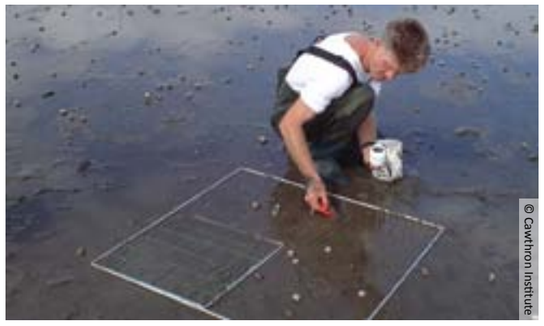
Tues Aug 12th / 1715 / Riwaka

Rebecca Lindsay, The University of Auckland

Jooke Robbins[1], Todd E. Dennis[2], David Mattila[3], Alden Tagarino[4], Rochelle Constantine[5]
[1]Provincetown Center for Coastal Studies, [2]The University of Auckland, [3]Hawaiian Islands Humpback Whale National Marine Sanctuary, [4]American Samoa Department of Marine and Wildlife Resources, [5]The University of Auckland

Fine-scale habitat use by humpback whales informs large-scale Marine Protected Area development in Oceania

Throughout the South Pacific, large-scale MPA's have been designated to provide protection for endangered humpback whales (*Megaptera novaeangliae*) in their Oceania breeding grounds. However, an understanding of fine-scale habitat use in this unique geographical region is needed to focus recovery efforts in the appropriate local areas. Using sightings of humpback groups and environmental factors hypothesised to be influential in humpback space-use patterns, we developed predictive habitat models in two South Pacific breeding grounds: American Samoa (2003-2010, n = 334) and Tonga (1996-2007, n = 564). MaxEnt models were created separately for mother-calf pairs, adult-only groups, and singing males, to determine if the spatial pattern of suitable habitat varied as a function of group-type. We found that depth of water was influential for predicting suitable mother-calf habitat at both sites, which primarily encompassed shallow waters, whilst access to deep water was important for adult-only groups. Additionally, slope and rugosity were informative for the prediction of suitable singing habitat. Our results are comparable with breeding grounds elsewhere, suggesting that favoured habitats for humpback whales are consistent globally, despite regional differences in environmental composition. Our study illustrates the value of presence-only habitat modelling to identify key areas for future systematic surveying.



Tues Aug 12th / 1715 / Waimea

Nathania Brooke, The University of Waikato

Phil Ross[1], Tom Trnski[2], Keith Gregor[3]
[1]The University of Waikato, [2]Auckland Museum, [3]Bay of Plenty Polytechnic

Ichthyoplankton: a temporal study on larval fish in Tauranga Harbour

Estuaries are important nursery habitats for many fish species on account of their high primary production and shallow warm waters. While it is acknowledged that human activities can degrade the ecological value of estuaries, there is little understanding of how this degradation might impact on fish larval life stages. As a first step to understanding potential anthropogenic impacts, knowledge of the spatial and temporal distribution of larval fish is essential. To gain a better understanding of the ecology of larval fish in the estuaries of north-eastern New Zealand, we examined the temporal distribution of fish larvae migrating through the estuary channel in Tauranga Harbour. Sampling used a $2m^2$ channel net with 0.8 mm mesh and was conducted Dec 2013 to Jan 2014. A total of 120,000 m^3 of water was sampled, over four 50 hour periods covering both flood and ebb tides, and day and night. The results indicate that the harbour is indeed a nursery ground for a variety of fish species. Common inshore reef fish species make up a large percentage of the larvae present. A number of other interesting and unexpected specimens were also encountered.

Tues Aug 12th / 1730 / Maitai 1

Steve Urlich, Marlborough District Council

Mark Gillard[1], Nigel Keeley[2], Niall Broekhuizen[3], Richard Ford[4], Rob Schuckard[5]
[1]The New Zealand King Salmon Co. Ltd, [2]Cawthron Institute, [3]NIWA, [4]Ministry for Primary Industries, [5]Sounds Advisory Group

Best practice guidelines for salmon farm management in the Marlborough Sounds

In November 2013, The New Zealand King Salmon Co Ltd and the Marlborough District Council committed to a process to ensure world-leading salmon farming practices occur in the Marlborough Sounds. Salmon farming is a relatively young industry in the Sounds (~25 years), but in that time, there has been rapid evolution in farming technologies and environmental monitoring. However, consent conditions have not consistently kept pace. Sufficient knowledge now exists to identify 'best practice' farm management and environmental quality standards. The guidelines aim to provide assurance to the community that salmon farming is environmentally and economically sustainable. A well-managed salmon industry provides multiple benefits to Marlborough, including employment and investment. The guidelines contribute to this by enabling production capacity at farm sites to be optimised within appropriate and agreed environmental constraints. The guidelines should also assist in the formulation of Marlborough's new Resource Management Plan. The development of the guidelines has involved industry and community representatives, national science providers, Government, and international experts from Scotland and Tasmania. In this talk, we outline that collaborative process and discuss the development of the benthic environmental standards as a key component of the guidelines, as well as the options for implementation.

Tues Aug 12th / 1730 / Riwaka

Leena Riekkola, The University of Auckland

Rochelle Constantine[1], Leigh Torres[2], Todd Dennis[1]
[1]The University of Auckland, [2]NIWA

Mitigating collisions between large vessels and Bryde's whales in the Hauraki Gulf

Collisions between vessels and whales are a significant source of whale mortality and an issue of growing concern. The Hauraki Gulf is an important habitat for Bryde's whales (*Balaenoptera edeni*), a critically threatened species in New Zealand. Bryde's whales are distributed throughout the Hauraki Gulf, an area of high shipping activity. Previous studies have shown that Bryde's whale mortality is primarily (84%) caused by vessel-strike injuries, but the long-term population-level impacts of this are poorly understood. Sightings between July 2012 and June 2013 (n=123) were used to characterise the spatio-temporal distribution of Bryde's whales within Hauraki Gulf. The whales were found to be evenly distributed throughout the inner Hauraki Gulf, and were most commonly observed alone. To assess whether re-routing vessel traffic could be an effective means of mitigating vessel-strikes, the spatial overlap of whale sightings and ship Automatic Identification System (AIS) data were analysed using GIS. We found that the highest probability of a vessel encountering a whale occurred in areas with the highest amount of vessel traffic. Our results suggest that due to the broad overlap between whale distribution and vessel movements in the Hauraki Gulf, re-routing vessel traffic is currently not a viable mitigation option.

Tues Aug 12th / 1730 / Waimea

Julien Huteau, The Waikato University, Environment Research Institute

Aamir Mukhtar
Titanium Industry Development Association

Physical and chemical properties of cockle shells from Tauranga Harbour environments: XRF, SEM and micro-structure

Environmental managers need to be aware of the ecological state of sensitive habitats within their jurisdiction. Directly linked with human activities, pollution is compromising a wide range of sectors such as tourism, trade partners for exportation, and public health associated with consumption of seafood. Recent research as part of a PhD program designed to understand the ecological and cultural effects of anthropogenic contaminants in estuaries has been undertaken in conjunction with the Titanium Industry Development Association (TIDA), to support innovation in the field of ecological research. This work is an exciting opportunity to develop new ways to characterise and understand disturbances from well-known pollution events. The initial phase of this research has been an internationally novel focus on the microhardness inside cockle shells as a measure of stress. We will also present the results of other techniques including x-ray fluorescence (XRF) and scanning electron microscopy (SEM) with energy dispersive X-ray spectroscopy (EDS) to elaborate the linkages between chemical micro-environmental signatures and the physical properties of the mollusc shell. Further aspirations leading from this research will be discussed with reference to Tauranga Harbour. In particular the relevance of the micro-structural work, XRF and SEM studies will be set in the context of examining metal speciation, isotopic labelling and the paleoenvironmental record. Acknowledgement: Chris Battershill of The Waikato University and Peter Franz of Titanium Industry Development Association.

Tues Aug 12th / 1745 / Maitai 1

Rich Ford, Ministry for Primary Industries

Stephanie Hopkins, Hamish Wilson
Ministry for Primary Industries

Researching the environmental impacts of aquaculture: where to next?

Sustainable aquaculture growth in New Zealand is presently being promoted by both industry and central government. Commercial scale aquaculture has existed for over 30 years in New Zealand and over that time our knowledge of its environmental impacts has improved. Recent work lead by the Ministry for Primary Industries (The Aquaculture Ecological Guidance Package) has focused on collating available knowledge, attempting to find consensus and knowledge gaps and communicating this information effectively for use in the spatial consenting process. High level goals from the Aquaculture Mid-Term Research Strategy regarding environmental impacts include:

- managing biosecurity risks cost effectively,
- the effects of aquaculture on water quality, and
- improved assessment, understanding and communication of the interactions between the environment and aquaculture.

This talk will communicate work thus far on an ecological effects of aquaculture research implementation plan (RIP) for approximately the next 5 years and invite feedback. Areas of particular focus will include baseline data collection, modelling of carrying capacity and biosecurity. This talk will detail work already completed or ongoing and outline potential future directions for both MPI funded and external research.

Tues Aug 12th / 1745 / Riwaka

Judith (Judy) Rodda, University of Otago

E. Slooten, A. B. Moore
University of Otago

Spatio-temporal visualizations of Hector's dolphin data from Te Waewae Bay, New Zealand

This research is unique in using photographic, individual-identification data rather than the more commonly used bio-tags in conjunction with innovative space-time mapping techniques. Spatio-temporal output is presented from two years of data collected on Hector's dolphins from Te Waewae Bay on the south coast of the South Island prior to the sanctuary being designated in 2008. The story unfolds with raw data related to groups of Hector's dolphins transformed into static yet effective maps (raster and Kernel Density Estimates) of distribution and density. The data are then refined to represent individual dolphins in a 3D space-time cube, using time as the vertical axis and the encounter points in the x, y plane. Expansion into 3D allows identification of clusters and activity patterns not visible in the 2D visualizations. The last chapter identifies environmental variables in a quantitative analysis that incorporates local regression models. The visualizations indicated that Hector's dolphins in Te Waewae Bay utilise the entire bay, some individuals were observed only on the east or west side of the Waiau River, and groups congregated close to freshwater inputs. This information adds to our understanding of Hector's dolphin spatio-temporal biology and will be useful for conservation management.

Tues Aug 12th / 1745 / Waimea

Susanne E. Schüller, University of Otago

Xiangqian Cui[1], Thomas S. Bianchi[1], Candida Savage[2]
[1]University of Florida, [2]University of Otago

Spatial gradients of marine and terrestrial organic matter in sediments of two New Zealand fjords

The burial of organic matter in ocean sediments is an important process that removes carbon from the atmosphere over geological timescales. Thus quantifying the amount of carbon burial and the type of organic matter in sediments is important for climate change models. Active margins, such as Fiordland, New Zealand, are thought to be effective carbon sinks due to their high fluvial sediment load. Recent studies indicate that Fiordland is a 'hot spot' for organic carbon burial, likely due to effective organic carbon retention within the deep fjord basins. As part of a larger study, here we provide first investigations into the source of organic carbon (marine or terrestrial) in surface sediments in Doubtful and Dusky Sound using a spatially explicit sampling scheme. We quantify phytoplankton pigments (chlorophyll-a, carotenoids), total organic carbon, stable isotopes (δ 13C and δ 15N), and lignin phenols as biomarkers of autochthonous and allochthonous organic matter. These data demonstrate strong spatial gradients from the fjord head towards the open ocean within Doubtful and Dusky Sound, highlighting the variability in marine versus terrestrial organic carbon input into the sediment. Understanding organic matter sources and burial provides carbon budgets for Fiordland, an exceptional model system with a pristine forested catchment.

Wed Aug 13th / 0830 / Maitai 1

Rochelle Constantine, The University of Auckland

Rochelle will open day two of the 2014 NZMSS Conference as a plenary speaker speaking on applied behavioural ecology and marine mammals.

Wed Aug 13th / 900 / Maitai 1

Alix Laferriere, Victoria University of Wellington & 2012 NZMSS Research Award Recipient

Rob Davidson[1], Jonathan P.A. Gardner[2], Kina Scollay[3]
[1] Davidson Environmental Ltd., [2]Victoria University of Wellington, [3]Ocean Answers Ltd

Examining the Influence of Habitat Structure on the Size and Demography of Blackfoot Paua

The demographic properties of blackfoot paua (*Haliotis iris*) populations are highly variable, with pockets of "stunted"populations occurring around New Zealand. Habitat quality and fishing pressure have been suggested to influence the fitness of individuals and the demography of paua populations. Marine reserves, where fishing pressure is excluded, are an ideal laboratory to examine habitat effects on distribution, density, size and growth of paua. In the Austral summer of 2013 and 2014, we conducted surveys of paua and habitat types within and outside four marine reserves in central New Zealand. Paua were significantly larger inside three reserves and both density and size were attributed to habitat associations. Stunted populations were observed in Tasman Bay and Long Island Marine Reserve, which prompted a survey to examine the link between habitat variability and stunted populations. Paua density, individual size and habitat types were surveyed at 16 sites in Tasman Bay and 14 sites at Long Island Marine Reserve. We present results of assessments of Haliotis iris density and size distributions and their associations with physical and biogenic habitat. The next step in the project is to experimentally test the effect of habitat on growth by conducting a reciprocal translocation at Long Island Marine Reserve.

Wed Aug 13th / 945 / Maitai 1

Andrew Bell, Ministry for Primary Industries

Science in New Zealand's Marine Biosecurity System

New Zealand's marine biosecurity system is one of the best in the world. As an island nation we have a lot to protect in terms of both our current and future environmental, economic, social and cultural marine values. Currently our biosecurity system comprises a comprehensive regime of regulatory and voluntary measures to reduce the risk of non-indigenous species reaching our waters. This is supported by a surveillance and response system which is designed to detect and manage any incursions as quickly and effectively as practical. However, the system is still reliant on the voluntary actions and goodwill of all New Zealanders to be fully effective. New Zealand's science community has an important role to play in marine biosecurity. Sitting at the heart of New Zealand's "marine constituency" scientists are able to (1) support detection by telling MPI what is new or unusual, (2) communicate to the public the risks of pests and diseases, (3) ensure their actions model behaviour that maintains biosecurity, and (4) thinking biosecurity as they pursue their science so as to deliver the implications to managers. This presentation will provide an overview of New Zealand's marine biosecurity system and the role the science community can play help it function effectively.

Wed Aug 13th / 0945 / Riwaka

Kirsty Smith, Cawthron

Sylvain Agostini[1], Yasunori Saito[2], Cathryn Abbott[3], Andrew Fidler[3]
[1]University of Tsukuba, [2]Fisheries and Oceans Canada, [3]The University of Auckland

Local temperature tolerance in the native range of an invasive species suggests pre-adaptation to New Zealand conditions

Mitochondrial (mt) genome evolution has been assumed to be selectively neutral even though mitochondria are the main producers of cellular energy. Recent studies indicate that metabolic requirements can exert selective pressures on the mitochondrial genome, leading to mitochondrial genotypes adapted to different environments. Phylogenetic analyses of the globally invasive marine tunicate *Didemnum vexillum*, using partial mtCOI sequences, revealed two distinct clades: one (clade B) apparently restricted to its native region (NW Pacific) and the other (clade A) now found in temperate coastal areas around the world. We hypothesized that clade B's restricted distribution may reflect it being inherently less thermotolerant than clade A. Multiple mitochondrial genomes from both clades were sequenced and showed significant inter-clade differences in predicted sequences of enzyme sub-units involved in oxidative phosphorylation. Laboratory experiments, carried out in Japan, examined thermal stress tolerance and mitochondrial enzyme function of colonies from both clades A and B. *Didemnum vexillum* clade A appears to be adapted to lower water temperatures than B, consistent with its restriction to temperate waters. Integrating information on environmental conditions and physiological responses of invasive and non-invasive sibling clades/species is a promising avenue for linking genotypes and phenotypes involved in local adaptation.

Wed Aug 13th / 0945 / Waimea

Sean Handley, NIWA

Stephen Brown, Trevor Willis, Russell Cole
NIWA

Six centuries of benthic change, Nelson Bays, New Zealand

Effective management of coastal resources requires understanding historical changes experienced by coastal systems. In the presence of ubiquitous human change, the absence of adequate control sites makes it difficult to determine; past environmental conditions, the rate, direction, magnitude and cause of change in relation to natural variability. Offshore sediment cores taken at Separation Pt., Golden Bay, depict temporal changes relating to increased sedimentation, changes to sediment composition and changing benthic versus pelagic productivity going back centuries. These results combined with other published work and desktop reviews of benthic effects in Nelson Bays show significant changes to the benthos have occurred since human colonisation in ca.1400AD. The relevance of this change and the importance of benchmarking will be discussed.

Wed Aug 13th / 1000 / Maitai 1

Tim Riding, Ministry for Primary Industries

Brendan Gould[1], Graeme Inglis[2], Don Morrisey[2], Serena Wilkens[2]
[1]Ministry for Primary Industries, [2]NIWA

Detecting marine invaders in the 21st century; New Zealand's marine biosecurity surveillance programs

New Zealand relies heavily on international shipping to facilitate trade with the rest of the world. The number of vessel arrivals continues to rise, with the concomitant risk of marine non-indigenous species (NIS) being transported to New Zealand attached to vessel hulls, or carried within ballast water. Measures to reduce the risk of NIS arriving in New Zealand are in place, however, until effective marine biosecurity measures are widespread globally, considerable risk remains. To protect New Zealand's marine environment, economy, and all the associated values, a number of surveillance mechanisms are in place to facilitate the early detection of marine NIS. The Marine High Risk Site Surveillance plays an essential role in the overall biosecurity system, surveying New Zealand's busiest ports and marinas. Principally the biannual port surveillance targets a number of identified, significant threat species that have not yet been recorded in NZ. It also tracks established marine NIS that are not yet widespread. Additionally, any new or emerging species can be detected and identified. Species identification is managed by the Marine Invasives Taxonomic Service, based at NIWA Wellington, who maintains an extensive network of national and international taxonomists for rapid species identification. New Zealand leads the world with marine biosecurity prevention and operational surveillance, and requires constant revision and innovation.

Wed Aug 13th / 1000 / Riwaka

Angela Smith, The University of Auckland

Do elasmobranchs metabolise fats for fuel?

Sharks increase their buoyancy by storing high concentrations of lipids in their livers. However, this lipid is thought to not be used directly as a fuel, which appears to be energetically wasteful. It is assumed that hepatic lipids are converted to ketone bodies, where a considerable amount of carbon is lost to acetone. It is also surprising given that the hearts of other vertebrates are mostly dependent on lipid metabolism. While Moyes et al. (1990) found minimal activity of carnitine palmitoyltransferase (the lipid mitochondrial importer), elasmobranchs still do have enzymes required for fatty acid oxidation. This study aims to revisit previous research, with the hypothesis that elasmobranchs metabolise lipids for fuel. Alternatively, the secondary hypothesis will be to determine whether elasmobranchs metabolise ketone bodies better than other vertebrates, as elevated ketone body metabolism can impact other processes (e.g. ketoacidosis, which occurs in diabetes and starvation). Mitochondrial assays will be undertaken to test various substrates' use by heart, brain and skeletal muscle mitochondria. Basic biochemical profiling of the blood will also be conducted, and the elasmobranchs analysed will be compared with a teleost and a mammal. This study is likely to clarify and contribute to the science of elasmobranch lipid metabolism.

Wed Aug 13th / 1000 / Waimea

Graham Rickard, NIWA

Future Predictions from an Assessment of CMIP5 Global Biogeochemical Models for the New Zealand Exclusive Economic Zone (NZ EEZ)

For the first time global biogeochemical (BGC) models are included in the Coupled Model Intercomparison Project (CMIP) process. From the 5th round (CMIP5) archive 16 BGC models have been assessed using monthly means of Chlorophyll-a, temperature, nitrate, phosphate, silicate, and mixed layer depths for the NZ EEZ for the "present day" (1976-2005). The assessment uses a model ranking of root-mean-square error and bias compared to annual cycles from observational data sets for a set of NZ EEZ sub-regions, covering the nutrient limited oligotrophic waters in sub-tropical waters to the north, to the iron limited sub-antarctic waters to the south. In between lie productive regions associated with the Chatham Rise and the Tasman Sea. These regimes provides a challenge to the range of physics and biogeochemistry represented by the 16 BGC models. The ranking shows that a best-fit present day model ensemble can be obtained; this can then be used to consider likely future changes to the biogeochemical fields under future representative concentration pathways (rcp) 4.5 and 8.5, as well as assessing integrated primary production and dissolved iron concentration, for example, that are presently difficult to constrain and validate.

Wed Aug 13th / 1015 / Maitai 1

Peter Lawless, Phoenix Facilitation Ltd

Marine Biosecurity in the Top of the South

The Top of the South Marine Biosecurity Partnership is a unique institution at the regional level in New Zealand. The Partnership was formed in 2009 when the Strategy for the region was agreed by the three councils, the then MAF Biosecurity, iwi and local stakeholders. This paper reports on five years of operational experience in efforts to reduce marine biosecurity risks. While coordination has led to higher levels of awareness and very timely incursion responses, monitoring data show no reduction in the primary indicator of recreational vessel hull fouling. Next steps are to use new provisions of the Biosecurity Act to develop a legally binding regional pathways plan. The paper outlines the challenges involved and reviews gaps in science and information that need to be resolved to make such approaches effective.

Wed Aug 13th / 1015 / Riwaka

Anna Kleinmans, The University of Auckland

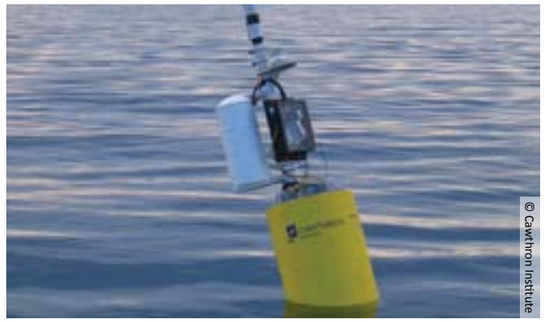
Neill A. Herbert
The University of Auckland

Investigating the low O_2 tolerance and likely response of Hapuku (*Polyprion oxygeneios*) to hypoxia

The wreckfish hapuku (*Polyprion oxygeneios*) is a promising new aquaculture species for New Zealand that has potential to expand seafood exports when production is expanded into offshore seacage systems. However, conditions are not always ideal in these systems due to natural variation in the oceanic environment. Low oxygen (hypoxia), for example, could be an issue for fish at certain seacage sites, especially as it limits the metabolic capacity of fish, which is known to have a negative influence on growth. We are therefore investigating the hypoxia tolerance limit of this species, as well as examining stress and behavioural response of hapuku during hypoxic events. A static respirometry system is being used to record the rate of mass-specific O_2 consumption (MO_2 [$mgO_2kg^{-1}\ h^{-1}$]) of P. oxygeneios under progressively low levels of oxygen saturation (% sat). From this data hypoxia tolerance will be resolved as the O_2 saturation level that causes a "break" in resting MO_2 under hypoxic conditions. In a separate experiment, we are using video-tracking software to assess the swimming speed of hapuku in tanks during hypoxic exposure. Signs of physiological stress (blood lactate and cortisol) will also be measured. Understanding how hapuku respond to hypoxia exposure is of importance to the NZ aquaculture industry.

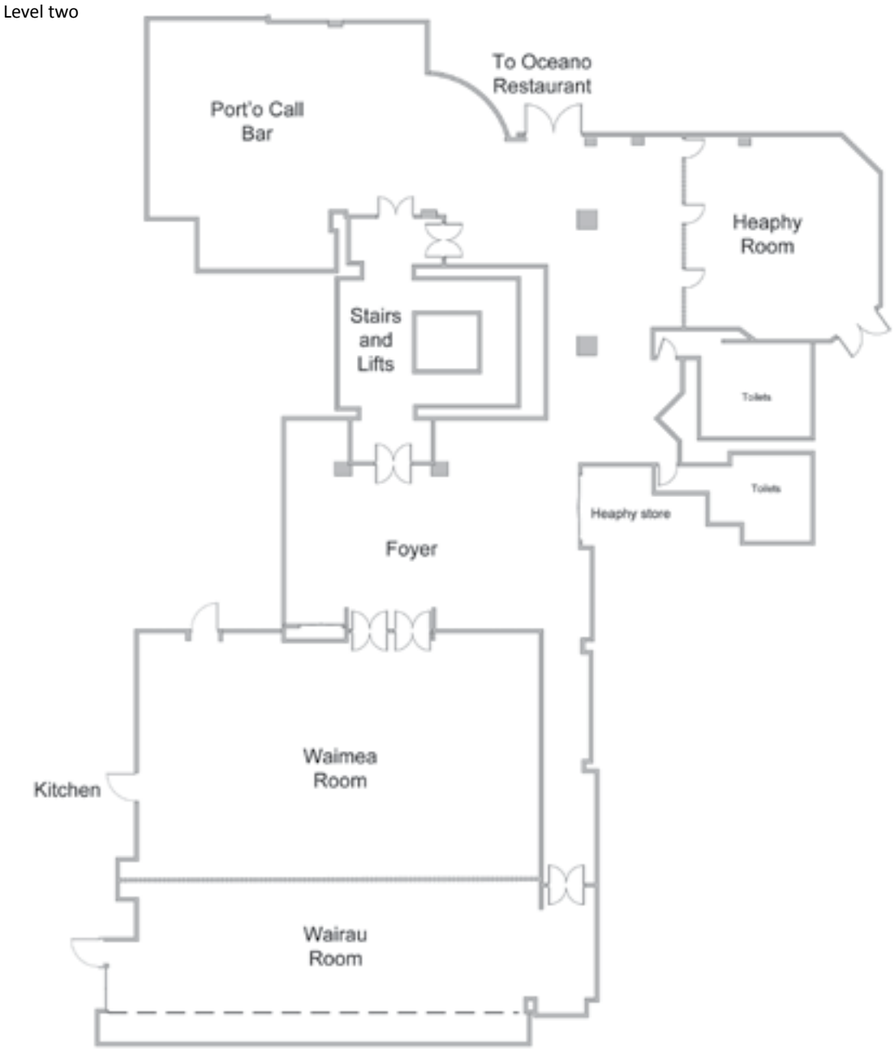
Rutherford Hotel Ground floor

Ground floor



Rutherford Hotel Level two

Level two



Rutherford Hotel Nelson
Tel: 0064 3 546 3001
Email: fujnctions@rutherfordhotel.co.nz

Wed Aug 13th / 1015 / Waimea

Daniel Pratt, NIWA

Drew M. Lohrer[1], Simon F. Thrush[2], Katie Cartner[1], Carl Van Colen[2], Mike Townsend[1], Rachel J. Harris[2], Conrad A. Pilditch[2], Judi E. Hewitt[1]
[1]NIWA, [2]The University of Auckland

Detecting subtle shifts in ecosystem functioning in a heterogeneous estuarine environment.

Reductions in light associated with turbidity can affect the productivity of estuarine microphytobenthos – a principal food source for benthic macrofauna and a key driver of sediment biogeochemistry. On a broad intertidal sandflat in Manukau Harbour, we mimicked the effects of elevated turbidity by shading replicated plots of sediment for 2 months during summer. We then measured sediment properties, macrofauna, and solute fluxes in shaded and non-shaded plots. After combining all of the flux information together to generate a multivariate metric of ecosystem functioning for each plot, we used distance-based linear modelling to document shifts in the drivers of functioning between treatments. A higher proportion of variation in ecosystem functioning was explained in non-shaded (64 %), relative to shaded sediments (39 %), suggesting that interactions were generally weaker in stressed plots. The bivalve M. *liliana* was the best predictor of ecosystem function in non-shaded plots (marginal R2 = 0.24, $p < 0.01$) but was less effective at explaining functioning in shaded plots (marginal R2 = 0.11, $p > 0.10$). Our results suggest that subtle changes in estuarine turbidity can alter ecological interactions on sandflats, driving shifts in ecosystem functioning that can be detected in variable, heterogeneous estuarine environments.

Wed Aug 13th / 1030 / Maitai 1

Javier Atalah, Cawthron Institute

Grant A. Hopkins, Barrie M. Forrest
Cawthron Institute

Development of augmentative biocontrol tools for managing pests on artificial and natural habitats

Augmentative biocontrol, through the enhancement of native natural enemies, is a frequent practice in terrestrial and freshwater systems, however there is a lack of research investigating the feasibility of marine biocontrol. Here we present an overview of ongoing research to develop biocontrol tools for the management of marine pests, both in artificial and natural habitats. Initially, theoretical framework was developed for the selection of biocontrol agents based on a range of traits that an ideal agent should satisfy before application. Benthic invertebrates were screened as potential biocontrol agents for biofouling on artificial structures. Predators, grazers and space pre-emptors were applied both to fouled and defouled surfaces, to evaluate response and prevention management strategies, respectively. We also present the results of a case study investigating non-target effects associated with use of sea urchin, as an augmentative biocontrol agent to eradicate the an invasive kelp in an area of high conservation value. Collectively, our research indicates that biocontrol could be an effective and environmentally sound method to mitigate effects of biofouling and the spread of non-indigenous species.

Wed Aug 13th / 1030 / Riwaka

Nick Tuckey, Plant & Food Research

Leonard Forgan[1], Denham Cook[2], Alistair Jerrett[2]
[1]Deakin University, [2]Plant & Food Research

The cardio-respiratory physiology of spiny rock lobster (*Jasus edwardsii*) during rest, recovery, and emersion

Although spiny rock lobster (*Jasus edwardsii*) are a wholly sub-littoral species they show a considerable ability to survive prolonged emersion – a fact exploited during the commercial export of this species. Yet, despite this remarkable hardiness, basic information on how this species physiologically responds to emersion is somewhat lacking. Using flow-through respirometery and electrophysiological techniques we identify that *J. edwardsii* undergo marked physiological changes during rest, emersion and recovery over a broad range of temperatures (3.7 - 17.8 °C). When exposed to 24 h emersion, VO_2 and heart rate decrease below resting levels in a temperature dependent manner, but, along with VCO_2 increase steadily as the emersion period proceeds. Ventilation frequencies show a contrasting response during emersion and increase significantly above resting rates. When allowed to recover in seawater, lobster significantly elevate their respiration rate – providing clear evidence of an O_2 debt. Near complete recovery occurs within 17 h at both 15.0 and 7.5 °C, but little recovery is observed at 3.7 °C. In addition to these findings, *J. edwardsii* undergo marked ventilation cycles, characterised by synchronous changes in RMR, heart rate and ventilation frequency.

Wed Aug 13th / 1030 / Waimea

Sorrel O'Connell-Milne, University of Otago

Anthropogenic drivers of parasite loading in the clam *Austrovenus stutchburyi*

Parasites can have significant impacts upon their host, interspecific relationships and ecosystem function. Commercial fishing often reduces densities and changes age structures of target populations. This research investigates the role of commercial harvesting as a factor that influences parasite loading within the Otago clam fishery. Clams have been commercially harvested from Blueskin Bay since 1982 and since 2009 experimental harvesting has extended to beds within Otago Harbour. Parasite loads within areas of high fishing pressure will be compared to no take zones to assess the effects of harvesting on parasite abundance within clams. At 28 sites within Blueskin Bay and Otago Harbour, a subset of shellfish of varying age and size will be analysed for parasite load. Unparasitised juvenile clams will also be collected, marked and caged in-situ to monitor relative parasite loading. Collection in both July and November will allow seasonality of parasite abundance to be quantified. In the laboratory, shellfish will be subjected to varying levels of parasite infestation and their growth, body condition and filtration potential evaluated over a six month period. Diminished clam biomass within harvested beds reduces intraspecific competition for food. The study will test whether any subsequent change in feeding pattern affects parasite uptake.

Wed Aug 13th / 1045 / Maitai 1

Kathy Walls, Ministry for Primary Industries

Jono Underwood[1], Anjali Pande[2]
[1]Marlborough District Council, [2]Ministry for Primary Industries

Searching for organisms that may, or may not, be there - response to a Mediterranean fan worm incursion into Waikawa Bay, Picton

The Mediterranean fan worm (*Sabella spallanzanii*) is a legally designated unwanted marine pest. Potential impacts of this tube-dwelling worm include disruption to nutrient cycling and competition with native species for space and food. First detected in Lyttelton Harbour in 2008 and in Auckland's Viaduct Basin in 2009, national eradication efforts were abandoned in 2010 when substantial populations were discovered in the Waitemata Harbour. MPI's current approach is to slow its spread by supporting regional councils with responses to regional incursions while a national marine pathway management plan is developed. In early 2014, *Sabella* was found on a heavily fouled yacht in Waikawa Bay, near Picton. The Marlborough Sounds have high scenic and recreational values and the area is important for aquaculture. The area is also a popular destination for visiting vessels, with many arriving from the Auckland region. The ability to respond effectively to a marine invader is greatly enhanced when the first report is on a vessel hull as opposed to on the substrate. We describe the sequence of events involved in responding to the incursion, the methodology used to survey the incursion site, the results of the survey and our approach to designing an ongoing surveillance plan.

Wed Aug 13th / 1045 / Riwaka

Esme Robinson, Plant & Food Research

Bill Davison[1], Alistair Jerrett[1], Suzy Black[2]
[1]University of Canterbury, [2]Plant & Food Research

Snapper - spectral sensitivity of vision

Design of successful fishing technologies requires a solid understanding of the sensory physiology of both target and non-target species. Snapper (*Pagrus auratus*) are a significant commercial species in New Zealand and overseas. Spectral sensitivity of snapper was investigated using behavioural (optomotor response) and physiological (electroretinogram) techniques. Results demonstrate that this species undergoes a shift in spectral sensitivity, with small (150g) fish being most sensitive to long wavelengths ('green'-'yellow'), while larger (750g) fish are most sensitive at short wavelengths ('blue'). These results provide important input for the design of selective fishing devices and also for transport of this species.

Wed Aug 13th / 1045 / Waimea

Craig Radford, The University of Auckland

A Noisy Threat: the impacts of noise on marine life

Research has shown that ambient underwater sound plays a critical role during a key life history phase of both fish and crustaceans. Not only this, sound is used by a variety of marine animals, including both fish and marine mammals, for communication. These life history strategies are under threat because the world around us is getting noisier, and this is especially true for our oceans. For example, the ambient sound levels of the world's oceans has doubled every decade since the 1970's, which has been linked to human activities in and near the water. The world's oceans are set to become even noisier due to a growing interest in the use of the sea for green renewable energy. There have been several documented effects of anthropogenic noise on marine animals from permanent hearing threshold shifts to acoustic masking. Acoustic masking is becoming a real concern because of the threat to hide important sounds marine animals are listening to. Here I call to attention the need to better understand the potential effects of anthropogenic noise on marine animals.

Wed Aug 13th / 1130 / Maitai 1

Matt Smith, NIWA

Graeme Inglis, Serena Wilkens, Dane Buckthought, Don Morrisey
NIWA

Emergency surveillance for marine pests following grounding of the container vessel, Rena

The grounding of the container vessel Rena on Otaiti (Astrolabe) Reef near Tauranga in October 2011 necessitated entry into New Zealand under emergency measures of vessels to assist in the salvage operations. One of these, a support barge, had sat idle in Port Curtis, Gladstone, Australia for up to two years before mobilisation. In-water inspection of the barge and its support tug on arrival at Tauranga found well-developed biofouling assemblages, with several non-indigenous species (NIS) that had not previously been recorded from New Zealand, including the tropical crabs, *Metapograpsus* spp. and the alga, *Grateloupia* sp. filicina-type, a notifiable and unwanted organism under the Biosecurity Act 1993. A monitoring programme for NIS was established as part of the Rena Long Term Recovery Programme. The programme involved a mix of training and active dive searches, shore searches and crab trapping within Tauranga Harbour where the salvage vessels had been berthed. Outreach materials and training workshops were also delivered to other providers and community groups involved in monitoring the impact of the grounding. For the second phase, high-risk locations and habitats offshore, on Otaiti Reef and nearby Mōtītī Island, where the barge and support vessels had been operating during the salvage process were surveyed. These locations are of particular significance to local Māori communities. Their involvement in implementing the surveys ensured compliance with Māori protocols and customs. This talk will describe the implementation process and give an overview of the programme's outcomes.

Wed Aug 13th / 1130 / Riwaka

Nick Shears, The University of Auckland, Leigh Marine Laboratory

Melissa Bowen, Jordan Markham
The University of Auckland

Regional and seasonal variation in long-term warming trends in coastal waters around New Zealand

Under a changing global climate, long-term temperature records are invaluable in quantifying and evaluating long-term warming trends. We analyse long-term sea surface temperature (SST) records from the Leigh and Portobello Marine Laboratory's that span 61 years, and compare long-term trends in SST with nation-wide trends over the last 32 years from satellite-derived SST. We found strong coherence between inshore SST measurements and satellite-derived estimates for both regions, indicating that inshore measurements are reflective of region-wide temperature patterns. Analysis of SST over the last 47 years at Leigh found little evidence of warming, with only a weak warming trend in May. In contrast, annual mean temperatures at Portobello have increased by 0.67°C over the last 61 years. This increase was only evident in autumn-winter months with an increase of ~1.3°C. Regional trends over the last 32 years, based on satellite data, contrast longer-term trends with stronger warming in the north. This is largely explained by ENSO variations over this period, which are strongly correlated with annual SST. Long-term reconstructions, based on SST records and long-term climate data, suggest a period of warming at Leigh in the mid-1900's, but variable temperatures since. Whereas, at Portobello temperatures appear to have increase steadily over the last century.

Wed Aug 13th / 1130 / Waimea

Ashley Webby, The University of Waikato

Nicholas Ling, Chris Battershill
The University of Waikato

Ecotoxicity of Rena heavy fuel oil, corexit 9500, and heavy fuel oil/corexit 9500 combinations to New Zealand fish

The wreck of the MV Rena on Astrolabe Reef in 2011 discharged 350 tonnes of heavy fuel oil (HFO). In aid of recovery, around 3m3 of the oil dispersant Corexit 9500 was applied. Given the almost total absence of toxicity data on New Zealand marine species, this project sought to assess the acute sublethal toxicity of HFO and Corexit 9500 to a range of culturally and commercially important species. Sub-adult snapper (*Pagrus auratus*), spotted wrasse (*Notolabrus celidotus*) and rock lobster (*Jasus edwardsii*) were exposed to HFO with and without the addition of Corexit 9500 for up to 96 h followed by recovery for up to 10 d. Fish were necropsied and examined for haematology and accumulation of polyaromatic hydrocarbons (PAH). Exposure to 1:10000 HFO, 1:40000 Corexit 9500 and 1:40 HFO/ Corexit 9500 combination for up to 96 h caused no lethality or measurable acute sublethal effects, although bile polyaromatic hydrocarbons (PAHs) reached levels several orders of magnitude higher than controls. Corexit 9500 increased PAH body burden when combined with oil but also appeared to accelerate depuration of PAHs during post-exposure recovery.

Wed Aug 13th / 1145 / Maitai 1

Jen Brunton, Ministry for Primary Industries

Derek Richards[1], Richard Kinsey[2]
[1]Environment Southland, [2]Department of Conservation

Joint-agency response to *Undaria pinnatifida* in Fiordland

The Asian kelp *Undaria pinnatifida (Undaria)* has been introduced to numerous temperate coasts world-wide, including many areas of New Zealand. It was absent from Fiordland until April 2010 when a mature sporophyte was found on a mooring line. The presence of *Undaria* in Fiordland is considered a threat to this globally unique marine environment. A joint-agency response involving Environment Southland, the Ministry for Primary Industries, and Department of Conservation was initiated to eliminate Undaria from Fiordland. The elimination involves a three-tiered approach: (i) monthly SCUBA surveys and removal of *Undaria* sporophytes by hand; (ii) using the herbivorous sea urchin, Evechinus chloroticus, as a biological-control agent; and (iii) using chlorine capsules under tarpaulins. The response has resulted in a significant reduction in the overall number of *Undaria* sporophytes, with 11 or less immature sporophytes being found on each of the last 27 surveys and a total of four sporophytes found during the last 17 months. Recent evidence suggests that microscopic *Undaria* gametophytes can persist for up to 3 years. As the last mature sporophyte was found in January 2012, the response now appears to be eliminating the 'seed bank'. If successful, it may be the first time world-wide *Undaria* has been eliminated from natural substrate.

Wed Aug 13th / 1145 / Riwaka

Tracey Bates, Victoria University of Wellington

James J. Bell
Victoria University of Wellington

The Influence of elevated seawater temperature on the physiology of a temperate marine sponge Tethya bergquistae

Increasing sea surface temperatures associated with climate change have been closely linked to large scale mortality, alteration of the timing of gonad development, food availability, and increased disease prevalence in marine invertebrates, including sponges. Despite the global interest in climate change, the effects of warmer waters on marine sponges are largely unknown, and the majority of studies that have been conducted have mostly focussed on tropical species. In particular, the influence of temperature increase on marine sponges are poorly investigated. Sponges are components in temperate rocky marine environments, and have many important functional roles, including bioerosion and accretion; bentho-pelagic coupling, while forming associations with many macrofauna and microbial organisms. Environmental degradation can alter sponge diversity and abundance, significantly influencing the distribution of other ecologically important organisms, and consequently, ecosystem function. This study aimed to experimentally investigate the effects of seawater temperature on the temperate marine sponge, *Tethya bergquistae*, by measuring respiration rates over a period of four weeks. Sponges were subjected to three temperature treatments of 13.5°C (control), 20°C and 22°C for four weeks. Over this time, oxygen consumption, mortality rates and disease prevalence were measured to investigate how this species may respond to temperature increases above the current summer maximum. Here we present results of this study.

Wed Aug 13th / 1145 / Waimea

Caleb McSweeney, The University of Waikato

Christopher N. Battershill, Adam Hartland, Phil Ross
The University of Waikato

The Future of Paua (*Haliotis iris*) for Motiti Island, post CV Rena

The moana (ocean) maintains ancestral connections and provides sustenance and nourishment for the surrounding communities. It is culturally important to raise children with the moana and collect kaimoana with their Kaumatua to share experiences and knowledge. Deterioration of the moana can dilute this relationship with the Whenua, Kaumatua and therefore their identity. The grounding of the CV Rena on Otaiti caused contaminated debris to be spread over Motiti Island's rocky coastline. This debris may jeopardise the cultural and social connections and may detrimentally affect juvenile life stages of kaimoana. Juvenile Paua (*Haliotis iris*) live amongst the crevices and under stones in the shallow intertidal zone for approximately 3-4 years before reaching maturity. Adult paua are commonly found in the same shallow subtidal zone. This key paua habitat is the area most impacted by the Rena debris that came ashore onto Motiti Island. In this research, we aim to determine if debris from the CV Rena has adversely affected Juvenile Paua around Motiti Island. Juvenile Paua will be exposed to Rena contaminants within a laboratory environment to determine effects on survivorship, behaviour and physiology. The results of this study will help the Kaitiaki of Motiti Island to manage their resource for future generations.

Wed Aug 13th / 1200 / Maitai 1

Derek Richards, Environment Southland

Laurel Teirney[1], Richard Kinsey[2], Jen Brunton[3], Stephen Logie[4], Rebecca McLeod[5]
[1]Independent Facilitator, [2]Department of Conservation, [3]Ministry for Primary Industries, [4]Ministry for Primary Industries, [5]Fiordland Marine Guardians/University of Otago

Development of a Marine Pathways Plan for a pest free Fiordland

Marine pests, introduced via human-mediated pathways, pose a major threat to the ecological state and quality of the Fiordland Marine Area. The detection of the invasive seaweed Undaria pinnatifida in Sunday Cove (Breaksea Sound) in 2010 triggered a partnership between Environment Southland, Ministry for Primary Industries, Department of Conservation and the Fiordland Marine Guardians to respond to the incursion. This program has been so effective that a similar approach is been used to developing a Fiordland Marine Pathways Plan. In 2012 the Government implemented its marine biosecurity pathway policy by introducing Pathway Management Plans as an amendment to the Biosecurity Act 1993. Such plans are based on first identifying the pathways whereby pests are transported into an area. Then the task is to develop ways of ensuring that pests can no longer access those pathways. To prevent pathways such as vessels and fishing/recreational gear from transporting pests, visitors to Fiordland may be required to modify their behavior. It is therefore essential to get buy-in from Fiordland's many users in order for the pathways plan to be effective. To this end, a large component of the development and implementation of the plan involves communication and consultation with the community. We will discuss the journey so far.

Wed Aug 13th / 1200 / Riwaka

Anja Studer, University of Otago

Robert Poulin
University of Otago

Climate change and parasitism in New Zealand intertidal invertebrates: a cause for concern?

Intertidal invertebrates are naturally exposed to highly fluctuating environmental conditions, but effects of climate change, such as increasing temperatures or more extreme heat waves, may increase their vulnerability. Besides direct effects of temperature, there are also indirect effects which could potentially be of importance. For example, temperature is known to strongly affect the transmission of trematode parasites in intertidal systems, with increasing infection pressure at elevated temperatures. Hence, intertidal invertebrates may be at risk from not only increased temperature-induced stress and mortality, but also from parasite-induced stress and mortality, and this may have significant ecological consequences. We present data from studies on a model system affecting crustaceans on soft-sediment mudflats (specifically the amphipod *Paracalliope novizealandiae*) and from a latitudinal study on infection levels in the NZ cockle *Austrovenus stutchburyi*. Our results confirm the high temperature sensitivity based on lab and field studies, but also show that over large spatial scales (i.e. latitudinal gradient of NZ), small scale variations in other factors than temperature are crucial. This indicates that consequences of the combined effects of temperature and parasitism, such as mass mortalities or population declines, are likely to be very localised, but that they are, and should be, of major concern.

Wed Aug 13th / 1200 / Waimea

Agnes M. Rouchon, Victoria University of Wellington

Nicole E. Phillips
Victoria University of Wellington

Carry-over effects of low-level copper pollution on early life stages of kina (*Evechinus chloroticus*)

Early life stages of marine invertebrates are highly vulnerable to environmental stressors and widely used in ecotoxicity assays, which typically look at immediate effects of exposure to pollutants. However stressors encountered early in life may have carry-over impacts that are only apparent later in life. We investigated carry-over impacts of low levels of copper (1-5µgL^{-1}) on kina larvae and settlers. Larvae were exposed in laboratory for 2 days, either early (day 4) or late (day 11) in development then re-exposed 3 weeks post-settlement. In a second experiment, larvae were exposed for 4 days or chronically via their diet, spiked water or both. Mortality and development were recorded throughout larval development and after settlement. There was no effect of copper exposure on larval mortality or development, however, kina exposed for 2 days early in larval life had significantly lower survival when re-exposed to copper after settlement (67% vs 90% in controls). Kina exposed for 4 days or chronically had a lower settlement success especially in diet treatments (8% vs 22% in controls). These results add to the growing body of evidence showing that metamorphosis is not a new beginning and emphasizes the importance of considering carry-over effects in ecotoxocity.

Wed Aug 13th / 1215 / Maitai 1

Irene Middleton, Northland Regional Council

Don McKenzie
Northland Regional Council

Mediterranean fanworm (*Sabella spallanzanii*) in Northland: what have we learnt?

Mediterranean fan-worm (*Sabella spallanzanii*) was first detected on the hulls of fishing vessels in Whangarei in April 2012. Since then fan worm has been detected on structures within the Whangarei harbour. Mediterranean fan-worm is listed as an 'exclusion pest' in the Northland Regional Council Regional Pest Management Strategy and a number of methods have been employed to reduce the number of fan-worm in Whangarei and decrease the rate of domestic reintroductions. Throughout the removal process we have learnt a lot about removal methods, the life history and growth rates of fan worm in Whangarei and the management and isolation of vectors that transport marine pests to Northland.

Wed Aug 13th / 1215 / Riwaka

Colin D. MacLeod, University of Otago

Robert Poulin
University of Otago

The combined effects of ocean acidification and parasitic infection on the New Zealand mud snail (*Zeacumantus subcarinatus*)

Over the past 15 years, it had been established that ocean acidification (OA) has significantly affected the chemistry of the global oceans, and will likely negatively affect a wide variety of marine species. However, the effects of OA in combination with other ecological processes, such as inter- and intra-specific competition, predation, and parasitism, remain poorly understood. Studies of host-parasite interactions in the context of OA may provide useful tools to investigate how relationships between species could change in an acidified marine environment. Parasites are a ubiquitous component of all marine ecosystems, complete their life cycles by infecting species at different trophic levels, and utilise infection pathways that may prove vulnerable to the stressors associated with OA. Preliminary data show that exposure of the New Zealand mud snail (*Zeacumantus subcarinatus*) to acidified seawater (7.6 and 7.4 pH) for 90 days caused a significant decrease in shell growth (50 - 80%). However, in acidified treatments and the control (8.1 pH) mud snails infected with trematode parasites exhibited significantly higher shell growth than uninfected individuals (40 - 75%). Consequently, intra-specific competition within snail populations could be affected by the interactive effects of OA and parasitic infection, as infected individuals grow at a greater rate than their uninfected conspecifics.

Wed Aug 13th / 1215 / Waimea

David Culliford, The University of Waikato

Christopher N. Battershill, Nicholas Ling
The University of Waikato

Understanding effects from storm water run-off from port log marshalling areas on the marine life of Tauranga Harbour

For geographical and practical reasons areas of the greatest industrial activity are often situated at the edge of harbours and estuaries. The Port of Tauranga, New Zealand's largest port, operates container, dairy & fruit and log marshalling along approximately three kilometres of the harbour edge. Log exports have risen from 157 tonnes in 1957 to 5,602,000 tonnes in 2012. The port is interested in forming a better understanding of effects of storm water effluent passing through log marshalling areas which discharges into the marine environment. The effluent collected at source from untreated log storage is characterised by low pH, high biological oxygen demand and the presence of resin acids. It dilutes quickly upon entering the marine environment and a concurrent thesis is modelling the plume and mixing depth. My MSc thesis will examine the lethal, sublethal and behavioural effects of the effluent on crustacea and larval fish, and investigate the uptake of resin acids and any associated growth effects through field studies with mussels. My presentation will focus on the background and methodology of the study and progress so far.

Wed Aug 13th / 1230 / Maitai 1

Edwin Ainley, Marlborough District Council

Jeannine Fischer, Jono Underwood
Ministry for Primary Industries

Mission (im)possible – the highs and lows of attempting suppression of marine pests

The benefits of managing marine biosecurity threats in partnership have been demonstrated by a multi-agency response to the discovery of the marine pest ascidian *Styela clava (Styela)* in Picton's marina. *Styela* is an invasive ascidian which poses a significant threat to New Zealand's aquaculture industry and native marine ecosystems, with its ability to blanket mussel lines and compete for food and habitat. Four small *Styela* were found in June last year during the Ministry for Primary Industries' (MPI) national high risk site surveillance for marine pest species. The find in Picton is the first discovery of *Styela* in the Marlborough Sounds, an area of significant value to New Zealand's aquaculture industry and recreational activities. A joint-agency response was established between the Marlborough District Council, MPI, Marine Farming Association, iwi and other concerned parties. The results of the ongoing management efforts, including dive surveys and manual removal of animals, are looking promising for the suppression of the *Styela* population in the marina. Continued work is, however, needed to manage the pest and minimise the chance of spread from Picton to other parts of the Marlborough Sounds.

Wed Aug 13th / 1230 / Riwaka

Darren Parsons, NIWA

Sue-Ann Watson*[1], Ian McLeod[2], Steve Pether[2], Neill Barr[2], Alicia King[2], Phil Munday[1]
[1]James Cook University, [2]NIWA

Responses of early stage kingfish (Seriola lalandi) larvae to increased acidification

There is increasing concern that ocean acidification, caused by the uptake of additional CO2 at the ocean surface could affect the functioning of marine ecosystems. By mid-century this may cause ocean pH to decline by 0.3-0.4 units, reducing the ability of marine calcifiers to form shells and skeletons. Likely impacts for non-calcifying species are not as well understood, but there is growing evidence that larval fish exposed to lower pH become behaviourally impaired, with potential consequences for recruitment success. Here we present preliminary results for the first ocean acidification experiment conducted on a New Zealand fish species; kingfish (Seriola lalandi). Kingfish eggs were collected from spawning broodstock and immediately transferred to 1000 l tanks that received one of three treatments: 400 (control), 950 and 1900 µatm CO2. Eggs hatched after c. two days and the experiment was terminated when larvae reached three days post-hatch (when feeding begins). Hatching success and survival were monitored, with no apparent difference between treatments. Preliminary results from behavioural trials, however, contained interesting trends in activity, response to light, and escape response of kingfish larvae. Considering the early developmental stage of larvae in this experiment, ocean acidification may pose as an ecologically significant issue for kingfish.

Wed Aug 13th / 1230 / Waimea

Esther Stuck, University of Otago

Miles Lamare
University of Otago

Extracellular pH changes as a consequence of Ocean Acidification

Ocean acidification will have significant effects on marine invertebrates, like sea urchins, however little is known about the effects external acidification and elevated CO^2(aq) has on Extracellular pH (pHe), important for the maintenance of intracellular pH where a number of enzymes are pH sensitive. To identify any latitudinal differences in pHe response to elevated CO^2(aq), the tropical sand dollar (*Arachnoidies placenta*), temperate sea urchin (*Evechinus chloroticus*) and the Antarctica sea urchin (*Sterechinus neumayeri*) were chosen for the present study. We used the fluorescent probe HPTS to investigate how elevated seawater CO^2(aq) levels effects pHe of echinoderm larvae. Different stages of development were used (early cellular stage and pluteus) to determine how pHe changes during development. Larval regions were also distinguished (gut, arms, oesophagus) to look at how pHe differed throughout the larvae. Our study has revealed that pHe in the tropical *A. placenta* is very tolerant to changes in seawater pH, both in the early developmental stage and in the pluteus; meanwhile temperate and polar species are more susceptible. *S. neumayeri*, predicted to be the most sensitive, was able to cope with minor changes in pH (<0.3units) with its pHe only differing from ambient when raised under pH 7.2.

Wed Aug 13th / 1245 / Maitai 1

Kate Schimanski, University of Canterbury

Grant Hopkins[1], Javier Atalah[1], Graeme Inglis[2], Oliver Floerl[1], Sharyn Goldstien[3]
[1]Cawthron Institute, [2]NIWA, [3]University of Canterbury

Understanding selective filters on non-indigenous species spread via hull-fouling

The spread of invasive marine species via hull-fouling involves multiple successive stages: (1) colonisation of the hull at a source location, (2) translocation to a recipient destination, (3) transfer from the hull to the recipient environment (introduction), (4) colonisation of local habitat/s and (5) establishment. Various selective filters act during each event and dictate which organisms move through to the next stage in the sequence, such as level of hull hygiene, vessel speed, en route environmental conditions and residence time. Despite recent studies aiming to elucidate the relative importance of some of these factors, important knowledge gaps still remain, such as the influence of life-history stage (e.g. post-settlement, juvenile or adult stage) on the survivorship and post-journey fitness of fouling taxa. Using the hull fouling bryozoan Bugula neritina as a model organism, we examined the effect of port residency period and subsequent voyage on survivorship and propagule pressure. Results suggest that longer periods of stress, as may occur in long oceanic journeys, may have a greater impact compared to short regional voyages for early stage recruits, but not for reproductively mature recruits, which consistently performed poorly. This work suggests further research is needed into the role of early-stage recruits in the hull-fouling invasion pathway. Regulatory frameworks to manage hull-fouling on arriving ships are being developed by some international jurisdictions (e.g, New Zealand, Australia and California). Better risk assessment and mitigation tools to support implementation of these measures are needed.

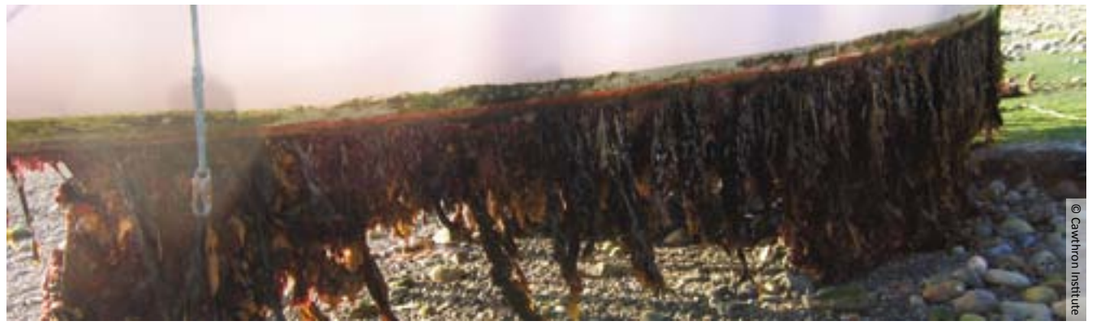
Wed Aug 13th / 1245 / Riwaka

Jenny Hillman, The University of Auckland

Naomi M. Gardiner, Mary C. Bonin
James Cook University

Acropora Coral Architecture and its Effect on Two Damselfish Associates: A Comparison of Colony Size and Structural Complexity

The importance of the structural characteristics of reef habitats to associated fish species is widely acknowledged, but the fine-scale attributes of these chosen microhabitats is lacking. This study investigates the influence of fine-scale structural characteristics of 14 caespito-corymbose Acropora coral species in Kimbe Bay, Papua New Guinea on abundance and maximum body size of two resident damselfish species, *Chrysiptera parasema* and *Pomacentrus moluccensis*. Substantial differences in the structural characteristics between the coral species were found to account for the variances in distribution of the two fish species within the coral species. Coral colony size dimensions influenced fish abundance patterns most significantly. Group size was greatest on larger colonies with wider branch spacing. Colony size, water depth and interbranch spacing all contribute to explaining variation in the body size of both species. For Acropora kimbeensis, colonies occupied by *C. parasema* were consistently larger and had greater colony lengths. This study provides evidence that small specialist reef fish are sensitive to disturbances that result in the alteration of preferred structural complexity of habitats. Knowledge of patterns of fine-scale microhabitat use can provide useful predictive understanding into likely alterations in composition and structure of associated fishes resulting from changes in coral structure.



Wed Aug 13th / 1245 / Waimea

Richard Bulmer, The University of Auckland

Luitgard Schwendenmann[1], Carolyn J. Lundquist[2], [1]The University of Auckland, [2]The University of Auckland/ NIWA

Carbon sequestration in temperate mangrove: response to mangrove clearance

Mangroves are among the most carbon rich forests in the tropics and are understood to be a significant carbon sink, however comparatively little is known about carbon sequestration in temperate mangrove. One of the reasons tropical mangroves play such an important role in carbon sequestration is the anoxic sediment conditions, characteristic of mangrove habitat, which act to immobolise larger quantities of carbon within the sediment than in terrestrial oxygenated systems. Clearance of mangrove halts the accumulation of root derived carbon within mangrove sediment and may result in significant carbon dioxide efflux if sediment is mobilised or becomes oxygenated. In this study we measured CO_2 flux from temperate mangrove soils cleared from 2 months to 13 years earlier at 33 sub-estuaries across the geographical range of the temperate mangrove, *Avicennia marina* subs. *australis*, growing in New Zealand. We observed elevated CO_2 efflux rates at areas of mangrove clearance and within adjacent mangrove stands than at adjacent sandflat environments, a relationship which continued at sites cleared over 10 years earlier. Disturbance of the surface sediment resulted in elevated CO_2 efflux across all habitats. Results suggest the carbon sequestration potential of temperate mangrove is substantial and an important consideration for temperate mangrove management.

Wed Aug 13th / 1415 / Maitai 1

Ashleigh Watts, University of Canterbury

Grant Hopkins[1], Sharyn Goldstien[2]
[1]Cawthron Institute, [2]University of Canterbury

Biofouling dynamics and local dispersal in an aquaculture system

Biofouling pests, including non-indigenous species, can have significant impacts on anthropogenic activities. This is particularly true for aquaculture, where biofouling communities grow on crop species and infrastructure, potentially resulting in crop losses, additional maintenance, and increased harvesting and processing costs. Biofouling communities are often transitory in nature with high species turnover in variable environmental conditions. It is of interest to marine farmers and scientists to gain a better understanding of the processes facilitating the regional proliferation and spread of biofouling species in such environments. In this presentation we describe a study that characterises the composition and distribution of problematic biofouling species in New Zealand's main mussel growing region, Pelorus Sound. Images and video footage of biofouling on mussel farms (*Perna canaliculus*) along the length of Pelorus Sound indicate strong spatial variation in biofouling communities, with a dominance of hard-fouling organisms, such as tube worms and barnacles, and high energy tolerant species, such as *Undaria pinnatifida* and *Pomatoceros terraenovae*, near the entrance of the Sound. In addition, genetic analyses of *Didemnum vexillum* and simple GIS-based modelling indicate that *D. vexillum* populations form a larger metapopulation, with substructure and low levels of connectivity. Findings from this study can be used to help marine farmers identify areas that are less prone to fouling by problematic or invasive species. Furthermore, knowledge of marine farm connectivity may reveal opportunities (e.g. the removal of 'stepping stone' farms) to reduce the regional spread of invasive species.

Wed Aug 13th / 1415 / Riwaka

Marcus Cameron, Auckland Council

Mike Stewart, Jenni Gadd, Deborah Ballantine, Greg Olsen
NIWA

The end of an era: What patterns have been revealed as 26 years of shellfish contaminant monitoring in Auckland comes to an end?

Auckland Council and its predecessor have carried out shellfish contaminant monitoring since 1987, but the programme is now coming to a close. In the programme, shellfish are used as sedentary "biomonitors" to assess the bioavailable contaminant load at a given site. Wild oysters have been monitored at four core sites in the Manukau Harbour since 1987 and deployed mussels at seven sites across the region since 1999. Contaminants monitored include metals, legacy organochlorines (pesticides and PCBs) and polycyclic aromatic hydrocarbons. In this talk, we present the findings from a recent assessment of status and trends in contaminant levels over the full monitoring record. Clear spatial patterns for both metal and organic contaminants were broadly related to surrounding landuse. However, trend patterns for metals were not consistent and there were some clear differences between species. Trend patterns for legacy organic contaminants were generally consistent, with both species showing decreases over time. Significant changes in land use were also picked up by the programme, such as the upgrade of the Mangere wastewater treatment plant. Further aspects presented will include comparison with other shellfish contaminant monitoring programmes, food safety guidelines and climate data.

Wed Aug 13th / 1415 / Waimea

Mark Morrison, NIWA

Meredith Lowe[1], Emma Jones[1], Leane Makey[2]
[1]NIWA, [2]Auckland University of Technology

The Kaipara Harbour; a key area for coastal fisheries

The Kaipara Harbour is New Zealand's largest estuary, and supports important fisheries functions both for the harbour proper, and for the wider west coast North Island ecosystem. A recent review for MPI has integrated our knowledge of the harbours fish, habitats and fisheries, and its environmental history. Here we summarise its contents; including past and present industries of kauri logging and flax gathering, pastoral farming, exotic forestry, sand mining, and fishing; a Local Ecological Knowledge (LEK) survey of 31 long-time local residents, who were asked to rank the relative abundance of various fish and shellfish species, biogenic habitats, and environmental changes over the time period of their association with the harbour; and contemporary fish-habitat surveys. This review project also included the aerial mapping of the southern Kaipara's large subtidal seagrass meadows, as well as large areas of the invasive Asian date mussels. Subsequent sampling of these meadows showed their value as a nursery habitat for juvenile snapper, trevally and other species. Threats and stressors to the fisheries' functions of the harbour were also examined, and it was concluded that increased sedimentation was the greatest issue. Finally, a series of Kaipara Harbour fisheries habitat knowledge gaps are identified and discussed.

Wed Aug 13th / 1430 / Maitai 1

Lauren Fletcher, Cawthron Institute

Barrie M. Forrest[1], James J. Bell[2]
[1]Cawthron Institute, [2]Victoria University of Wellington

Biological knowledge underpinning the management of marine pests in New Zealand

Introduced marine pests pose an important long-term threat to coastal ecosystems. The last 10-15 years has seen an increased prevalence of invasions and adverse effects from marine pest species in New Zealand, with some species impacting high-value industries such as shellfish aquaculture. Marine pest incursion responses are often implemented with limited information on the biological processes underpinning the species' invasion success. The relevance of biological knowledge to the management of marine pests is discussed, with particular reference to the introduction and subsequent management of the invasive colonial ascidian *Didemnum vexillum*. Following establishment on a commercial mussel farm in 2006, an extensive regional surveillance and eradication programme was initiated, in conjunction with scientific research addressing knowledge gaps. Assessment of *Didemnum's* reproductive seasonality, natural dispersal potential and negative impacts on mussel aquaculture, as well as associated implications for management, are presented. Our findings indicate that, contrary to assumptions based on overseas studies of *Didemnum*, and literature for related species, *Didemnum's* biological attributes and behaviour in New Zealand make it harder to successfully manage than first envisaged. This situation highlights the difficulties in predicting outcomes of introductions, particularly for invasive species that behave differently in different environments as well as through time.

Wed Aug 13th / 1430 / Riwaka

Weimin Jiang, Cawthron Institute

Ben Knight, Chris Cornelisen
Cawthron Institute

Application of remote sensing data to coastal monitoring of chlorophyll a in New Zealand

Despite the free availability and good spatial and temporal coverage of remotely sensed satellite data, these data have had little operational use in the coastal monitoring environments of New Zealand. In order to better utilize such data, we present practical examples of local calibration satellite algorithms for estimating chlorophyll a for different locations around New Zealand. The good performance of some sites with relatively short time periods of data, illustrate that even with relatively simple empirical models, local calibration and operational use of satellite data for New Zealand's coastal waters is feasible. Successful calibration over 'short' time periods offers access to over a decade of data at daily or greater temporal resolution, allowing for historically poorly sampled sites to be interrogated for long term trends. While successful calibration cannot be guaranteed, we have identified simple steps that may be able to assist in improving the performance and uptake of these valuable datasets for use in New Zealand.

Wed Aug 13th / 1430 / Waimea

Dana Clark, Cawthron Institute

Joanne Ellis[1], Murray Patterson[2], Jim Sinner[1], Chris Cornelisen[1], Paul Gillespie[1], Ben Knight[1], Judi Hewitt[3], Simon Thrush[4], Mike Townsend[3]
[1]Cawthron, [2]Massey University, [3]NIWA, [4]The Auckland University

Quantifying, mapping and valuing marine and coastal ecosystem services in Nelson Bays

Research on ecosystem services has grown exponentially during the last decade. Historically, most studies of marine and coastal ecosystem services (MCES) were specific to commercial fisheries or focused on single habitats such as mangroves, coastal wetlands and coral reefs. International and regional policy requirements have identified the need for spatially explicit MCES information at regional scales. In many marine regions, however, the absence of necessary information on the spatial distribution of ecological components remains a significant data gap that can prevent future progress on mapping MCES. As part of a recently funded multidisciplinary program, we have developed frameworks to quantify, spatially map and determine the 'total economic value' of MCES for multiple habitat types in Nelson Bays. We have used data-driven and principles-based approaches to map both functional habitats and associated ecosystem services for provisioning, regulating and supporting functions and an overview of two of these ecosystem services will be discussed. Such maps allow planners, managers and stakeholders to explicitly consider ecosystem services in ecosystem based management, including marine spatial planning. Our future research directions to develop marginal valuation of ecosystem services to three specific coastal management issues in Nelson Bays will also be reviewed.

Wed Aug 13th / 1445 / Maitai 1

Anastasija Zaiko, Cawthron Institute

Aurelija Samuiloviene[1], Alba Ardura[2], Yaisel J. Borell[3], Eva Garcia-Vazquez[4]
[1]Klaipeda University, [2]University of Oviedo, [3]University of Oviedo, [4]University of Oviedo

Metabarcoding approach in biodiversity and biosecurity surveys: a pilot study from the Baltic Sea

Marine pest incursions can cause significant and on-going damage to natural ecosystems, aquaculture, fisheries and social amenities. Most marine surveillance programmes require considerable taxonomic expertise, are laborious, and often fail to identify species at the larval stage. Therefore, marine pests may go undetected at the initial stages of incursions. Metabarcoding uses species-specific DNA barcodes and High-Throughput Sequencing, producing large numbers of comparatively low-cost sequences. This technique allows effective species detection and identification from environmental samples. Here we showcase the application of metabarcoding for the surveillance of plankton communities within the SE Baltic Sea coastal zone. Results were compared to those from routine monitoring surveys and morphological analyses. Out of approximately 100,000 high-quality sequences produced, 18 distinct taxonomic units were identified and assigned with high similarity either to species or genus level. Four of five non-indigenous species found in the samples were identified exclusively by metabarcoding. All five species are considered as invasive in the Baltic Sea with reported impacts on ecosystem and biodiversity. This study indicates that metabarcoding is a powerful comparative tool for marine surveillance programs. The approach is suitable for general biodiversity assessment, early detection of marine pests, monitoring of their spread and development of environmental quality metrics.

Wed Aug 13th / 1445 / Riwaka

Te Puea Dempsey, The University of Waikato

Chris Battershill, Adam Hartland, Phil Ross
The University of Waikato

Toitu Te Moananui A Toi – Investigating the Water Quality on Otaiti (Astrolabe Reef) following the CV Rena grounding using DGT Samplers

Indigenous peoples of the South Pacific have an intrinsic connection with the natural environment. The ocean is of particular significance as it is a source of spirituality, sustenance, and survival. The grounding of the CV Rena in October 2011 resulted in the deposition of fuel oil, debris and other contaminants onto the reef floor at Otaiti (Astrolabe Reef), Bay of Plenty. Research undertaken on Otaiti in 2012 and 2013 highlighted elevated levels of heavy metals such as copper, tin, lead, zinc and nickel in seafloor sediments. Some of these metals are known to have negative effects on marine organisms and are likely to impact on the Mauri; or 'the essential life principle' of the ecosystem. The results of water quality monitoring using diffuse gradients thin films (DGT) are reported. We investigated the extent of Rena-derived metals in the water column adjacent to contaminated seafloor sediments on Otaiti. The assessment of these effects at the vulnerable early life history stages of recruiting marine organisms provides an insight into longer term environmental impacts. This research provides an interface between Matauranga Maori and Western Science, which is an important and unique component of the Rena Long-term Environmental Recovery Plan to understand both the scientific and cultural impacts of this incident.

Wed Aug 13th / 1445 / Waimea

Emma Jones, NIWA

Mark Morrison
NIWA

New Zealand's continental shelf: its biogenic habitats revealed

Biogenic habitats play very important roles in maintaining biodiversity and healthy marine ecosystem functioning, including the under-pinning of some fisheries stocks life histories. In New Zealand, the limitations of traditional scientific surveys have resulted in a lack of basic information about the spatial distribution, function, and threats to biogenic habitats on the coastal shelf. To address this, the collective Local Ecological Knowledge (LEK) of long-term fishers was 'captured' and used to develop a national scale map of areas of potentially important biogenic habitat on New Zealand's continental shelf. This exercise revealed spatial 'hot-spot"? clusters of biogenic habitats, many consistent with existing scientific studies and others previously undocumented. Targeted sampling of selected sites using multibeam, towed camera, and physical methods confirmed that in almost all cases, the habitats described were present to a greater or lesser extent. The data collected has allowed a first step in characterizing the biodiversity and potential functional roles some of these habitats play, and to assess their ability to be mapped using remote sensing approaches.

Wed Aug 13th / 1500 / Maitai 1

Xavier Pochon, Cawthron Institute

Anastasija Zaiko, Grant Hopkins, Jonathan Banks, Susie Wood
Cawthron Institute

Assessment of early biofouling communities using Next-Generation Sequencing

Biofouling is a major transport pathway that can facilitate the establishment of marine Non-Indigenous Species (NIS). Identification of early life history stages of marine organisms by morphology is difficult particularly in initial 'slime layers' (biofilms). Next-Generation Sequencing (NGS) offers huge potential for the simultaneous detection of early life-stages of multiple marine pests from biofilms, but the availability of underwater biofilm sampling devices is limited. In this study, perspex plates were placed for four weeks in the Nelson marina until biofilms formed. Four sampling methods (modified syringe, sterilized sponge, underwater tape, and sterilized swab) were tested. Each device was tested in triplicate in situ and on-land to account for the potential incorporation of additional diversity from the water column. Positive PCR products were obtained for all devices except for underwater tape. Amplicon libraries (18S rDNA gene) were constructed and sequenced using Illumina™MiSeq. There were no statistical differences in diversity detected among the other sampling devices, nor between samples collected in or out of water. The NGS analysis identified diverse eukaryotic communities, which were dominated by Metazoa and Chromoalveolata. NIS including the introduced Ciona savignyi were identified, indicating that biofilms on transient vessels could be a vector for transporting organisms globally.

Wed Aug 13th / 1500 / Riwaka

Benjamin Knight, Cawthron Institute

Lincoln MacKenzie, Kirsty Smith, Lesley Rhodes, Tim Harwood
Cawthron Institute

Resolving the role of hydrodynamics in Alexandrium bloom cessation events in a Queen Charlotte Sound embayment.

Over the last four years there have been varying sized bloom events of the toxin producing dinoflagellate, Alexandrium catenella, in a small embayment located off Tory Channel, Queen Charlotte Sound. While peak concentrations have varied year to year in the bay, a common feature of the population has been a sudden decline in abundance at the end of summer. In this presentation we present initial results from numerical modelling and empirical investigations to reveal the role of wind and tidal forcing on the flushing dynamics of the bay. We aim to use these results to gain preliminary insights in the role of physical forcing on the ecological dynamics of the species - particularly the sudden observed declines. This information will form the basis of future studies that aim to develop a predictive capability to assist forecasting of future events in the region.

Wed Aug 13th / 1500 / Waimea

Dominic McCarthy, Auckland Council

Peter Singleton
Waikato Regional Council

The Sea Change (Hauraki Gulf Marine Spatial Plan) Project – challenge, innovation and information

'Sea Change – Tai Timu Tai Pari' (Hauraki Gulf Marine Spatial Plan) is a multi-agency, stakeholder led project to reverse the continuing decline in the quality of the Hauraki Gulf. The Gulf is a nationally significant, highly valued and heavily used natural asset. The aim is to use an innovative best practice approach, new to New Zealand, to achieve a Hauraki Gulf that is vibrant with life and healthy mauri, increasingly productive and supporting healthy and prosperous communities. This ecosystem based project will provide increased certainty for achieving community economic, cultural and social goals, and will ensure that the ecosystem functions underpinning those goals are sustained. Project structure and the collaborative stakeholder process will be outlined, along with the important role of scientific information in the decision making process.

Wed Aug 13th / 1545 / Maitai 1

Helen Neil, NIWA

Peter McMillian, Peter Marriott
NIWA

Maximum ages for black oreo and smooth oreo

Black oreo (Allocyttus niger) and smooth oreo (Pseudocyttus maculatus) are commercially exploited deepwater (600-1500m) fish in New Zealand and are considered to be long-lived, with unvalidated age estimates of up to 153 years for black oreo and 86 years for smooth oreo. The bomb chronometer radiocarbon dating procedure was used as a validation method and strongly supported the age estimates for black oreo, but provided only partial support for smooth oreo age estimates. Oxygen isotope result for black oreo otoliths showed rapid enrichment in early life up to about 5 years followed by relatively constant values, suggesting that early life stages were in near-surface waters and later stages in deep water at ~700-1100m. In contrast smooth oreo do not exhibit rapid oxygen isotope enrichment and suggest a variable life history between 500-1500m water depth throughout life. Carbon isotope results showed enrichment that is probably associated to changes in diet and metabolic rate from the juvenile to the adult fish, associated with an increase in depth with age.

Wed Aug 13th / 1545 / Riwaka

Malcolm Clark, NIWA

Geoffroy Lamarche, Ashley A Rowden
NIWA

Science requirements for management of environmental effects of seabed mining; a need for information, collaboration and coordination

There is growing interest in offshore minerals exploration around New Zealand, and more widely in the Southwest Pacific region. There is current, or recent, activity off New Zealand for ironsands, phosphorite nodules, and seafloor massive sulphides (SMS). In addition, SMS exploration is developing off Tonga and Samoa, and is well advanced in Papua New Guinea. Cobalt-rich crust and manganese nodules also occur in the region. However, a major challenge currently facing management agencies is how to facilitate development of potential mining operations while ensuring that environmental integrity is not compromised. In this presentation we outline the types of mineral resources, and review what science needs to provide to support the environmental management of deep-sea minerals exploitation, especially the need for baseline information, a robust monitoring programme, and studies to underpin precautionary conservation measures. We will describe work to determine the nature and extent of impacts, and the development of aspects of ecological risk assessment and environmental impact assessment which can help guide research and mineral resource management in New Zealand. We stress the need for a strong collaborative approach between governments, minerals companies, researchers, concerned communities and other stakeholders, to provide a solid foundation for environmental management.

Wed Aug 13th / 1545 / Waimea

Malcolm Green, NIWA

Marcus Cameron[1], Megan Carbines[2], Judi Hewitt[3], Simon Thrush[3], Jarrod Walker[3]
[1]Auckland Council, [2]NIWA, [3]The University of Auckland

Water flows downhill: preparing for change in coastal management as freshwater management is reformed

Freshwater management reforms will bring change to estuary management, although the extent of that change is not yet clear. The National Policy Statement for Freshwater Management establishes a framework for building a national limits-based approach to freshwater management. Estuaries are specifically excluded, but proposed amendments do require councils to have regard to connections between freshwater and coastal systems. This will include setting contaminant load limits that take account of aspirations for estuaries. Like freshwater, estuaries suffer cumulative effects of diffuse-source contaminants and their management is hindered by difficulties with the RMA. Hence, the same limits-based management approach could be applied to estuaries. An alternative, and favoured overseas, approach is to manage estuaries under the principles of ecosystem-based management. EBM promotes integrated management that considers species and habitats collectively, treats humans and their institutions and governance structures as part of the ecosystem, and considers the cumulative effects of different human sectors. Limits, on the other hand, are highly prescriptive and potentially narrowly focused. Are the two approaches mutually exclusive? In this talk, we consider our preparedness for policy change by looking at how the limits-based approach could be reconciled with the principles of EBM and applied to NZ estuaries.

Wed Aug 13th / 1600 / Maitai 1

Lucinda van Oosterom, The University of Auckland

The use of vocalisations as a contact call in schooling fish

Vocalisations are sounds produced for the purpose of serving a biological function, often to promote fitness and aid communication. Many birds and mammals use vocalisations as contact calls to mediate group cohesion, and it's possible that this occurs in schooling fish. In tight schools fish use visual and hydrodynamic cues to detect their neighbours, however, for nocturnal fish that maintain loose schools during the night these cues may be unavailable and sound may instead be exploited. The New Zealand bigeye, *Pempheris adspersa*, is a sound producing nocturnal reef fish common throughout New Zealand's NE coast, that have specialised hearing structures that allow increased sensitivity to the frequency bandwidth of their vocalisations. Here we tested the hypothesis that P. adspersa use vocalisations to mediate group cohesion. School size was measured using GoPro images while exposing the fish to recordings of ambient reef sound at three sound levels (125, 130 and 135 dB re 1ÂµPa). Average school area decreased significantly when fish were exposed to all playback levels, suggesting that sound may be an important factor for group cohesion of *P. adspersa*. To my knowledge this is the first study to experimentally test the group cohesion hypothesis on a fish species.

Wed Aug 13th / 1600 / Riwaka

Mark Fitzpatrick, Independent

Research opportunities linked to, but not in support of, the growth in the offshore resources sector

New Zealand is in the midst of unprecedented growth in the offshore resources sector. Driven by the current government, supported by the majority opposition, there is a marked increase in the scale and extent of available offshore permits. Coupled with a lessening in the availability of resources elsewhere in the globe New Zealand is now a potential offshore resource hotspot. Legislation to manage this interest is young. There is significant uncertainty around the shape of applications and approval conditions fuelled by a paucity of environmental data. Growth and parallel uncertainty is being discussed across multiple forums and an undercurrent of disconnection is beginning to flow; marine experts are exercising their right to express concern and opposition. However, an opportunity exists. While neither supporting nor opposing these projects, the empty coffers of data in these areas of interest can be filled. During the last 2 years I have been involved (EIAs or review) in almost every offshore resources project to date and see significant opportunities for non-profit primary researchers to use the growth in this industry, for the betterment of marine science research. Such betterment can only improve the management of projects that are being developed in a climate of unwavering governmental support.

Wed Aug 13th / 1600 / Waimea

Mark Kaemingk, Victoria University of Wellington

Jeffrey S. Shima
Victoria University of Wellington

Going with the flow, or battling against the current?: Do larval Inanga prefer to remain in freshwater or travel out to sea?

Inanga (*Galaxias maculatus*) comprise most of New Zealand's whitebait fishery, yet surprisingly little is known about their early life-history. Basic information — like whether larvae require an oceanic phase to complete their life cycle – is unknown. We exposed newly hatched Inanga larvae of two age classes (1-3d and 9-11d) to pairwise combinations of freshwater, brackish water, and seawater using an Atema flume design and evaluated their preference (as proportion of time spent in cue). Young larvae showed a consistent preference for lower salinity water whereas the older larvae preferred seawater to freshwater, brackish water to seawater, and freshwater to brackish water. Our results suggest water preferences may change with ontogeny. The orientation of young larvae to freshwater could restrict initial dispersal and help to retain newly hatched larvae in a river plume, but marine larval development may prevail under conditions where individuals are forced to choose between freshwater versus seawater habitats. Therefore, Inanga could be a cosmopolitan species with a larval rearing environment that may include freshwater, estuaries, or seawater habitats (i.e, Inanga may be facultative rather than obligate marine developers). Certainly, this hypothesis requires further evaluation, but if supported, it has profound implications for our understanding of this species.

Wed Aug 13th / 1615 / Maitai 1

Melanie Orr, Leigh Marine Laboratory, The University of Auckland

John Montgomery
The University of Auckland

Elasmobranchs & undersea power cables

There is increasing interest in power generation using offshore renewable energy sources, such as wind or tidal power. Most offshore renewable energy developments (OREDs) generate electricity at source and transfer this electricity to shore using subsea power cables. The electrical current passing through a power cable induces a magnetic field around the cable. Electrically-conductive seawater flowing through these magnetic fields will in turn induce weak electrical fields. Whilst cable specifications vary between OREDs, the electric fields around many of these subsea cables fall within the very sensitive electrosensory detection range of elasmobranchs. Benthic elasmobranchs in particular rely on electroreception to pinpoint hidden or buried prey and are most likely to encounter subsea power cables. The potential behavioural impacts of subsea power cables on carpet sharks (*Cephaloscyllium isabellum*) and eagle rays (*Myliobatis tenuicaudatus*) are being studied in a series of tank-based experiments with electric fields equivalent to those that would be induced around a 180A DC undersea power cable. Behavioural responses are compared between both foraging and non-foraging individuals and groups.

Wed Aug 13th / 1615 / Riwaka

Joanne Ellis, Cawthron Institute

Malcolm Clark, Geoffroy Lamarche, Helen Rouse
NIWA

A review of environmental management frameworks for offshore mining

The NIWA-led programme, Enabling Management of Offshore Mining through improved understanding of environmental impacts (or EMOM), has three main research aims. One research aim is to develop science guidelines for management of offshore environmental impacts. This includes reviewing the international literature and experiences gained from New Zealand's onshore Resource Management Act framework to determine best industry practice for developing a set of generic guidelines for an Environmental Mining Management System (EMMS). The literature review included Ecological Risk Assessment (ERA), Environmental Impact Assessment (EIA) and Environmental Management Plans (EMP) which form the key components of an EMMS. In this presentation we provide examples of EIA and EMPs for the four fastest developing areas of seafloor mining initiatives presently being undertaken or planned in the New Zealand region: hydrocarbons (oil and gas), iron-sands, massive sulphide deposits and phosphate nodules. The review is based on ERA, EIA and EMP procedures to support the requirements of the EEZ Bill, Crown Minerals Act and Resource Management Act that are applicable to current and future off-shore mining activities.

Wed Aug 13th / 1615 / Waimea

Mike Hickford, University of Canterbury

David R. Schiel
University of Canterbury

Wandering whitebait: determining the natal source of inanga using otolith microchemistry

Galaxias maculatus (inanga) is the primary species in New Zealand's whitebait fishery. Each year, myriad juveniles (whitebait) are caught as they re-enter freshwater after a six month marine larval phase. There is no existing knowledge of the natal source of these fish, although genetic studies suggest considerable mixing and dispersal while at sea. Previous research by us has shown that large rivers often support sink populations because of degraded spawning habitat, whereas smaller, more pristine, streams may support key source populations. However, management of the whitebait fishery, and targeted in-river habitat restoration, requires knowledge of the source of returning whitebait. Here we use otolith microchemistry to characterise the chemical 'signature' of embryos from twelve spawning sites and to determine the natal source of whitebait entering eight South Island rivers. We show that spawning habitats produce distinct and consistent signatures in developing embryos, and that most rivers have very little self-recruitment. Our results show strong west coast to east coast transport of larvae and no evidence of natal philopatry. We suggest that inanga populations in New Zealand are panmictic and that nearshore oceanographic processes are key drivers of limited larval retention and extensive population mixing.

Wed Aug 13th / 1630 / Maitai 1

Kate Johnson, The University of Auckland

W. Lindsey White[1], Kendall D. Clements[2]
[1]AUT University, [2]The University of Auckland

Histology of the hindgut in marine herbivorous fishes

The digestive systems of marine herbivorous fishes are poorly characterised compared to those of terrestrial herbivorous vertebrates. The gastrointestinal tracts of four temperate species from the Hauraki Gulf, Auckland, and eight tropical species from the vicinity of Lizard Island, Great Barrier Reef, were described using histological and ultrastructural analysis. Species that possessed a stomach had many small villi covering the mucosal surface of this region, resulting in a very large surface area. In general, the anterior intestine and the anterior hindgut had the largest villi. Bacteria were present in the hindgut of all study species, with the greatest density in the anterior hindgut. The location of bacteria within a transverse section of the intestine varied between study species. Those study species possessing large Epulopiscium symbionts had a greater density of bacteria in the centre of the lumen. Ultrastructural analysis of algal fragments from the hindgut revealed differences between study species. In some species bacteria were closely associated with algal fragments, whilst in other species bacteria attached to and hydrolysed algal fragments. These results suggest functional differences in the hindgut of the study species.

Wed Aug 13th / 1630 / Riwaka

Tara Anderson, NIWA

Jenny Beaumont, Alison MacDiarmid
NIWA

Ecological drivers in offshore assemblages: The importance of habitat formers and bioengineers

Compared to coastal environments very little is known about offshore benthic communities, especially along New Zealand's exposed west coast. High intensity spatial sampling in the south Taranaki Bight in 2011-2012 identified two highly diverse offshore habitats associated with *Tucetona laticostata* beds: Bivalve rubble habitats in depths of 40-60 m supporting early-stage colonizing encrusting invertebrates, including several deep-water macroalgal species, and Bryozoan rubble habitats in depths of 60-90 m supporting later-stage colonisers, characterized by a highly diverse bryozoan-dominated assemblage. Further inshore, extensive areas of the midshelf (> 10 km's) were characterised by wormfields - dominated by dense albeit patchy populations of the surface-living Sabellid tubeworm, *Euchone* sp A. These worms bind sand-grains together to form their tubes, and can occur in extremely high densities (≤ 10.8 thousands per m_2 in this study) making them potentially important sediment stabilisers in otherwise highly dynamic and ecological depauperate shelf environments. With increasing interest in offshore seabed resources understanding the functional importance of these habitat forming species is critical to balancing the consequences of human activities and ecosystem health.

Wed Aug 13th / 1630 / Waimea

Eimear Egan, University of Canterbury

Dr. Michael J. Hickford[1], Dr. John Quinn[2],
Prof. David R. Schiel[3]
[1]University of Canterbury, [2]NIWA, [3]University of Canterbury

Insights into the "black box" of a widely dispersing Galaxiid. What can otolith microstructure reveal?

Galaxias maculatus is an important component of New Zealand's whitebait fishery. Several intrinsic and extrinsic factors make a holistic management approach to the conservation and sustainable harvest of this species challenging. These factors include a bipartite life cycle with uncertain larval development and dispersal, panmixia, the multispecies nature of the whitebait fishery, as well as cultural, political and economic concerns. Since Panella's (1971) discovery of daily ring deposition in otoliths, the task of understanding the marine larval phase of bipartite species has become more achievable. The aim of this research is to use otolith microstructure characteristics to explore the 'black box' of larval development and identify components that are spatially or temporally discrete. Otoliths were collected and examined from four key fisheries in New Zealand throughout the 2013 fishing season. Age and size at migration, pelagic larval duration, growth rate at sea and other characteristics were derived. Daily growth rings confirm larval development periods and variation in microstructure characteristics within and among regions is evident. The information obtained from these calcified structures can provide biologically meaningful data that if useful for scientists and policy makers, and can help in better management of New Zealand's iconic whitebait fishery.

Wed Aug 13th / 1645 / Maitai 1

Selena McMillan, The University of Auckland

W. Lindsey White[1], Kendall D. Clements[2]
[1]Auckland University of Technology, [2]The University of Auckland

The role of hindgut microbes inprotein supply to the marine herbivorous fish, *Kyphosus sydneyanus*

Bulk stable isotope analysis (SIA) and, more recently, compound specific stable isotope analysis (CSIA) have been used in ecology to determine dietary sources and to describe trophic relationships. Here, we use SIA (δ15N and δ13C) to investigate nutritional inputs in the marine herbivorous fish species *Kyphosus sydneyanus* (Kyphosidae) in New Zealand. Inputs of the algal diet and hindgut microbes were examined in liver and muscle tissue of the fish. We also used CSIA (δ 15N and δ 13C) to determine the source(s) of assimilation for 12 amino acids from the diet (algae) and/or symbiotic hindgut bacteria (microbes) to the liver and muscle tissues of the fish. Bulk stable isotope analysis indicated that all *K. sydneyanus* tissues and gut contents varied little in δ 13C mean values (-17.3‰ to -15.9‰). In contrast, potential sources and consumer tissues were trophically fractionated in δ15N, and the four sample types (muscle, liver, algae and microbes) were isotopically distinct in δ15N. CSIA revealed that both algae and microbes contributed amino acids to the fish, with relative contribution varying among amino acids. We determined the modal contributions of algae and microbes to fish liver and muscle using the Bayesian-based statistical model SIAR (Stable Isotope Analysis in R). Microbes contributed over 70% δ15N to glycine and threonine in muscle and liver, whereas algae and microbes contributed equally to lysine in muscle, and dietary algae contributed most (86.5%) to liver. We found differences in δ 13C between liver and muscle in sources of some amino acids. For aspartate, glutamine, and threonine the muscle received <5% contribution from algae. Conversely, algae was the source of 32-45% of these 3 amino acids in liver. Our results suggest not only that both the algal diet and hindgut microbes contribute carbon and nitrogen to amino acids in fish tissues, but also that the predominant sources of some amino acids differ between muscle and liver. In general, the liver seems to receive more amino acids from endogenous digestion of algae in the foregut. The muscle seems to assimilate more amino acids directly from microbes, and possibly derives carbon skeletons for dispensable amino acids from bacterially-derived short-chain fatty acids in the hindgut.

Wed Aug 13th / 1645 / Riwaka

Helen Neil, NIWA

Geoffroy Lamarche, Malcolm R. Clark, Ashley A. Rowden, Alison MacDiarmid
NIWA

Building up a baseline environmental database associated with Petroleum and Mining industrial marine activity in line with the Exclusive Economic Zone Act 2012 – An Example from the Pegasus Basin

There is rapidly growing interest in New Zealand waters for offshore hydrocarbon and mineral resources. Under the New Zealand's Exclusive Economic Zone (Environmental Effects) Act 2012, planning to undertake an activity includes an Impact Assessment and thus requires knowledge of baseline information. A recent example in the Pegasus Basin provides insights of such information. The Pegasus Basin is located to the northeast of South Island, New Zealand. Since 2000, a number of research, industry and publically-funded geophysical surveys and environmental studies have focused on the Pegasus Basin and its natural environment, including an Ocean Survey 2020 project in July 2013. Multibeam bathymetry data provides high definition information on physiography and geomorphology. Seafloor reflectivity (backscatter) is used as a proxy for benthic habitat. Some ground-truthing of nominal benthic habitats and bottom features have been conducted using underwater imaging and direct seafloor sampling. Distribution of megafauna from predictive habitat suitability modelling and knowledge of other activities in the region, particularly fishing, are also available. These surveys have generated a comprehensive collection of geological, oceanographic, biological and environmental data that together provide the means to assess both the petroleum potential and the ecology of the basin.

Wed Aug 13th / 1645 / Waimea

Philipp Neubauer, Dragonfly Science

Olaf P. Jensen
Rutgers University

Bayesian estimation of predator diet composition from fatty acids and stable isotopes

Quantitative analysis of stable isotopes (SI) and, more recently, fatty acid profiles (FAP) are useful and complementary tools for estimating the relative contribution of different prey items in the diet of a predator. The combination of these two approaches, however, has thus far been limited and qualitative. We propose a mixing model for FAP that follows the Bayesian machinery employed in state-of-the-art mixing models for SI. This framework provides both point estimates and probability distributions for individual and population level diet proportions. Where fat content and conversion coefficients are available, they can be used to improve diet estimates. This model can be explicitly integrated with analogous models for SI to increase resolution and clarify predator-prey relationships. We apply our model to simulated data and an experimental dataset that allows us to illustrate modeling strategies and demonstrate model performance. Our methods are provided as an open source software package for the statistical computing environment R.

Wed Aug 13th / 1700 / Maitai 1

Paul Caiger, The University of Auckland

Kendall D. Clements
The University of Auckland

Phenotypic diversity in a reef fish across an exposure gradient

Previous work suggests that New Zealand triplefins have diversified as a result of selection on ecological characters in relation to habitat, i.e. through ecological speciation. Strong evidence for this requires demonstrating that such processes of ecological (habitat) divergence are ongoing, such as in other classic model systems like crater-lake cichlids and freshwater sticklebacks. We tested the hypothesis that ecological diversification is ongoing in the triplefin fish Forsterygion lapillum, a habitat generalist. This involved examining the relationships between abundance and morphological characters such as size and fin morphology in different habitats across an exposure gradient. Seasonal sampling indicated substantial annual variation in both fish size and abundance by habitat, probably as a result of short life span. Data from onshore sites indicates there are significant differences between sheltered and exposed sites in both fish size and fin morphology, as seen in the model freshwater systems listed above. Preliminary results of offshore fish are consistent with the pattern from onshore samples, however further work is being undertaken for these highly-exposed sites. Together, these data demonstrate intraspecific phenotypic differences in F. lapillum populations in relation to habitat, indicating that this is one of few examples to demonstrate ecological speciation in a marine fish.

Wed Aug 13th / 1700 / Waimea

David Middleton, Seafood New Zealand

Data, evidence, and ecosystems management

The role of science in ecosystems-based management should be no different to that under any other management paradigm: scientific investigation must provide the evidence base upon which informed management decisions can be made. Stakeholders participating in ecosystem approaches to management must be able to distinguish between scientific evidence, and scientific theorising and hypotheses. Providing scientific evidence relies on data collection; in the absence of data, hypothesis testing — confronting beliefs with data — cannot proceed. Long term series of consistent and reliable data are central to building understanding of ecosystem functioning and providing scientific evidence for consideration by stakeholders and managers. Management of New Zealand's commercial fisheries is supported by comprehensive collection of data on fishing effort and catches. Recognition of the value of data has seen the seafood industry establish initiatives to ensure data is used, and to collect additional data where necessary. Because random sampling, a fundamental principle in scientific data collection, is remarkably hard to achieve in practice, developing procedures for data quality assurance is central to this effort. New Zealand requires innovative approaches if long term, high quality monitoring data is to be collected cost effectively from the non-fisheries components of the marine estate.

Thur Aug 14th / 0930 / Maitai 1

John Booth

Five Easy Pieces

Being pensioned off mainstream science needn't necessarily mean an immediate plummet from your perch. Fresh opportunities for enquiry emerge: ones perhaps better suited to your abilities; ones you choose rather than are required to do; ones to counterpoise 'House built; man dies'; and ones that even bring-on creative flair. Long-term changes in five marine components of the Bay of Islands have tickled my fancy – if not tinkled the keyboard: the seagrass meadows, mangrove stands, algal forests, shellfish beds, and the finfish stocks. As I emerged into scientific research late in the 1960s counterculture-period, when none of the genders cut their hair or shaved, it was impossible to be certain what these back-then-familiar ecosystems would look like with the Vanishing Point half a century into the future. I reveal that transformation – in a flagrantly light-weight fashion. 'There's no denying It gets you high' testified Dennis Hopper (Easy Rider 1969). He was talking about being a bird; I'm talking about an old Kiwi finding stimulating, satisfying, and even constructive areas of research that keep him fixed, for now, upon his perch.

Thur Aug 14th / 1000 / Maitai 1

Peter Talley

Talley's Group Limited, Owner

The Talley's Group is a multi-division, international company that started from a small seafood business in Motueka. It is still owned and operated by the Talley family, with second and third generation family members taking an active part in its operation.

Thur Aug 14th / 1045 / Maitai 1

Annie Galland, Victoria Univesity of Wellington

Matthew R. Dunn
Victoria University of Wellington

Demographics of a deep sea shark

Sharks are important inhabitants of our seas, because they can have a strong top-down influence on food webs, are an important fishery resource and are a focus for conservation. Over the past few decades, some shark species have experienced substantial declines in numbers, largely attributed to targeted and incidental fishing. Sharks as a whole are considered vulnerable to overfishing due to their life history characteristics, in particular their low reproductive rate. As a result, New Zealand has just adopted a new National Plan of Action for the future conservation, management, and sustainable utilisation of sharks. Little is known about deep-water sharks, even though they make up more than half of the extant shark species, and many are a by-catch in commercial trawl fisheries. I describe the demographics of the common deep sea shark Etmopterus lucifer, from samples collected on Chatham Rise during the NIWA research trawl survey in 2012. Measurements were made including shark size, sex, diet, and the first measurements of reproductive activity and age. The likely ecological role, potential benefit to fisheries, and status of this species, are then discussed

Thur Aug 14th / 1045 / Riwaka

Sam Mc Cormack, The University of Waikato

Chris Battershill, Michele Princep, Phil Ross
The University of Waikato

The chemotaxonomy of marine sub-tidal invertebrates

The plastic morphology of sea sponges makes identification difficult. Classical taxonomic methods based on morphology often fail to provide definitive evidence for differences among taxa. New taxonomic tools, including chemotaxonomy have the potential to assist in the identification of sponges. Chemotaxonomy is the attempt to classify and identify organisms, according to demonstrable differences and similarities in their biochemical compositions. My research tests the use of chemotaxonomy as a method to differentiate among sea sponges. I will use three taxonomic methods, chemotaxonomy, classical taxonomy based on morphology and genetic barcoding to develop a best practice method for sponge identification. This study makes use of liquid chromatography-mass spectrometry (LC-MS), a data rich technique, which yields a chromatographic retention time (an indication of polarity), an ultraviolet (UV) spectrum (indicative of the functional group(s) present in a compound) and a mass spectrum (indicative of the molecular weight of the compound) all on a very small sample of crude extract. Morphology based on colour, shape and texture in situ and ex situ will be examined as well as thick sections of sponge water vascular systems. Finally we will examine differences and similarities in the genetic code to separate species. The feasibility and practicality of using individual or a combination of taxonomic techniques will be examined, to determine best practice methods for sponge identification.

Thur Aug 14th / 1045 / Waimea

Stephen Brown, NIWA

Sean Handley[1], Stacie Lilley[2], David Schiel[3]
[1]NIWA, [2]University of Canterbury, [3]University of Canterbury

Benthic Community Response to artificial enhancement of soft sediment habitat

The provision of hard substratum on seabed soft sediment habitat creates varied habitats for benthic organisms. As part of an oyster enhancement program we tested the effects on benthic community species composition of depositing shell on subtidal soft sediment habitat in Tasman Bay, central New Zealand. The species assemblages on the shell-enhanced habitat were distinct from those on adjacent non-enhanced seabed. Addition of shell caused a shift in dominance from mobile deposit-feeders and infaunal scavenger/predators to sessile filter-feeders and epifaunal scavenger/predators. Faunal densities, taxonomic and functional richness, and taxonomic redundancy within functional groups increased in enhanced habitat. Beta and gamma diversity also increased due to patchiness of the habitat created within enhanced experimental sites. Large-scale habitat enhancement via the deposition of waste shell on the seabed is likely to confer benefits to ecosystem function associated with those community level effects.

Thur Aug 14th / 1100 / Maitai 1

Meredith Lowe, NIWA

Mark Morrison[1], Crispin Middleton[1], Tegan Evans[2], Melanie Vaughan[3], Dane Buckthought[1], Matt Smith[1], Emma Jones[1]
[1]NIWA, [2]The University of Auckland, [3]Auckland Council

Finding paradise? Is seagrass the utopia for small snapper: a tail of undersea meadows and roving small fish packs

Snapper (Pagrus auratus) are a key coastal commercial and recreational fisheries species in New Zealand. Recent work has shown that juveniles (c < 90 mm, <1 year old) are often associated with biogenic habitat types, including seagrass, horse mussels, and sponges, within estuarine and sheltered water areas; all vulnerable to degradation/loss through human activities, both land-based and marine. Sub-tidal seagrass meadows in particular support disproportionately high densities relative to other habitat types. We examined juvenile snapper habitat usage for the three largest remaining seagrass meadow areas in northern NZ (southern Kaipara, Parengarenga, Rangaunu harbours). Seagrass areas were mapped (aerial photography in Kaipara, satellite imagery in East Northland), and these maps used to allocate fish sampling using beach seines (n = ~200 sites) across the harbours. High juvenile snapper (11-80 mm) densities were caught extensively in association with lush sub-tidal seagrass, and higher tidal velocities. In the Kaipara, catches ranged from the multiple tens to low hundreds, with apparent increasing juvenile size with water depth (c 5 m range); in East Northland many catches ranged from several hundred up into the thousands. Baited/un-baited cameras also revealed substantial numbers of juvenile snapper. The remote sensing data appeared to correlate well with differing juvenile snapper catch rates. In East Northland, field observations strongly suggested that sub-catchments with less run-off/ development/ more native vegetation cover had better seagrass cover/ condition and higher juvenile snapper densities. These survey data are being used to assess how land-based impacts cascade into juvenile snapper production, and ultimately coastal fisheries productivity.

Thur Aug 14th / 1100 / Riwaka

Nikki Webb, The University of Waikato

Chris N. Battershill, Michele R. Prinsep
The University of Waikato

Chemical ecology and bioactivity of New Zealand marine sponge, Cliona celata

Chemical ecology and bioactivity of New Zealand marine invertebrates has the potential to lead to the next big drug discovery. Cliona celata is a cosmopolitan intertidal and subtidal marine sponge found around New Zealand and in particular for this project, inside and outside the Tauranga harbour. Preliminary research indicated the presence of potentially novel brominated secondary metabolites within the sponge. This is a new finding as the sponge has been examined many times previously from other localities around the world. Bay of Plenty Cliona celata may utilise these chemicals as a defense mechanism to inhibit and repel encroaching organisms. Using variables such as exposure, depth, season, damage (from predators), and epibiont coverage, we aim to determine the ecological role of these chemicals. We will also assess their potential as a pharmaceutical or research tool. Isolation and identification of these chemicals is therefore essential. The scope of this project is to investigate the chemicals within the sponge, why and where they are present, and whether there is any bioactivity associated with them.

Thur Aug 14th / 1100 / Waimea

Phil Ross, The University of Waikato

Alix Laferriere[1], Chris Battershill[2]
[1]Victoria University, [2]The University of Waikato

Kapiti Island Marine Reserve 21st birthday survey: 90's flashbacks and trophic cascades in the 21st century

The Kapiti Island Marine Reserve came into existence in 1992. Shortly thereafter, a survey was conducted characterising fish, invertebrate and benthic communities at 11 stations around the island. The aim of the survey was to establish a baseline against which to detect changes occurring in the reserve over time. In the following two decades, a handful of studies investigated the effects protection for a subset of these sites and organisms. However, no attempts were made to replicate the taxonomically and spatially comprehensive survey conducted at the reserve's inception. For Kapiti Marine Reserve's 21st birthday, the Department of Conservation (DoC) and The University of Waikato (UoW) decided to throw a party: a survey party! The 11 stations originally surveyed were revisited and a team from UoW, DoC and Victoria University (including a member of the 1992 survey team) characterised the islands coastal flora and fauna. Here we present the results of the survey, highlighting luxuriant kelp forests, standing-room only paua, bigger butterfish, extensive rhodolith beds and we comment on the importance of controlling for habitat when measuring the effects of marine protection.

Thur Aug 14th / 1115 / Maitai 1

Alex Thompson, Ministry for Primary industries

Tracey Osborne, Scott Walker
MPI

Valuing fishing grounds and the cost of displaced fishing

A GIS for mapping fishing events has improved the quality of advice to marine resource decision makers. Summary maps of fishing effort, catch, and value per unit area have proven very effective for communicating advice. We demonstrate how we quantify fishing in any area of interest. Value of production is estimated using port price, the annual value of leased quota (a measure of willingness to pay for access to fish), or economic return using multipliers from an economic model. The technique has enabled comparison of various marine spatial closure options and assisted decision makers make well informed marine management decisions.

Thur Aug 14th / 1115 / Riwaka

Kathryn Lister, University of Otago

David J. Burritt, Miles D. Lamare
University of Otago

Environmental pollutants induce oxidative stress, altering reproductive output and maternal antioxidant loading in temperate and Antarctic sea urchins

Oxidative stress (OS), which occurs when there is an imbalance between reactive oxygen species production and antioxidant scavenging capacity, is often associated with pollutant-induced toxicity in marine invertebrates. The past decade has seen increasing evidence suggesting that the capacity of organisms to withstand OS may play a key role in shaping reproductive trade-offs. We present evidence for resilience to pollutant- and UV-induced OS in a temperate and an Antarctic sea urchin via increased maternal loading of protective antioxidants. Our results indicate that sea urchin sperm have a much simpler antioxidant system than eggs and that the paternal contaminant history has little influence on whether embryos are more or less susceptible to oxidative damage when exposed to additional stressors. Lastly, we report that abnormal or delayed development in embryos in response to pollutants or UV stress is largely independent of oxidative lipid and protein damage. These results imply that general OS resilience may not necessarily translate to a fitness or survival gain, at least in early developmental stages. Understanding the physiological mechanisms underlying environmental pressure on life history trade-offs, as well as the rate of potential adaptation is important for elucidating anthropogenic impacts in the marine environment.

Thur Aug 14th / 1115 / Waimea

Norliana Rosli, University of Otago

[1]Daniel Leduc, [1]Ashley A. Rowden, [2]P. Keith Probert
NIWA[1], University of Otago[2]

Are benthic standing stocks and diversity greater in canyon and seamount than open slope habitats?

The presence of different habitats on continental margins has an important influence on the structure of benthic communities. For example, canyons such as Kaikoura Canyon off North Island's east coast, are characterised by enhanced benthic densities and biomass, and distinct community structure relative to the slope. Fishing intensity (e.g, bottom trawling) causes chronic disturbance to soft sediment in deep-sea, however little is known, about the biodiversity and ecology of meiofauna in the New Zealand's region and the effects of trawling on their community structure. The aim of this study is to investigate patterns of meiofaunal abundance, diversity and community structure along bathymetric gradients in different deep-sea habitats (i.e, continental slope, canyon and seamount) and to investigate the environmental and anthropogenic factors that might influence changes in meiofauna community attributes. Meiofauna communities were sampled at 27 stations, from 670m to 1561m, in 2010 as part of NIWA's Vulnerable Deep-Sea Communities Project. Preliminary results show that total meiofauna and nematode densities are highest in the canyon habitats. Further analyses will determine the relative influence of environmental variables and fishing intensity on meiofauna community structure.

Thur Aug 14th / 1130 / Maitai 1

Jacob Hore, Ministry for Primary Industries

Electronic Monitoring in a New Zealand Fisheries Context

The use of human observers to monitor the activity of commercial fishing vessels is costly and logistically challenging. MPI is currently trialling the use of electronic monitoring (EM) as an alternative to human observer placement within inshore fisheries. The trial has seen ten inshore trawlers fitted with cameras that record the activity of the vessel while it is at sea. Using a set of review parameters designed to extract the desired empirical data EM not only provides useful fisheries information but also performs an important verification function. Following the outcomes of the trial MPI will consider the expansion of EM into the wider inshore fishing fleet, across a range of monitoring objectives. With the potential for EM to become a broadly implemented monitoring tool there is the opportunity to consider what uses there may be for EM gathered information in the future. By turning our thinking to how we might utilise EM and EM gathered data in the future we are able to feed back into the wider EM programme design.

Thur Aug 14th / 1130 / Riwaka

Jan Hesse, The University of Auckland, Leigh Marine Laboratory

J. Stanley, A. Jeffs
The University of Auckland

Does the removal of large lobsters (*Jasus edwardsii*) affect their recruitment into reefs?

The most valuable spiny lobster fishery in New Zealand is for *Jasus edwardsii*, which inhabits the temperate rocky reefs around the entire country. There is strong evidence that the removal of these important predators by fishing plays a role in altering the habitat structure of reefs, especially in north-eastern New Zealand. Reduction of adult lobster abundance on reefs is thought to trigger a trophic cascade by reducing predation on the sea urchin, *Evechinus chloroticus*, which in turn increase in number and graze down kelp forest habitats to form barren reef habitats. Possible habitat settlement preferences of *J. edwardsii* pueruli were investigated using experimental settlement collectors that simulated artificial kelp forest, natural kelp forest and barren reef. Overall, the pueruli showed no discrimination among the three treatments (p=0.955, df =20). A novel method for 24 hour uninterrupted predation observation has been developed to estimate potential predatory pressure on juvenile lobsters in barren and kelp forest habitats. Results indicated a significantly higher relative predation pressure on barren habitats (p=0.01, df=23). Overall, this study suggests that the settlement and subsequent survival of early juvenile *J. edwardsii* may be influenced by changes in reef habitats which appear to be associated with lobster fishing.

Thur Aug 14th / 1130 / Waimea

Mark Wilcox, The University of Auckland, Marine Institute

Andrew Jeffs
The University of Auckland

Re-establishment of soft-sediment mussel beds in the Hauraki Gulf

The green-lipped mussel, Perna canaliculus, historically formed beds covering much of the soft-sediment of the Hauraki gulf, especially in the Firth of Thames and Tamaki Strait. Today, but a minuscule fraction of this habitat remains and it is unclear why there has been no natural regeneration. Given that previous work indicates mussels can survive in the gulf, restoration efforts are underway to attempt to re-establish mussel beds on the soft-sediment benthos. In order for any restoration effort to be successful, optimization of the methods for re-establishment should be investigated. We conducted several experiments to determine if modifications to the benthos are required for or enhance the re-establishment success of adult mussels and potentially mussel spat. We also outline some of the current work being done with the re-establishment of larger scale mussel beds.

Thur Aug 14th / 1145 / Maitai 1

Darcy Webber, Victoria University of Wellington

Richard Arnold[1], Alistair Dunn[2]
[1]Victoria University of Wellington, [2]NIWA

Bayesian Inference of Computationally Expensive Fisheries Models

Complex models, such as individual-based or spatially-explicit models, provide a potential framework for exploring complex dynamics in populations, communities and ecosystems. Inference that ignores individual variability and/or spatial complexity may provide biased, imprecise or overly-precise platforms for management advice. However, standard inference is often not possible in such computationally expensive models. Bayesian emulators are a method with the capacity to make inference about such models. An emulator is a stochastic representation of a simulator conditioned by evaluations of that simulator at known inputs. The emulator allows us to interpolate (or extrapolate) the evaluations of the simulator to beliefs about the simulator output for any input and conversely to make inferences about the "best inputs", conditional on a given data set. We have adapted this method so that it may be used to make inference about simple fisheries problems and are extending the methodology for computationally expensive problems. While the application of this method and its potential for inference of such models is exciting, there are other potential uses for the Bayesian emulation framework in fisheries management. For example, conditioned emulators could be used within management strategy evaluation (MSE) to speed up the simulation and improve the accuracy of the results.

Thur Aug 14th / 1145 / Riwaka

Kendall Gadomski, University of Otago

Miles Lamare[1], Henrik Moller[1], Michael Beentjees[2]
[1]University of Otago, [2]NIWA

Temporal and spatial reproductive patterns of the toheroa, Paphies ventricosa, at Oreti Beach, Southland, New Zealand

Paphies ventricosa (Gray, 1843) (Veneroidea: Mesodesmatidae), is a large surf clam endemic to New Zealand, with a geographically patchy distribution. Population sizes have greatly reduced historically, and recruitment is a key issue for the species, for which knowledge of reproduction is important. Animals were collected monthly from a single site in 2011, and seasonally from four sites in 2012. Gonad tissue was excised, fixed, processed, stained with Meyer's haemotoxylin and eosin, and mounted for microscopic analysis. Light micrographs were studied visually, and animals were assigned to one of four reproductive stages – early active, late active, ripe, and partially spawned/spent. ImageJ software was used to measure oocyte diameter and density in females, and spermatid layer thickness in males. Results of reproductive stage classification and discreet measurements were used to identify temporal and spatial reproductive patterns of toheroa at Oreti Beach, Southland, New Zealand. Preliminary results show a seasonal pattern of two spawning events – one in early spring, and one in late summer.

Thur Aug 14th / 1145 / Waimea

Sydney Harris, The University of Auckland

Marine Soundscape Ecology: A New Mechanism for Biodiversity Measurement

In the face of accelerated global climate change, monitoring biodiversity has become a critical task for ecologists. Habitat loss is occurring alarmingly quickly in both terrestrial and marine ecosystems, resulting in the endangerment and extinction of species up to 1,000 times faster than natural rates. However, traditional biodiversity measurement techniques present logistical and financial obstacles to conservation efforts. Soundscape Ecology has recently emerged as a promising solution to these problems, providing a mechanism for measuring diversity using acoustics. Acoustic diversity indices have proven to be beneficial indicators of biodiversity in a variety of terrestrial landscapes. This is the first study to explore the relationship between biodiversity and acoustic diversity in coastal marine habitats. Three acoustic diversity indices developed for terrestrial use are adapted and applied to recordings of nine coastal reefs in northeastern New Zealand. Acoustic diversity is then compared to traditional measures of species diversity from the same sites. Comparisons are investigated between protected and unprotected areas as well as distinct habitat classifications. Diurnal, lunar and seasonal patterns are also examined. Marine Soundscape Ecology could provide a more efficient, affordable and reliable way to measure marine biodiversity, making monitoring of Marine Protected Areas far more streamlined and effective. spatial management areas, in more offshore regions or along unprotected coastlines, during summer and, in particular, winter.

Thur Aug 14th / 1200 / Maitai 1

Matt Pinkerton, NIWA

Ecosystem modeling of the Chatham Rise: the food-web structure of New Zealand's most productive ocean region

The Chatham Rise extends eastwards from New Zealand into the southwest Pacific Ocean. High primary production here supports New Zealand's most valuable deep-water fisheries. A model of the structure of the food-web of the Chatham Rise was developed, bringing together information including on seabirds, cetaceans, seals, demersal and pelagic fishes, cephalopods, krill, salps, benthic invertebrates, hyperbenthic prawns, small zooplankton, phytoplankton and bacteria. A semi-objective balancing method was used to adjust simultaneously more than 700 parameters to give a balanced model. The main pathways of energy through the food-web involved six key groups of organisms: prawns/shrimps, small demersal fishes, mesopelagic fishes, squid, krill, and salps. In the model, these six groups together provided 82% of the food for demersal fishes and 99% of the food for air-breathing predators. These mesopelagic and hyperbenthic groups of "middle-trophic level" organisms are impacted by both top-down and bottom-up factors: fishing affects their predators whilst climate variability/ change potentially affects their food supply. Intense fisheries exploitation may strengthen bottom-up control in ecosystems, and their sensitivity to climate variability, making understanding the functional ecology of these key middle trophic level groups increasingly important.

Thur Aug 14th / 1200 / Riwaka

Hanieh Saeedi, The University of Auckland

Mark Costello[1], Rudo v. Cosel[2]
[1]The University of Auckland, [2]Natural History Museum in Paris

A morphology of razor clams (Bivalvia: Solenidae) anatomy

Deep-burrowing razor clams (Solenidae and Pharidae) inhabit coastal waters of tropical and temperate seas excluding some oceanic islands. Morphological characters such as anterior shell furrows and pallial tentacles are restricted to Solenidae. Scientists recently proposed a possible relationship between the presence of anterior shell furrows and pallial tentacles. This study thus examines this hypothesis by studying 1,188 dry shells of 51 species of Solen and Solena rudis, and 84 wet specimens of 21 species of Solen and Solena. There was a significant positive relationship between all biometrical parameters except for the relationship between the shell length and furrow length. Although 70% of Solen species had anterior shell furrows only 67% had anterior pallial tentacles. Also about 25% of Solen species either did not have anterior tentacles or lost their tentacles due to poor sample preservations. Most species with anterior tentacles were reported in Asia from a small S. cylindraceus in Mozambique to a larger species, Solen dactylus, in Iran. Anterior pallial tentacles were reported in specimens of Solen regularis and S. marginatus from Thailand and Portugal, respectively. However, S. regularis from Malaysia and S. marginatus did not have anterior tentacles. It is still unclear that species without anterior pallial tentacles could evolve before those species with anterior tentacles (nascent organ) or opposite (vestigial organ). Molecular studies and DNA-Barcoding techniques would be necessary to study the phylogeny and evolution of Solenidae regarding the presence or absence of the tentacles.

Thur Aug 14th / 1200 / Waimea

Deanna Clement, Cawthron Institute

Darryl MacKenzie
Proteus Wildlife Research Consultants

Twelve nautical miles and beyond – Hector's dolphin abundance and distribution revisited

In collaboration with the Ministry for Primary Industries (and their AEWG) and the Department of Conservation, the most intensive aerial survey for Hector's dolphins to date occurred along the east and north coasts of the South Island (ECSI), consisting of more than 7,000km of effort within and beyond our territorial waters. Seasonal surveys confirmed several features of this population's distribution and abundance; clear preference for Banks Peninsula and Clifford/Cloudy Bay waters, substantial breaks in population structure between regions and a general shift offshore over colder months. Surveys also established that this population is larger than expected from previous estimates. ECSI Hector's dolphin abundance within 20nmi was estimated to be 9130 (CV: 19%; 95% CI: 6342-13 144) in summer and 7456 (CV: 18%; 95% CI: 5224-10 641) in winter. Approximately half of the summer estimate was distributed across previously unsurveyed regions in offshore waters between 4 and 20nmi. Results indicate that while a large portion of this population occurs within protected waters over summer (~50% within fisheries restriction zones and up to ~80% including sanctuaries), reasonable numbers of dolphins occur outside designated spatial management areas, in more offshore regions or along unprotected coastlines, during summer and, in particular winter.

Thur Aug 14th / 1215 / Maitai 1

Brenton A. Twist, University of Otago

Christopher D. Hepburn, William J. Rayment
University of Otago

Modelling habitat preferences of the scallop Pecten novaezealandiae within Paterson Inlet, Stewart Island

Productivity within scallop fisheries is highly variable due to the species' sporadic spawning and variable recruitment. In the Mātaitai (customary fisheries area) within Paterson Inlet, Stewart Island, there is currently a harvesting ban on the scallop Pecten novaezealandiae due to a recreational fisheries collapse. A better understanding of the habitat preferences of scallops within this area could improve management of the fishery. Habitat characteristics and scallop densities were measured during a series of strip-transect and photoquadrat surveys at 19 sites within Paterson Inlet in June 2013. In total, 1.5km^2 of habitat was surveyed, with mean scallop density varying from 0m^{-2} to 0.21m^{-2} per site. GLMs were used to relate scallop presence and density to seven habitat characteristics. The best model, based on minimum AIC, included distance from the inlet entrance, percentage algal cover, benthic algal mat presence, density of the starfish Coscinasterias muricata and harvest pressure. Model averaged coefficients calculated based on Akaike weights of models within six AIC points of the best model identified distance, algae cover, algal mat presence, and harvest pressure as factors important in controlling scallop distribution and density. Future research can be directed from these results to help best inform management in this area.

Thur Aug 14th / 1215 / Riwaka

Hanieh Saeedi, The University of Auckland

Mark J. Costello, Todd Dennis
The University of Auckland

Global biodiversity and biogeography of razor clams (Bivalvia: Solenidae)

Solenidae are deep-burrowing bivalves that inhabit intertidal and shallow sub-tidal soft-bottom sediments of tropical and sub-tropical areas. However, global geographic patterns of diversity and distribution of Solenidae are not well-studied. Here we used combined data published in the literature and open-access databases including the Global Biodiversity Information Facility (GBIF) and the Ocean Biogeographic Information System (OBIS) to map the global geographic distribution of Solenidae species. Environmental data were obtained at a spatial resolution of 0.083Âº from GMED (Global Marine Environment Datast). We applied a species distribution modeling program 'Maximum Entropy' (Maxent) to predict suitable environments for Solenidae species. The geographic distribution of species in 5° latitudinal bands showed a distinct bimodal pattern, and global patterns of richness decreased markedly from the equator to the poles. Indo-Pacific area exhibited the greatest diversity; there were no distribution records for this family in Antarctica and some large oceanic islands such as New Zealand. Model outputs indicated the majority of suitable Solenidae environments are likely to occur in the shallow waters of the Indo-Pacific area. The most important environmental factors in determining Solenidae environment suitability were land distance, depth, wave height, and sea surface temperature. Knowledge of the biogeographical patterns of Solenidae on a global scale will help identify factors such as geological and climatological phenomena that are known to influence the diversity patterns of ecologically and environmentally important marine organisms such as razor clams.

Thur Aug 14th / 1215 / Waimea

Phil Ross, The University of Waikato

James Williams[1], Shade Smith[2], Ian Hogg[3]
[1]NIWA, [2]Triplfin Consultants, [3]The University of Waikato

Larval dispersal v. early aquaculture: alternative explanations for the population structure and dynamics of toheroa

Extensive toheroa (Paphies ventricosa) populations were once present on exposed surf beaches in the regions of Northland, Wellington and Southland. However, commercial and recreational harvesting of toheroa was intense during the mid-20th century and populations declined to levels where harvesting of the shellfish was no longer viable. Despite the harvesting of toheroa having been prohibited in many parts of New Zealand for over 40 years (with the exception of limited customary harvest) some populations have failed to recover. While the reasons for this lack of recovery are uncertain, limited inter-population connectivity (and therefore recruitment) has been suggested as a possible explanation. To assess connectivity among toheroa populations, we examined genetic diversity and differentiation among populations at Ripiro and Ninety Mile Beaches in Northland and Oreti Beach in Southland using the mitochondrial COI gene. The total lack of genetic diversity observed in Oreti toheroa suggests isolation between northern and southern populations. Hydrodynamic barriers to dispersal, founder effects and inbreeding are proposed as hypotheses to explain the observed inter-population genetic differences. Alternatively, translocations and the establishment of new toheroa populations during the early human history of New Zealand have been documented and could explain the lack of diversity in Southland toheroa and failure of populations to recover post-exploitation.

Thur Aug 14th / 1315 / Maitai 1

Chris Battershill, The University of Waikato

Conrad Pilditch
The University of Waikato

Continental Shelf Sponge Gardens and Benthic Pelagic Coupling: Where does all the carbon go when the habitat is lost through sedimentation?

Across an average 'sponge garden', sponges can process 100ml seawater s^{-1}m^{-2}, frequently filtering upto 95% of potential food particles present, to a size of 50µm. In a series of feeding experiments approximately 20 µg C.l-1 POC, 120 µg C.l-1 DOC and 360 µg C.l-1 ultraplankton were retained. This equates to 8,600 l seawater per m^2 per day being processed by sponges accounting for over 4.3t C per day per km^2 of habitat. However, despite high levels of apparent feeding activity, the consumption of carbon isn't reflected in growth, indeed most sponge communities remain highly stable in population density and individual size over time. Where does the carbon go? Is it burnt in metabolism? What is the contribution to boundary layer $C0_2$ and how do microbial symbionts interact with sponge metabolism? We examine benthic carbon flux associated with sponge communities in order to assess the importance of sponge gardens to benthic - pelagic coupling and raise hypotheses as to the role of sponges in contributing to benthic carbon budgets. We discuss the consequences of the probable substantial loss of sponge garden habitat around our coasts from persistent sedimentation events, in terms of associated carbon flux and trophic cascades.

Thur Aug 14th / 1315 / Riwaka

Emma Newcombe, Cawthron Institute and Aroha Spinks

Huhana Smith, Craig Allen, Javier Atalah, Jim Sinner, Taiao Raukawa
Cawthron Institute

Kaimoana from Hōkio to Ōtaki: A hapu-centered study of shellfish on Horowhenua beaches

Toheroa populations have declined to extremely low levels along the Horowhenua coast from Hōkio to Ōtaki. Historic over-harvesting by many communities was widespread, and anecdotal evidence suggests that gathering without customary permit occurs today, but other factors potentially contribute to the decline of this taonga species. These include land use changes, crushing by vehicles, and interactions with ghost shrimp. Local hapu have aspirations to reseed toheroa, and our project aims to inform that process. We designed a survey to relate surf zone and landscape factors with variations in shellfish populations. Survey design was a collaboration between scientists and local Māori researchers to ensure relevance to both groups. Data collection involved 35 hapu volunteers. We also characterised the current land use and the change in key landscape features (primarily wetlands) from historical information, and assessed the relationships between land use and current shellfish populations. The survey documented the absence of toheroa from most sites and examined relationships between environmental variables and currently dominant species. A parallel study of faecal indicator bacteria in shellfish showed unexpectedly high contamination at most sites along this stretch of coast. This exercise of active kaitiakitanga alongside science endeavours has fortified enthusiasm of local Māori for restoration efforts.

Thur Aug 14th / 1315 / Waimea

Peter Lawless, Phoenix Facilitation Ltd

Kaikoura Community Led Coastal Management

The Kaikoura Marine Management Bill brings in a suite of conservation measures for New Zealand's premier marine mammal tourism area. These include a large marine reserve, a whale and a seal sanctuary, three mataitai, two taiapure and changes to recreational fishing limits. A new body is established as a Ministerial advisory committee. This paper sets out the Kaikoura story and the genesis of the Bill. The pivotal role of the tangata whenua is discussed. The requirements for implementation of the strategy are described. The role of science is explored and limitations to knowledge is discussed. The approaches used to create community alignment are outlined and lessons learned that might have applications in other areas are set out.

Thur Aug 14th / 1330 / Maitai 1

Iain MacDonald, NIWA

Julia C. Mullarney
The University of Waikato

Memory-loss: Using Lagrangian measurements of flocculation dynamics and turbulence to remove antecedent influences on sediment in motion

The physics of aggregated particles (or flocs) are a key component of sediment transport in muddy environments, and yet, many of the intricacies of the flocculation process remain poorly understood. Often the assumption is made that sediment particles suspended in a moving water column are in equilibrium with the local environment (such as turbulence field and stratification). However, it has been shown that fine sediments have a strong memory of previously encountered upstream conditions, which can at least partially, overwrite their response to local conditions. Therefore, quantifying fine sediment dynamics requires following particles to account for antecedent processes. Here, we compare Lagrangian and Eulerian observations of floc evolution from a sediment-laden tidally forced creek to separate local and historical influences. Measurements were made with the subsurface 'FlocDrifter', a novel purpose-designed drifter equipped with an underwater floc camera system, an ADCP for velocity and turbulence measurements and a CTD probe. The results show how the floc size distribution and settling speeds evolve as the flocs transit the tidal creek.

Thur Aug 14th / 1330 / Riwaka

Anna Wood, University of Otago

Ashley A. Rowden[1], P. Keith Probert[2]
[1]NIWA, [2]University of Otago

Memory-loss: Using Lagrangian measurements of flocculation dynamics and turbulence to remove antecedent influences on sediment in motion

Habitat-forming bryozoans form patch-reefs on Otago shelf. Individual patch-reefs are interspersed with muddy biogenic carbonate gravels. Diverse epi- and infauna occur, but the mechanisms by which these complex habitats support faunal diversity are unclear. We explored these mechanisms by quantifying habitat complexity and macroinvertebrates in grab samples and testing for correlations between the two. Measures of epi- and infaunal habitat complexity and food availability characterised the environment. Measures of abundance, expected richness, trophic diversity, and assemblage structure characterised the biodiversity. Variables describing the amount of epibenthic habitat and the diversity of sediment components were important in explaining the various biodiversity metrics. Understanding interactions between biodiversity and complex habitats can be confounded by the different quantities of habitat present in samples of different complexity. Hence, findings of the present study are discussed in relation to the species-area relationship. The passive sampling hypothesis and habitat diversity hypothesis are relevant. The former posits that increased richness in larger areas is a sampling effect resulting from the greater abundance of organisms, and the latter suggests that additional niches are generated by the presence of complex habitats and that these niches provide habitat required by specialised organisms.

Thur Aug 14th / 1330 / Waimea

Erin Spencer, National Geographic, College of William & Mary

Community Based Management of Invasive Lionfish in the Florida Keys

Originally from the Indo-Pacific, lionfish appeared off the coast of South Florida in the mid-1980s and have since been recognized as one of the top threats to marine conservation in the world. In the summer of 2013, I received a National Geographic Young Explorers Grant to study local responses to invasive lionfish. I spent one month interviewing divemasters, chefs, researchers, and lobstermen in the Florida Keys to determine how they perceived the lionfish problem, as well as learn the methods they employed (if any) to help mitigate the impacts of the fish. I discovered that a new but thriving culture has emerged surrounding lionfish hunting and consumption, inspired by an active education and outreach program by local nonprofits and government organizations. Actions include organized lionfish derbies, marketing lionfish in local restaurants, and individual removal with pole spears. Although the lionfish invasion is still a very serious problem, local efforts are making a difference. The response of locals in the Keys is an exciting example of the effectiveness of community-based invasive species management and the power of social media and outreach in inspiring local action.

Thur Aug 14th / 1345 / Maitai 1

Scott Nodder, NIWA Wellington

Conrad Pilditch[1], Ingo Klaucke[2]
[1]The University of Waikato, [2]GEOMAR

Organic enrichment & sedimentation in deep-sea pockmarks & depressions, south Chatham Rise

Sea-floor depressions ranging in scale from 10-1000's of metres in diameter have recently been discovered on the upper southern flank of the Chatham Rise. These features are potentially formed by fluid and/or gas hydrate (methane) release at the sea-floor. A voyage in 2013 (RV Sonne SO-266) investigated more fully the structure and fluid systems associated with these "pockmarks" and also provided an opportunity to determine whether infaunal community structure and function differed inside and outside the seafloor depressions. Sediments were collected using a multi-corer (10 cm-diameter tubes) in water depths ranging from 500 to 1000 m from which we incubated sediments to determine benthic metabolism, sampled for macro- and meio-fauna and sectioned to determine sediment properties in the upper layers. Preliminary results indicate differences in the grain-size and chemical characteristics within the large km-scale depressions, related to the preferential accumulation of organic-rich sediments compared to the surrounding sea-floor. This organic enrichment was reflected in elevated benthic activity as measured by increased sediment oxygen consumption. We also measured higher benthic activity in smaller-scale circular pockmarks (10's of metres) on the southwestern flank of the Chatham Rise. Fluid and/or gas expulsion appears to be ephemeral in the southwestern pockmark fields, with no evidence of active methane expulsion detected during the voyage. Seismic reflection data from the larger depressions indicate that while fluid processes were a factor in the geological past, recent erosional and depositional activity, potentially related to the development of current systems within the Subtropical Front, has effectively capped the direct escape of methane-charged fluids to the modern-day sea-floor. Thus, it appears that sea-floor communities are structured more by recent sedimentation processes than previous gas and/or fluid expulsion events.

Thur Aug 14th / 1345 / Riwaka

Abigail Smith, University of Otago

Growth and Calcification in Bryozoans

Bryozoans are marine benthic invertebrate colonial calcifiers, important and especially abundant and diverse in Southern Hemisphere shelf environments. Large heavily-calcified colonies can be up to 50 years old, but most longer-lived bryozoans are limited to 10-20 y. Many smaller species are annual. Radial extension in flat encrusting bryozoans is generally on the order of 1-5 mm/y. Erect calcified species generally grow vertically 2-15 mm/y, though articulated species such as Cellaria may reach rates of 40 mm/y. Corresponding calcification rates are generally 101-102 mg/y, but there can be an order of magnitude variation in rate among years in high-latitude bryozoans. Multi-branched bryozoans produce up to 24 g $CaCO_3$/y. Global climate change, leading to increasing water temperatures, could generally increase marine bryozoan metabolic rates, and possibly colonial growth. On the other hand, decreasing pH (ocean acidification) could cause corrosion, stress associated with calcification, and decreased survival.

Thur Aug 14th / 1345 / Waimea

Brittany Graham, NIWA

Jim Roberts[1], Laureline Meynier[2], Simon Childerhouse[3], Sarah Bury[4], Alistair Dunn[5]
[1]NIWA, [2]Massey University, [3]Blue Planet Marine, [4]NIWA

Drilling back through time to determine the factors for the decline in New Zealand sea lions

One of the rarest pinnipeds, the New Zealand sea lion, has been in decline at its largest breeding colonies on the Sub-Antarctic, Auckland Islands. Pup production has declined there by approximately 50% since the late 1990s. Although well studied, the factors for this decline remain unclear, but commercial trawl fishery mortalities, disease-related mortalities of pups, and changes in prey availability have been suggested as major contributing factors. We present stable carbon and nitrogen isotope data of samples collected from teeth annuli that represent a biannual signal extending over 15 years from before and after their population decline. The stable isotope dataset, along with other datasets, including prey abundance estimates and climate indices, suggest that there have been shifts in ocean climate conditions and in their trophic ecology over this period.

Thur Aug 14th / 1415 / Maitai 1

Alison MacDiarmid, NIWA & 2013 NZMSS Award Recipient

New Zealand marine sciences in the Anthropocene

We live in the age of the Anthropocene when human activities are increasingly influencing local, regional and planetary ecosystems. In New Zealand humans arrived late from a global perspective, but nonetheless our marine habitats are threatened by a wide range of potentially hazardous human activities. A recent expert assessment of these threats concluded that many of the biggest threats to New Zealand marine habitats stemmed from human activities outside the marine environment itself. In fact the two biggest threats (ocean acidification and global warming) stemmed from human activities on an international scale. It is increasingly clear that we are altering the physical and chemical nature of our atmosphere and oceans, and biological responses are starting to be identified. So what should be our response as a community of marine scientists and managers? I submit we cannot persist with business as usual. I suggest that we need to adopt a broader socio-ecological framework for our science. This will demand we re-examine the fundamentals of who we regard as necessary scientific collaborators, with whom we should be meeting and what we should be discussing at our annual conferences, how we determine what science questions to address, how we communicate our science, and how we structure our institutions.

POSTER PRESENTATIONS (alphabetical by last name)

Georgia Bell

University of Otago

Federico J. Balter, Chris D. Hepburn, Sergio E. Morales
University of Otago

Dynamics of fecal indicators in estuarine environments after a rainfall event

The consumption of seafood contaminated by fecal associated microbes can cause severe illness in humans. Rainfall is a well-known vehicle for introducing such microbes into estuarine environments, yet the ecology and survival of these pathogens are not well known. Bivalve molluscs (such as cockles and mussels) living within contaminated environments are at risk of accumulating high volumes of pathogens as they filter out particles suspended within the water. This project will investigate the dynamics of fecal contamination of Cockles (*Austrovenus stutchburyi*) and Mussels (*Perna canaliculus*), as well as the water and their substrate, within the Waikouaiti estuary in Karitane. By utilizing the fecal associated marker organism *Escherichia coli*, we will define uptake and clearance rates of fecal microorganisms for both species. These results will define an appropriate sampling time frame that will capture the uptake and clearance rates of fecal microbes introduced into the field following a rainfall event. The molecular technique, 16s rRNA sequencing, will be employed to identify taxonomic groups of fecal microbes in order to identify the enteric hosts and therefore the sources of contamination. For the community, we aim to give locals a 'safe shellfish harvesting time', which will be indicative of a period where fecal microbial loads are found to be lowest. Over all we aim to broaden the understanding of the dynamics and survival of microbial fecal contaminants in estuarine environments.

Bodhi Bettjeman

Plant & Food Research

Zoé Hilton[1], Luke Pearce[1], Nigel Joyce[2]
[1]Cawthron Institute, [2]Plant & Food Research

Enhancing a niche, sustainable, high-value omega 3 source - Greenshell™mussel (*Perna canaliculus*)

Greenshell™mussels (GSM - *Perna canaliculus*) are a source of omega 3 long chain polyunsaturated fatty acids (n-3 LC PUFA). GSM oil is a high-value product containing a series of minor lipid components (non methylene interrupted fatty acids (NMI)-FA, plasmalogen, phytosterols and furan fatty acids) that are not contained in most fish oil products and that have been shown to have their own particular beneficial properties. There is a growing body of evidence that GSM oil may have its own unique health benefits, in particular in relation to reducing inflammation. The high cost of GSM oils is due to the low yields obtained and the complicated extraction technologies that are used to prepare the products. Because of the increasing cost and limited availability of traditional fish oils, there is scope for enhancement of novel and sustainable omega 3 rich sources. This study determines the potential for GSM as a sustainable local source of omega 3 and identifies where the organism stores its n-3 LC PUFA using both conventional and novel lipid mapping techniques. This work aims to enhance the NZ GSM oil industry by improving quality and yield of the oil.

Helen Bostock

NIWA

Sara Mikaloff-Fletcher, Mike Williams
NIWA

Estimating carbonate concentrations in the waters around New Zealand and Antarctica

A major gap in our ability to understand the present state of ocean acidification in New Zealand's EEZ and the Southern Ocean has been the limited number of observations of carbonate species in these regions. We use multiple linear regressions (MLR) to estimate alkalinity and DIC from the common hydrographic parameters; temperature, salinity, depth/pressure and oxygen. We find distinct regimes based on water masses, where the alkalinity and DIC have different relationships with the hydrographic parameters. The aim of this work is to use all the hydrographic data for the region to produce detailed maps of the carbonate parameters: pCO2, pH, [CO32-], aragonite saturation, calcite saturation, that take into account local currents, especially around complex topography. This approach was initially successfully applied to the Southern Ocean (south of 25°S) using observations from the GLODAP (1990s), CARINA and PACIFICA (2000s) global datasets. Now, we have applied the same approach to look more specifically at the region south of the Polar Front (approximated at 60°S), where the strong role of upwelling, productivity and sea ice is likely to lead to different relationships between hydrographic parameters and carbonate species.

Grant Broomfield

The University of Waikato

Steve Bird[1], Nicholas Elliott[2], Simon Muncaster[3], Koen Mensink[3], Jane Symonds[4]
[1]The University of Waikato, [2]Bay of Plenty Polytechnic, [3]Wageningen University, [4]NIWA

Characterising the immune response of the yellowtail kingfish for use in studies of fish health

Aquaculture globally is currently looking at ways of expanding and increasing its production, to create a more sustainable and profitable industry. There are two ways to achieve this, firstly through the optimisation of culture conditions for existing species and secondly, with the introduction of new high value candidate species. For these approaches to be successful, it is important to understand aspects of a fish's physiology to help overcome any production bottlenecks encountered. However, the quality of the research that can be carried out is very much dependent on the amount of genetic data available within a particular species.The Yellowtail Kingfish (*Seriola lalandi*) has been recognised as a suitable candidate species for aquaculture in NZ and using newly developed techniques a large amount of genetic information has been obtained. From this a number of important immune genes have been identified and subsequently characterised for use as biomarkers of fish health. Using these tools, a programme of research will be developed to understand the role of the immune system within larval and adult fish and will be subsequently used to monitor the health of farmed fish stocks or measure the effectiveness of any therapeutic approaches.

Sarah Bury

NIWA

Matt H. Pinkerton[1], Julie. C.S. Brown[1], Greg Olsen[1], Evgeny Pakhomov[2], Jethro Johnson[3], Elanor Miller[4], Rochelle Constantine[3], Mike Doule[5], Katie StJohnGlew[6]
[1]NIWA, [2]University of British Columbia, [3]The University of Auckland, [4]University of Otago, [5]Australian Marine Mammal Centre, [6]University of Southampton

Stable isotope analytical issues associated with high lipid-content organisms: a focus on ceteceans and notothenioid (anti-freeze) fish

An extended stable isotope study of the Ross Sea ecosystem has resulted in over 5000 analyses of multiple fish species and humpback whales. Ross Sea fish are dominated by a single family, the notothenioids, which characteristically lack swim bladders and attain increased buoyancy by reducing skeletal mineralisation and concentrating lipid deposits in their tissues: examples being Antarctic toothfish (*Dissostichus mawsoni*), Patagonian toothfish (*Dissostichus eleginoides*), Antarctic silverfish (*Pleuragramma antarticum*), and icefish (*Chionobathyscus dewitti*). Antarctic toothfish are particularly lipid-rich, commonly with 10-30% of their body mass derived from lipids. Muscle samples from these lipid-rich fish, along with whale skin and blubber biopsies (which also include cetaceans from New Zealand waters), have presented difficulties with regard to effective lipid extraction, mass spectrometry analysis and bulk isotope data corrections. We discuss the sample processing and analytical challenges we have encountered obtaining reproducible fully lipid-extracted material, the effects of the lipid extraction process on δ15N values and the isotopic corrections we have developed in order to generate reliable δ 13C values for bulk tissue analyses.

Sarah Bury

NIWA

Julie C.S. Brown, Thomas Max
NIWA

Elemental analyser modifications to measure isotopic values of nanomolar quantities of C and N

Standard analytical systems for measuring nitrogen (N) isotopic values in organic material typically require a minimum of 20-50 µgN of material to achieve accurate and precise isotopic data. Using a Flash2000 elemental analyser with zero-blank autosampler linked to a DeltaVPlus IRMS (Thermo Fisher Scientific, Bremen, Germany) we are now routinely analyzing N content and δ15N values in samples down to 5µgN with an accuracy and precision of 0.2‰. This enables us to easily analyse N isotope values in carbonate-rich sediments, filtered open ocean phytoplankton samples and individual micro-invertebrates. We are now applying further modifications to the hardware and analytical software to push the detection limit to less than 1µgN. This will have important applications to research requiring isotopic analysis of single specimens of very small organisms (e.g. phytoplankton, invertebrates, nematodes, bacteria, viruses). Such analyses will enable us to tease out what have previously been community level isotopic signatures adding extra levels of detail to trophic information at the base of food webs. In addition, analysis of protein microlayers in shells, otoliths and megafaunal teeth will open up new possibilities of fine scale chronological sampling, enabling us to trace ecological changes back in time in more detail than before.

Mathew Cumming

Plant & Food Reasearch

Bronwyn Hall, Deborah Le Corre, Kathleen Hofman
Plant & Food Reasearch

The biochemistry and thermal denaturation properties of native collagen from different NZ marine species: A comparative study

Collagen has many applications in the food, cosmetic and biomaterials industries. The most abundant sources currently used are from mammalian tissues. However, there is increasing interest in collagen from marine sources which provide opportunities for different applications. Collagen is a large molecule consisting of three alpha chains, each approximately 1000 amino acids long wrapped in a helix. Marine collagens differ from the mammalian protein in the amounts of proline (PRO) and hydroxyproline (OHPRO) they contain. The structures of PRO and OHPRO limit rotation about the peptide bond and define the spatial orientation of adjacent amino acids in the chains. In addition, the hydroxyl group of OHPRO is involved in hydrogen bond stabilisation. Therefore the consequences of different amounts of PRO and OHPRO are significant for collagen proteins from different sources, influencing both the stability and functional properties. In the present study we extracted acid soluble collagen from three New Zealand fish: orange roughy (Hoplostethus atlanticus), ling (Genypterus blacodes) and salmon (Oncorhynchus tshawytscha). Electrophoretic analysis (SDS-PAGE) was performed to compare the molecular profiles. Comparative analyses of the OHPRO concentrations and thermal denaturation properties were carried out. The influence of heating rate on collagen denaturation and implications for functionality are presented.

Richard de Hamel

University of Otago, Marine Studies Centre

Jo Thompson*[1], Sally Carson[2]
[1]Cawthron Trust, [2]University of Otago

Flexing the Mussels with Year 13 students

For three years, more than 470 year 13 secondary school students have carried out research on greenlipped (Greenshell™) mussels, *Perna canaliculus* based at the Nelson Marlborough Institute of Technology's Aquaculture laboratory at the Cawthron Aquaculture Park, Nelson. As the programme expands this research aims to provide evidence-based support for the relationship between the science community and schools. This research looks at what kinds of engagement works best and how purposeful science education could look in the future.

Rex Fairweather

The University of Waikato Coastal Marine Field Station

Phil Ross, Hamish Lass
The University of Waikato, Bay of Plenty Regional Council

Mediterranean Fanworms invade Tauranga Harbour

The Mediterranean Fanworm, *Sabella spallanzanii*, is an invasive polychaete tubeworm that has spread throughout harbours and estuaries worldwide. *Sabella* was first observed in New Zealand waters in Lyttelton in March 2008. A large gregarious species, *Sabella* prefers sheltered waters where it can form dense smothering aggregations that compete with resident species for space and inhibit recruitment and food availability as a consequence of its high filtering capacity. As New Zealand populations of *Sabella* become established they are likely to impact aquaculture infrastructure. This has been documented in Australia, the location where *Sabella* was first recorded as invasive approximately 20 years ago. Following the discovery of significant and widespread *Sabella* populations in the Waitemata harbour, eradication programmes in both Waitemata and in Lyttleton were terminated (June 2010). However, surveillance has continued in other ports and harbours and eradication programmes have been implemented in Coromandel, Nelson and Whangarei. As New Zealand's largest port, Tauranga is particularly vulnerable to biological invasions. In September 2013, a single *Sabella* was recorded at a recreational boat ramp in Tauranga Harbour. A delimitation programme was instigated, and further invasive organisms recorded also suggesting recreational rather than commercial vessels as the means of invasion.

Kendall Gadomski

University of Otago

Miles Lamare[1], Henrik Moller[2], Michael Beentjees[3]
[1]University of Otago, [2]University of Otago, [3]NIWA

Embyonic and larval development and their responses to temperature in toheroa, a New Zealand bivalve *Paphies ventricosa* (Veneroidea: Mesodesmatidae)

Paphies ventricosa (Veneroidea: Mesodesmatidae) Gray 1843, is a large (up to 150 mm) surf clam endemic to New Zealand, with a geographically patchy distribution. Using SEM and light microscopy, *P. ventricosa* embryonic and larval development were observed and follow those previously described for Mesodesmatidae family, with *P. ventricosa* having a small egg (63-70 µm), reaching the ≈83 to 102 µm trochophore by 15 hrs, and a 100 µm D-veliger larva by 22 h. At 20°C, a pediveliger larval stage was reached by 39 days. The growth of *P. ventricosa* larvae cultured over 39 days at either 12, 16 or 20°C increased at warmer temperatures, and using the temperature quotient Q10 to quantify the response, we observed a Q10 = 1.82 (from 12 to 16°C) and Q10 = 2.33 (from 16 to 20°C) at day 27. Larval shape was not temperature dependent, suggesting that the smaller larvae in colder temperatures reflect a slowing of larval development, and not due to physiological damage by temperature resulting in abnormal larval development. The response of *P. ventricosa* larval to temperature has implications for spatial and temporal recruitment patterns, with sea temperature reducing development times in the plankton and enhancing the number of larvae reaching settlement.

Tom Gillespie

University of Otago

David A. Orlovich, Chris D. Hepburn
University of Otago

Identification of fungi associated with blisters of paua

Currently there are no named species of fungus that infect the shell of Haliotis spp. Friedman et al. (1997) cultured a fungus that was isolated from blisters in the shell of Haliotis iris but the isolate remains unnamed and is no longer available for study. In order to determine the identity of fungi associated with Haliotis spp., fungi found inside shell blisters of Haliotis iris from sites around the South Island and Stewart Island, New Zealand were collected and identified by DNA bar-coding and phylogenetic analysis. Approximately 1050 bp of the nuclear small subunit (SSU), 650 bp of the nuclear internal transcribed spacer (ITS) region and 600 bp of the nuclear large subunit (LSU) were sequenced. Sequences were compared with others from GenBank and preliminary phylogenetic analysis indicates that the fungus is in the order Lulworthiales, closely related to the genus Lulwoana. Currently the only species described in Lulwoana is *L. uniseptata* (≡ *Lulworthia unispetata*) is a marine fungus that was originally found on wood. Further sequencing of new collections and isolation of the fungus into culture is currently underway.

Sravani Gupta

Plant & Food Research

Reginald D. Wibisono, Graeme Summers, Samantha Collins, Graham C. Fletcher
Plant & Food Research

How fishy can it get?

The formation of trimethylamine (TMA) results in unacceptable "fishy" or "off" odours and flavours. TMA is the reduced product of trimethylamine oxide (TMAO), a common compound found in marine fish, where it serves as an osmoregulator, protein stabiliser and buoyancy aid. Depending on species and storage conditions, TMAO breaks down to TMA and dimethylamine (contributors to total volatile basic nitrogen - TVB-N) and formaldehyde, reducing perceived seafood quality. Most research conducted on TMAO and TMA has been carried out on Northern Hemisphere species such as cod and haddock. To quantify contributors to spoilage for different New Zealand fish, we tested 39 commercial species for their TMAO/TMA-N/TVB-N concentrations. Mean TMAO concentrations ranged from 14 to 790 mg/100 g. TVB-N values ranged from 6.6 to 21.8 mg/100 g and the overall TMA-N content was low (maximum 6.7 mg/100 g), with TMA-N contributing between 5.5 and 20.8% of the total TVB-N value. Further work will test more species, investigate the effect of habitat and seasonal variation on TMAO concentrations, and determine the effect of TMAO concentrations on spoilage. Understanding the contribution of TMAO to the spoilage of different species will help us to develop targeted shelf-life extension technologies

Jan Hesse

The University of Auckland, Leigh Marine Laboratory

J. Stanley, A. Jeffs
The University of Auckland

The Lobster in a Bottle - A novel technique for predation observation

Determining the impact of predators on juvenile spiny lobsters living on reefs is very important for understanding recruitment processes that ultimately help to determine the size of fished lobster populations. In this study a novel video device was used on reefs to make 24 hour observations of attempted predation on live juvenile Jasus edwardsii housed in a transparent container. The technique proved to be a significant advance to conventional tethering methods, which were greatly influenced by predators being attracted to divers deploying the tethered lobsters (up to 85% of all recorded predation events). In contrast, the lobster housed within the transparent bottle was observed to be subjected to multiple predation attempts over 24 hours. Peak predation risk to juvenile lobsters was identified between 02:00-04:00 am (night) and 11:00-12:00 pm (day). Video observations identified rock cod (*Lotella rhacinus*, 38%) and conger eel (*Conger verreauxii*, 29%) as major nocturnal predators. We identified distinct predator behavioural patterns, such as guarding the potential prey (blue cod - *Parapercis colias*) or continuous striking attempts by the spotted wrasse - Notolabrus celidotus. The results confirmed the importance of methodology for in situ predator observations, and provided initial data on the predation pressures on reef-dwelling juvenile spiny lobsters.

Jordan Aria Housiaux

University of Otago

Exploring the Murky World of the Sevengill Shark, *Notorynchus cepedianus*, in Southern New Zealand

The sevengill shark, *Notorynchus cepedianus*, is an important marine apex predator. In an ongoing MSc study I have gathered the first data on abundance, seasonal distribution and population connectivity of sevengill sharks in New Zealand. Sharks are attracted to coastal sampling sites in Otago and Stewart Island using burley. When sharks approach the bait line I implant fish tags and obtain photo identification of unique dorsal markings. Thus far, 57 sampling trips have been completed. Sharks were encountered on 63% of trips in summer, but on no trips in winter, suggesting strong migratory behaviour. Tag re-sight data will be used to construct mark-recapture models for estimating abundance. It is hoped that photo-ID will emerge as a less invasive alternative to physical tagging. Phylogenetic relationships among sevengill shark populations in NZ are being explored to assess population connectivity. Samples from within NZ (n=27) indicate no differentiation in mtDNA (COI) at a national scale. Further analyses of NZ samples and comparison with sequences from other sites in the Pacific will confirm the level of genetic exchange among populations. These findings provide some of the first data to help us understand the important role these predators have in structuring multiple coastal ecosystems.

Rhian Ingley

Morphum Environmental Ltd.

Prioritisation through different lenses

One of the key objectives of state of the Environment monitoring and other environmental data collection is to inform management decision making. Morphum conducted a technical assessment of the ecological and receiving environment health of the Manukau Harbour to inform stormwater catchment management planning. The assessment included the consolidation of available data to provide a high level ranking of the degree of risk associated with stormwater impacts from the subcatchments of the Manukau Harbour. Such high level risk assessment can change markedly depending on management perspective. An example is presented here where subcatchments ranking is affected by the inclusion or exclusion of adjacent Coastal Protection Areas. Exclusion of these areas provides a focus on the current state of the environment whilst inclusion of these areas provides a lense to shift the focus from fixing degraded areas, to the protection of high value areas.

Matthew Jones

Auckland University of Technology

Barbara Bollard-Breen
Auckland University of Technology

Role of scavenging in a mid-slope fish community

Scavenging is an important energy conduit in the deep-sea. Many deep-sea fish species are assumed to be facultative scavengers, but the proportion of their diet obtained from carrion is either difficult to ascertain or unknown. We estimated the proportion of scavenged food in the diets of eleven common deep-sea fish species from mid-slope depths on the northeastern Chatham Rise, New Zealand. We identified that basketwork eel (*Diastobranchus capensis*), Baxter's dogfish (*Etmopterus baxteri*), and serrulate rattail (*Coryphaenoides serrulatus*) were scavengers. Additionally, the shovel-nosed dogfish (*Deania calcea*) and long-nosed velvet dogfish (*Centroselachus crepidater*) were possible scavengers. Other species showed no evidence of scavenging, including the orange roughy (*Hoplostethus atlanticus*), warty oreo (*Allocyttus verrucosus*), robust cardinal fish (*Epigonus robustus*), four-rayed rattail (*Coryphaenoides subserrulatus*), black slickhead (*Xenodermichthys copei*), and big-scaled brown slickhead (*Alepocephalus australis*). These results correlate well with the presence or absence of fish at baited landers from recent research at other similar New Zealand locations, with scavengers appearing at baited lander deployments (n > 5 appearances per deployment), while the non-scavengers were rarely seen or absent. Scavengers may benefit from fisheries bycatch discards, which could influence the trophic structure of mid-slope communities.

Alana Jute

The University of Auckland

Brendon Dunphy
The University of Auckland

An Investigation of the Marine Invasive Species *Sabella spallanzanii* the Mediterranean fanworm in five Auckland Marinas

The introduction of non-native organisms into new ecosystems via various human vectors such as hulls of boats and ballast water from ships often results in dispersal, settle and spread of non-native species into new habitats resulting in significant ecological, economic and social changes for the affected country. One particular taxa, which has been found to be a very dominant fouling organism and successful Marine Invasive Species (MIS) tend to be filter feeders. *Sabella spallanzanii* the Mediterranean fanworm is one such filter feeder that has become a major MIS in New Zealand since its first discovery in Lyttelton Harbour in 2008 it soon made its way to Waitemata Harbour in Auckland 2009 and now has spread to several marinas in the city. The aim of this study is to determine the reproductive and feeding habits and physiological tolerances of *S. spallanzanii* in five marinas in Auckland. The specimens are being collected from five different marinas that have all have good established populations of *S.spallanzanii*. Results from this project will provide more insight into this MIS which will be able to assist marine managers and the North Regional council in developing potential management approaches for these specimens and future MIS.

Emma Kearney

University of Otago

The relationship between predators and the scallop *Pecten novaezelandiae* in Te Whaka a Te Wera Mātaitai, Paterson Inlet, Stewart Island

The New Zealand scallop *Pecten novaezelandiae* shows naturally high spatial and temporal variability in distribution and abundance. Experimental studies have shown that when exposed to predatory starfish, scallops allocate energy to structural defences or escape mechanisms such as shell thickening and adductor muscle growth at the expense of spawning. *Pecten novaezelandiae* found around Stewart Island grow to larger sizes and are comparatively long lived compared to Northern populations. There has been no take of Pecten novaezelandiae within the Te Whaka a Te Wera Mātaitai since 2001 due to concerns surrounding population decline attributed to overfishing. The region is isolated from environmental stressors associated with anthropogenic land use. Initial surveys do not indicate a correlation between the epibenthic predator densities and the size and density of *Pecten novaezelandiae*. This work begins to examine the relationship between predation and the allometry of *Pecten novaezelandiae* within the Mātaitai. The preliminary results of *Pecten novaezelandiae* larvae settlement studies throughout the Mātaitai will be discussed along with future work.

Ivan Kurtovic

Plant & Food Research

Matthew Miller, Helen Cleaver, Susan Marshall
Plant & Food Research

Flavour development in dairy products using fish digestive lipases

Fish are a potential source of enzymes that have relatively high catalytic efficiencies at lower temperatures and potentially novel activities. There is potential to exploit the activity of fish digestive lipases to reduce energy costs in industrial processes, purify specific fatty acids, deliver structured lipids for nutraceutical use, and produce particular flavours in food products. Digestive lipases from Chinook salmon (*Oncorhynchus tshawytscha*) and New Zealand hoki (*Macruronus novaezealandiae*) were evaluated as flavour-modifying agents in dairy products. Cream was incubated either with fish lipase extracts or two commercially available lipases used in dairy flavour development. The fish enzymes were similar to one commercial lipase in terms of the total amount and type of fatty acids released (mainly short chain). The highest specificity was towards the key dairy product flavour and odour compounds, butanoic and hexanoic acids. To demonstrate a potential route for industrial application, Chinook salmon lipase was immobilised on a hydrophobic resin (Toyopearl® Butyl) and used to hydrolyse milk lipids in a batch reactor. Eight cycles were achieved before the hydrolysis rate dropped off significantly. In addition to short-chain fatty acids, the immobilised lipase also showed specificity against the monounsaturated oleic acid. Free fatty acid composition together with sensory characteristics of lipase-treated creams and milk demonstrate the potential for flavour enhancement in dairy products using fish lipases.

Sorrel O'Connell-Milne

University of Otago

Traditional harvest knowledge maximises yield and regeneration of karengo (Bangiaceae)

The investigation and subsequent incorporation of traditional knowledge into the management and harvest methods for wild stocks globally and within New Zealand is of importance to the sustainability of our natural resources. Recent research into a sustainable harvest method for an intertidal alga has found further support for the incorporation of Māori traditional knowledge (mātauranga) into science. This group of intertidal algae within the Bangiaceae family, known as karengo in Māori, is harvested entirely from wild stocks and is culturally important to Māori. Traditional pulling was compared with cutting and scraping harvest methods. A sustainable harvest technique was determined by assessing yield and post harvest regeneration within the winter growth period from each harvest method. Hand pulling resulted in the greatest biomass regeneration post harvest, providing a 46% greater yield than scraping and no discernable difference in biomass six weeks post harvest compared to unharvested plots. A later harvest (August) resulted in an 83% greater yield than an early harvest (July). Therefore, to obtain an optimal yield whilst maintaining a sustainable harvest, hand pulling late in the season is recommended. This research supports and strengthens a harvest technique based on mātauranga Māori and provides information to empower kaitiaki (Māori guardians) to actively manage and preserve highly valued wild karengo stocks.

Rata Pryor Rodgers

Victoria University of Wellington

Jonathan P A Gardner
Victoria University of Wellington

Is seston quality or quantity limiting the presence of mussels on Wellington's South Coast?

Temperate rocky shores are characterised by 'universal' patterns of zonation throughout the world. An exception to this rule of zonation can be seen on the shores of Wellington's South Coast, where there is an almost complete absence of all mussel species on the rocky shore. Yet just kilometres away in Wellington Harbour there is a well-developed intertidal community, with an abundance of mussels comprised of four species. Mussels are a dominant aspect of intertidal communities and play important roles as transferors of water column primary production to benthic secondary production, as competitors for space, as prey and ecosystem engineers. *Perna canaliculus* is also an important species for New Zealand's aquaculture industry. This study aims to determine if seston quality and/or quantity is limiting the presence of mussels on the South Coast. Research is comparing clearance rates, absorption efficiencies and net energy balances of two mussel species when feed water from Wellington's South Coast versus an enriched seawater supply from the ponds at Cawthrons aquaculture park. Clearance rates of *P. canaliculus* spat were also calculated. Samples will later be processed using the FlowCAM to determine what type of particles the mussels were accepting or rejecting because preliminary investigation suggests that particle type (not number) may be the limiting factor for mussel distributions.

Susanne E. Schüller

University of Otago

Candida Savage
University of Otago

Early diagenesis of phytoplankton in Doubtful Sound sediments

The flux of phytoplankton blooms to the seabed provides an important input of organic matter and nutrients to the benthos and is an important process that influences historical proxy records in sediments. New Zealand Fiordland offers an exceptional opportunity to investigate incorporation of phytodetritus into the sediment under anoxic, oxic and bioturbated sediments and how these conditions affect preservation of biomarkers. Phytoplankton pigments (chlorophyll-a, carotenoids) were used as biomarkers to test whether preservation of pigments is enhanced in anoxic versus oxic sediments in Doubtful Sound, and to quantify the influence of bioturbation on the preservation and degradation of pigments. As hypothesized, pigment preservation was better in anoxic sediments compared to oxic sediments. Furthermore, bioturbation of anoxic sediment enhanced preservation of phytoplankton pigments. We inferred that this was due to the bioturbators removing phytoplankton from the sediment surface and rapidly incorporating it into deeper sediment layers where it is less susceptible to degradation. Consequently, in deep fjord basins bioturbation can enhance pigment preservation and reduce degradation through rapid burial of phytodetritus into the sediment. Furthermore, the low oxygen conditions in many fjord basins offer effective sinks for phytoplankton organic matter and organic carbon burial.

Paul South

University of Canterbury

David R. Schiel
University of Canterbury

Varying the temporal scale of sampling affects measures of mussel settlement

The supply and settlement of larvae have important implications for marine population dynamics. Recently, much research has focused on linking larval abundance and dispersal data to observed patterns of settlement. Consequently, the measurement of settlement has become increasingly important in benthic marine ecology and in understanding benthic-pelagic linkages. However, this is potentially confounded by complex settlement behaviours and physical variables that may impact upon the abundance of larvae. We assessed a common method of sampling mussel larvae: a fibrous plastic scrubbing pad; the Tuffy™. To do this, we examined settlement of mussel larvae into tuffies that were deployed on different days and for different durations of time. Specifically, we compared daily to longer-term patterns of settlement in three week-long trials. We address the efficacy and implications of data standardisation methods that are commonplace in studies of mussel settlement. Significant differences in mussel larvae abundance between days and durations suggest that longer deployments may be more influenced by post-settlement processes and settlement behaviour of mussels rather than settlement per se. We show that patterns of settlement are species-specific and in-Tuffy abundance can be the product of a gradual accumulation of mussel plantigrades or a reflection of a highly mobile plantigrade pool. Our findings have significant implications for studies that use Tuffies as standardised mussel collectors.

Nicole Sturgess

The University of Waikato

Chris Battershill[1], Phil Ross[1], Willem de Lang[1], Peter McCoomb[2]
[1]University of Waikato, [2]MetOcean Solutions Ltd

Mapping the biogenic seabed habitats of the Paraninihi Marine reserve, Taranaki, New Zealand

Biogenic habitats increase diversity, abundance, and productivity of a range of species that associate with them. With the exception of shallow and regularly dived coastal waters, there is limited information about biogenic habitat in New Zealand's marine environment, both in terms of what species associate with biogenic habitats and where these habitats occur. As scuba, ROV or camera surveys are often impractical, alternative methods are required to rapidly map large sections of the seabed. Multi-beam echo sounder (MBES) systems are one such method. The Parininihi Marine Reserve was established off the North Taranaki Coast in 2006. In 1996, a preliminary survey of Parininihi reefs demonstrated the ecosystem was unique in term of its diverse community structure, comprising of warm temperate and cold/sub Antarctic fauna. Indeed the reef supported the highest reported diversity of benthic encrusting organisms in New Zealand, for open rocky reef habitats. My thesis will consist of mapping the distribution of biodiversity, within and adjacent of Paraninihi Reserve, to define the extent of biogenic communities over the different habitats. Multi-beam echo sonar (MBES) will be used to map and identify the various biogenic habitats, with scuba and drop camera surveys to ground truth the MBES data. My poster will focus on the background, objectives and mythology of the study so far.

Matt Walkington

NIWA

Performance of a New Salinometer

In situations where there are large numbers of samples to be measured to the highest accuracy, there appears to be little doubt that the new RBR MS-310e Micro-Salinometer is just too slow to be a practical instrument compared with the alternatives, such as the Guildline 8400B AUTOSAL. What is not quite so clear is whether the MS-310e can be operated at all with the accuracy demanded for calibrating the conductivity sensors on modern open ocean CTD equipment (+/- 0.002 PSS-78 or better). This paper attempts to answer the questions is the MS-310 (1) too slow and (2) too inaccurate for open ocean oceanography by presenting the results of testing and operation of the device and its long and well established (but much bigger and more expensive) competitor. Conclusions and recommendations include that for the best accuracy (1) both the MS-310e and all samples and standards need to be maintained in the same stable temperature environment to 1 °C or better (2) instability in the instrument response implies restandardisation as frequently as several times per day (or more) (3) the output of the MS-310e needs to be averaged over several minutes after sufficient time for flushing (9 minutes) and initial stabilisation (3 minutes) (4) the 15 minutes to measure a sample is more than three times the time taken by an AUTOSAL and simply too long to be practical in certain cases and (5) even with attention to the necessary details, the stability and accuracy easily achieved by the AUTOSAL seems to be at the very upper limit of possibility for the MS-310e, if not beyond.

Anna Wood

University of Otago

Ashley A. Rowden[1], P. Keith Probert[2]
[1]NIWA, [2]University of Otago

Bryozoan mimics, habitat complexity, and biodiversity: A settlement study

Settlement plates designed to resemble natural habitats were used to test hypotheses about the relationship between habitat complexity and biodiversity. PVC mimics of habitat-forming bryozoans were deployed for six months at an open shelf site at 80 m water depth off Otago. Physical dimensions of the mimics were based on measurements of *Cinctipora elegans*, the dominant habitat-forming bryozoan of the study area. The mimic units varied in colony height and branch density to investigate the influence of these elements of habitat structure on associated biodiversity in a fully crossed, replicated (fixed factor) experiment. A high level of settlement occurred and the epifaunal cheilostome assemblage for the high, medium, and low density mimics (medium height) was quantified. Significant differences in assemblage structure and composition resulted from the different branch densities, but there was no significant difference in rarefied and extrapolated measures of species richness, or in estimates of total species richness, for each branch density treatment. Overall, the results indicated that the main effect of bryozoan-generated habitat complexity was to provide surface area that supported increased abundances of colonising fauna. In addition, the medium and high branch densities supported different and less-variable assemblages than those found at low branch densities.

Tim Young

Auckland University of Technology

Andrea C. Alfaro, Silas Villas-Bôas
The University of Auckland

Metabolomic applications in marine invertebrate development and aquaculture

Global mollusc production is rapidly increasing and is one of the largest aquaculture activities in the world. Considerable attention is being placed in the production of hatchery-reared juveniles to preserve wild populations and provide industry with high-quality stock for grow-out. However, variations in larval health and growth is proving to be a significant bottleneck within the industry. In order to develop remedial strategies, it is crucial that we mature our understanding of endogenous regulatory mechanisms involved in early developmental timing, energy acquisition/allocation, sensory systems and immunological responses. Metabolomics is the non-targeted analysis of a broad range of metabolites within cells, tissues and organisms. Metabolites are end products of gene and protein expression and are exceptionally sensitive to genetic and environmental perturbations. Thus, metabolomics offers a revolutionary framework for phenotyping organisms at the molecular level. Examples of applications are widespread across diverse areas of research from human medicine to deep-sea microbial ecology. However, despite its wide applicability, metabolomics-based approaches for studying marine invertebrate larval development has not yet been realised. We report the first application of metabolomics to investigate developmental variation in marine invertebrate larvae.

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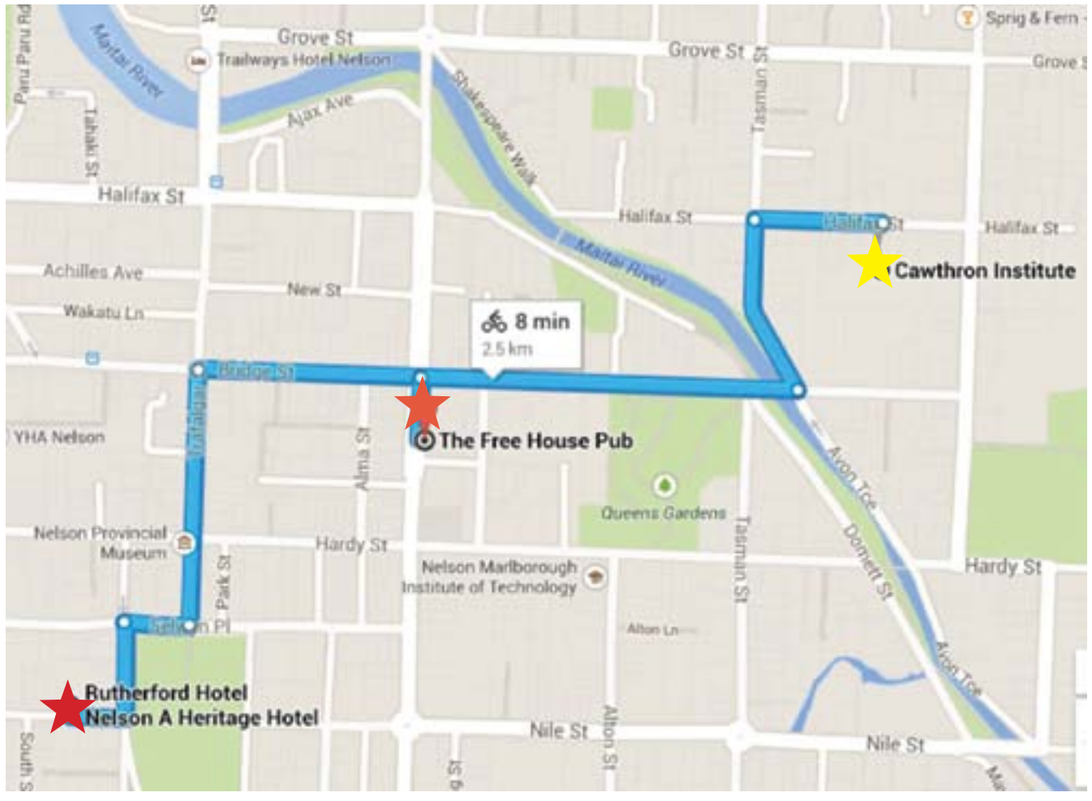
Nelson City Map



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